THE GUÅHAN 2050 SUSTAINABILITY PLAN

AN UPDATE TO THE GUAM COMPREHENSIVE DEVELOPMENT PLAN

The Guåhan 2050 Sustainability Plan

An Update to the Guam Comprehensive Development Plan

Contract For:
Professional Services to Draft the Guam 2050 Sustainability Plan

Project No:
Bureau of Statistics and Plans RFP-BSP-2022-001

AUGUST 2025

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THE BUREAU OF STATISTICS AND PLANS
Government of Guam

Acknowledgements

Text to come.

Letter from the Director

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Letter from the Governor

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Executive Summary

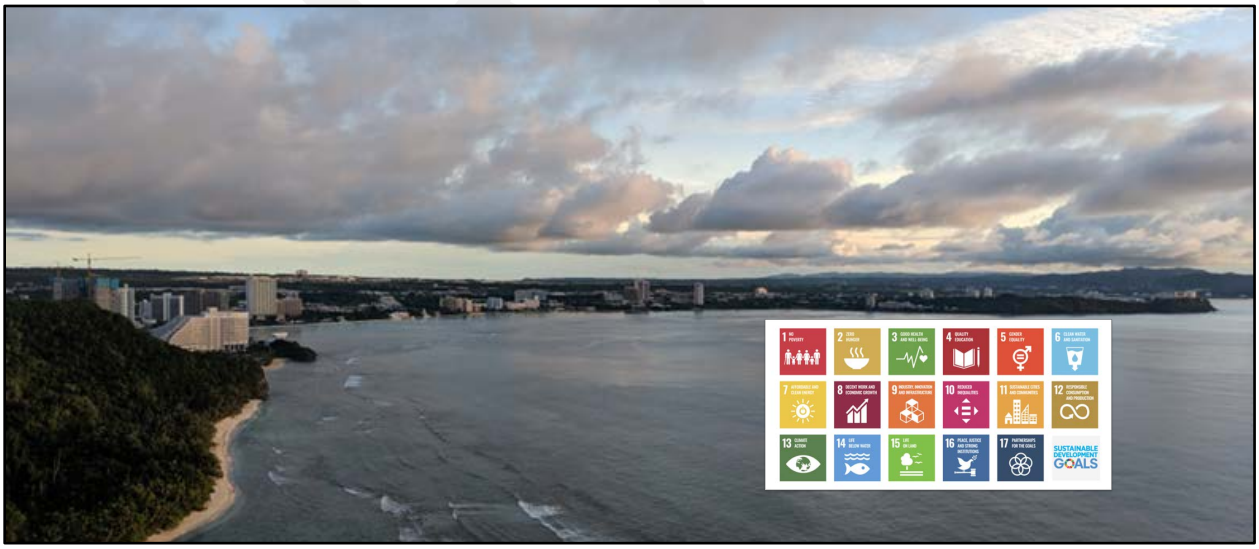
The Guåhan 2050 Sustainability Plan is not simply a land use map—it is a living commitment to the people of Guam. It recognizes that every decision about where and how we build, protect, and invest has consequences for generations. By integrating environmental stewardship, economic opportunity, and cultural preservation, the plan charts a path that is both ambitious and grounded in community priorities.

Guam's Choice for the Future

By 2050, Guam can be a place where vibrant villages, a prosperous economy, a thriving environment, and a celebrated culture reinforce one another—where development decisions respect the limits of our island, balance competing needs, renew our natural resources, ensure equity, and engage everyone in shaping the future.

We face converging challenges: climate change bringing hotter days, rising seas, and stronger storms; global economic forces impacting tourism, defense, and local industries; rapid population and land use pressures from military expansion and urban growth; and cultural change that risks eroding CHamoru heritage and community life.

The Guåhan 2050 Sustainability Plan (G50SP) is Guam's roadmap to meet these challenges. It was created through broad community engagement, guided by Public Law 35-110, and aligned with the United Nations Sustainable Development Goals.



Core Values and Principles

The G50SP is guided by five core principles that serve as a compass for all its policies:

1. **Limits** – Respect ecological and infrastructure thresholds.
2. **Balance** – Integrate environmental, economic, and cultural needs.
3. **Renewal** – Revitalize the built environment; restore degraded lands, waters, and heritage.
4. **Equity** – Ensure fairness in access to land, resources, and opportunity.
5. **Engagement** – Include all voices in decisions and implementation.

These principles are embedded within five thematic goals of the G50SP: Sustainable Communities, Prosperous Economy, Thriving Environment, Vibrant Culture, and Village Sustainability. Each goal has a dedicated chapter in the plan, with policies and objectives that respond to Guam's unique challenges and opportunities.

Big Ideas and Policies

The G50SP's land use policy framework is the backbone of the plan. It organizes many hundreds of interrelated policies across the five thematic chapters into a coherent system designed to guide development, conservation, and infrastructure investments through 2050.

At its core, the framework:

- **Sets clear spatial priorities** – Urban growth is directed to areas with existing infrastructure, while rural landscapes, watersheds, aquifers, and cultural heritage sites are conserved through protective zoning and overlays. Green infrastructure and coastal resiliency are prioritized by plan policies.

- **Integrates hazard and climate data** – Flood maps, sea level rise projections, and hazard overlays shape where and how building can occur, reducing long-term risk.

- **Connects land use to infrastructure** – Development approvals are tied to the capacity and resilience of water, wastewater, stormwater, energy, and transportation systems.

- **Balances economic and cultural objectives** – Policies encourage redevelopment of underused urban areas, support small business and eco-cultural tourism, and protect agricultural lands to strengthen food security.

- **Elevates village planning** – Each village's character, priorities, and needs are reflected in context-specific land use policies, ensuring growth supports rather than erodes local identity.

This integrated approach replaces fragmented, sector-by-sector decision-making with a shared, island-wide framework that still leaves room for village-level flexibility. By embedding environmental stewardship, cultural preservation, and economic opportunity into the same decision process, the framework helps avoid conflicts, streamline permitting, and ensure cumulative gains toward sustainability.

From Plan to Action – Integrated Governance for a Sustainable Guam

Turning the vision into reality will depend on how Guam governs its land and resources over time. The G50SP implementation will be coordinated by the Bureau of Statistics and Plans, supported by a Sustainability Plan Implementation Task Force. Actions are phased into short-term (2025–2030), mid-term (2030–2040), and long-term (2040–2050) horizons. The G50SP implementation roadmap emphasizes more *integrated* governance that is:

- **Coordinated** – Aligning the actions of agencies responsible for planning, infrastructure, environment, and cultural heritage so decisions reinforce rather than conflict with one another.

- **Accountable** – Assigning clear responsibility for outcomes, tracking performance against measurable indicators, and reporting results to the public, the Legislature, and village leaders.

- **Transparent** – Making planning data, maps, and progress reports publicly accessible and understandable.

- **Inclusive** – Engaging village mayors, the Municipal Planning Councils, cultural organizations, and residents—recognizing tribal and indigenous governance roles as equal partners in decision-making.

- **Adaptive** – Reviewing policies regularly, learning from results, and updating approaches in response to new challenges, science, and community priorities.

This governance-centered approach ensures that land use planning is not a one-time exercise, but an ongoing process of balancing competing needs in a way that builds trust, reduces uncertainty, and strengthens Guam's resilience. The G50SP is as much about *how* decisions are made as it is about *what* decisions are made, recognizing that strong institutions and sustained community partnerships are essential to securing the island's shared future.

Ultimately, it will be up to the people of Guam, working together and with an enduring commitment to a common purpose, to realize the vision of a sustainable, equitable Guåhan for present and future generations.

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List of Abbreviations

AFB	Air Force Base
ALC	Ancestral Lands Commission
ARC	Application Review Committee
BMP	Best Management Practices
BSP	Bureau of Statistics and Plans
BTS	brown tree snakes
CCU	Consolidated Commission on Utilities
CIPs	Capital Improvement Plans
CLTC	Chamorro Land Trust Commission
CNMI	Commonwealth of Northern Mariana Islands
Cpv	Channel protection volume
CZMA	Coastal Zone Management Act
DOAG	Department of Agriculture
DLM	Department of Land Management
DPR	Department of Parks and Recreation
DPS	Distinct Population segment
DPW	Department of Public Works
ESA	Endangered Species Act
EEZ	Exclusive Economic Zone
FIA	Forest Inventory Analysis
FENA	US Navy Water System
HMU	Habitat Management Unit
INRMP	Integrated Natural Resources Management Plan
JRM	Joint Region Marianas
G3	Guam Green Growth
GAPCSR	Guam Air Pollution Control Standards and Regulations
GEPA	Guam Environmental Protection Agency
GHURA	Guam Housing and Urban Renewal Authority
GLUC	Guam Land Use Commission
GPZ	Groundwater Protection Zone
GISC	The Guam Invasive Species Council
GRSS	Guam Coral Reef Resilience Strategy
G50SP	Guam Sustainability Plan 2050
GPA	Guam Power Authority
GWA	Guam Waterworks Authority
HCP	Habitat Conservation Plan
G3	Guam Green Growth
LFTRC	Live-Fire Training Range Complex

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MC	Micronesia Challenge
MOUs	Memorandum of Understanding
NAAQS	National Ambient Air Quality Standards
NCTS	Naval Computer and Telecommunication Station
NFIP	National Flood Insurance Program
NGLA	Northern Guam Lens Aquifer
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NSAA	Naval Support Activity Anderson
NWI	National Wetlands Inventory
NWR	National Wildlife Refuge
NOAA	National Oceanic and Atmospheric Administration
OHWM	Ordinary high-water mark
RAS	Recirculating aquaculture systems
Rev	Recharge volume
RMI	Republic of Marshall Islands
SDGs	United Nations Sustainable Development Goals
SIDS	Small Island Developing States
TSS	Total Suspended Solids
T&E	Threatened and Endangered
SIP	State Implementation Plan
SDGs	Sustainable Development Goals
SPREP	South Pacific Regional Environmental Programme
UN	United Nations
USFWS	United States Fish and Wildlife Service
USDA	United States Department of Agriculture
WesPacFIN	Western Pacific Fisheries Council
WQv	Water quality volume

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Chapter 1. **G50SP**

1.1 Introduction

In 2025, Guam is facing challenges from climate change, global economic forces, and the social and environmental stress of a major military buildup. In such times, the people of Guam have recognized the central importance of sustainability to a shared and prosperous island future.

This Guåhan 2050 Sustainability Plan (G50SP) was mandated by Public Law 35-110 (Akto Para i 2050 Maga'planun Mina'ok Lina'la' Guåhan) to address the "imperative [to] better meet the needs of the present without compromising the ability of future generations to meet their needs." In the legislature's view, the pathway for achieving this was to update Guam's comprehensive development plan in order to address the many sectors of life on Guam that are affected by land use, including its villages, economy, environment, and culture. The legislature also recognized that achieving sustainability depends not on a singular sector but on maintaining a healthy, balanced relationship between all of them. Each is important, each must be respected.

With the guidance of the Bureau of Statistics and Plans (BSP), the G50SP was developed by assessing land use trends, challenges, and opportunities for a sustainable island future on Guam. Importantly, the plan was also built around extensive community engagement, including interviews with government agencies and the village mayors, focus groups, and an island-wide survey. This engagement confirmed that the people of Guam envision a prosperous future that preserves the island's environment and culture. Above all, the people desire a future that reflects the cherished values and sense of community and social cohesion that make Guam unique.

1.1.1. Sustainable Development is Key

Public Law 35-110 directs that the G50SP consider Guam's economy, environment, and culture in relation to the United Nations' Sustainable Development Goals (SDGs) and the U.N. Program of Action for Small Island Developing States. The seventeen SDGs and the experiences of other small islands jurisdictions are markers to help guide Guam toward a more sustainable future. They address poverty, clean water and energy, and climate action. They focus on "life on land," "life below water," and sustainable communities. They set out fundamental sustainability goals such as reducing inequality and achieving social justice.

The U.N. SDGs are recognized as central measures of the people's health and welfare, cultural preservation, and protection of Guam's special environment. Aligned with the United Nations Sustainable Development Goals, Governor Lourdes Leon Guerrero and Lt. Governor Joshua Tenorio promulgated Executive Order 2019-23 establishing Guam Green Growth – a public-private partnership between the Government of Guam and the University of Guam Center for Island Sustainability – to actively develop tangible solutions addressing the sustainability challenges that Guam faces, such as building a green economy (see section 1.3).

GUAM GREEN GROWTH
An island-led movement for sustainability

As a comprehensive land use and development plan, the G50SP includes sustainability principles and land use objectives and policies to help Guam realize the U.N. SDGs. The plan seeks to guide the responsible use of Guam's land and resources for the next twenty-five years in order to achieve a more sustainable Guam, with shared prosperity for its residents.

The plan is organized around five themes – *Sustainable Communities, Prosperous Economy, Thriving Environment, Vibrant Culture,* and *Village Sustainability*. Each theme has its own chapter, with goals, objectives, and land use policies addressing island-wide land use and sustainability challenges. Chapter Seven of the G50SP also considers more specific land use and sustainability issues in Guam's nineteen villages. The villages of Guam share many concerns, such as the need for sustainable drinking water supply and preserving the island's special cultural heritage, but each also has land use needs unique to their settings.

Chapter 8 of G50SP frames a strategy for implementing the plan. The intention is that this plan will help guide Guam to prosperity for all its residents, by meeting the needs of both present and future generations. The key to success will be the degree to which the Government of Guam, Guam's residents, and their leaders commit to the plan's goals and policies. This includes taking decisive action now for the sake of the future. As the legislature observed:

> *It is clear that our stewardship of Guam's resources is not just a responsibility for the future, and we must act now to protect our economy, our island way of life, and our culture.*

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1.1.2. Community Engagement and the G50SP

Under BSP's guidance, the G50SP reflects the input of professional land use and technical experts, Government of Guam agency representatives, and the community itself. This input was critical first and foremost to the development of certain key principles framing the plan, as well as to development of the land use policies and programs for each of the plan's sections. Community engagement was and will continue to be an important component of the plan, especially in on-going implementation, as discussed in Chapter Eight.

Community Engagement

Effective land use plans reflect the desires and aspirations of the people. An extensive outreach program was crafted and implemented for the G50SP to ensure that the plan was developed from the bottom up as much as from the top down. This engagement program had five stages.

Subject Matter Expert Interviews: In-depth interviews were held with agency subject matter experts and primary stakeholder groups on Guam (see Appendix xx). These helped establish the land use priorities and concerns of community influencers and policy makers, as well as issues people feel must be addressed in order to achieve the goals and objectives of the G50SP. The interviews provide an excellent archive of how those involved in shaping policy, growing the economy, overseeing the island's villages and preserving Guam's environment, culture and history view Guam's journey to achieve a more sustainable future.

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prosperous economy, thriving environment, vibrant culture and sustainable community for Guam. As with all of the other qualitative research efforts, video recordings, transcripts and summary notes were prepared to aid analysis.

Regional Meetings: Building on insights from the focus groups and qualitative, semi-structured interviews as well as project research, three regional public meetings were held (south, central, and northern Guam). In preparation, Mayors of each village were interviewed to assess and receive guidance on meeting organization (location, included villages, etc.). In each meeting, land use issues and concepts were organized by four focus areas: economy, environment, culture and sustainable development. Residents were asked to identify the location of their concerns or important elements they believed needed attention on large maps depicting the villages in the north, central and southern regions, as well as on a map of the entire island. All attendees were also invited to complete an online survey to share their perceptions and priorities for achieving a sustainable Guam. The attendance, and results from the mapping exercise, and the online survey as well as the transcripts of each of the interviews with the mayors along with summary notes are included in the G50SP background files.

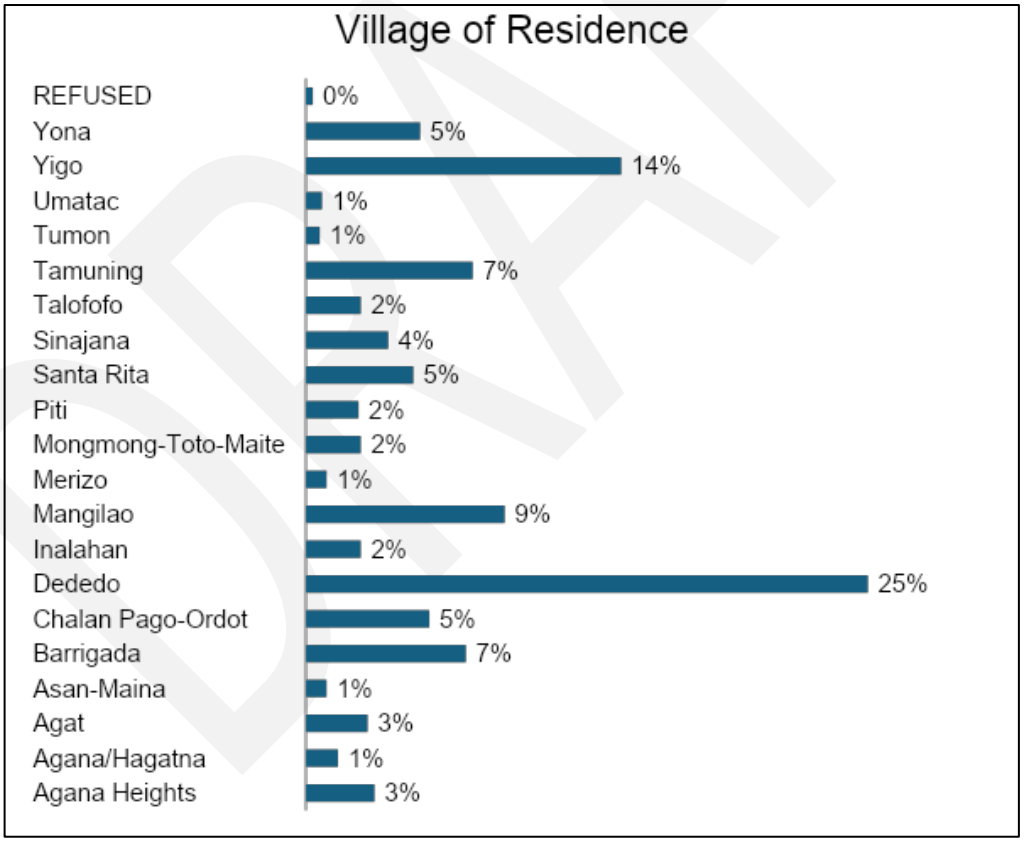


Figure 1-1. Island-wide Engagement Survey Results by Village of Residence.

Island-wide Telephone Survey: Based upon the considerable body of qualitative information gathered throughout Guam, a quantitative, island-wide, telephone survey was conducted to gather evidence of the attitudes, concerns and prescriptions for sustainability that had been

identified. Just over seven hundred (702) randomly-selected residents participated in the survey, providing information that is accurate to within +/- 4.2%. The survey was administered to residents over the age of 18, and the sample was similar to those identified in the 2020 U.S. Census and thus is deemed to provide an accurate representation of the attitudes of the people of Guam. A report of the significant findings of the survey can be found in Appendix xx.

As discussed in Chapter 2, population distribution reflects strong clustering in key urban and suburban villages. The Island-wide engagement survey supports the demographic analysis. Dededo, for instance, accounts for the largest share of respondents (25%), followed by Yigo (14%), and Mangilao (9%), presented in Figure 1-1. Figure 1-2 shows that 47% of respondents live in the Central Region, followed by 38% in the North, and 14% in the South. This distribution highlights the centrality of core villages such as Tamuning and Mangilao in regional planning, while also drawing attention to the lower population density—and greater infrastructure challenges—in southern villages.

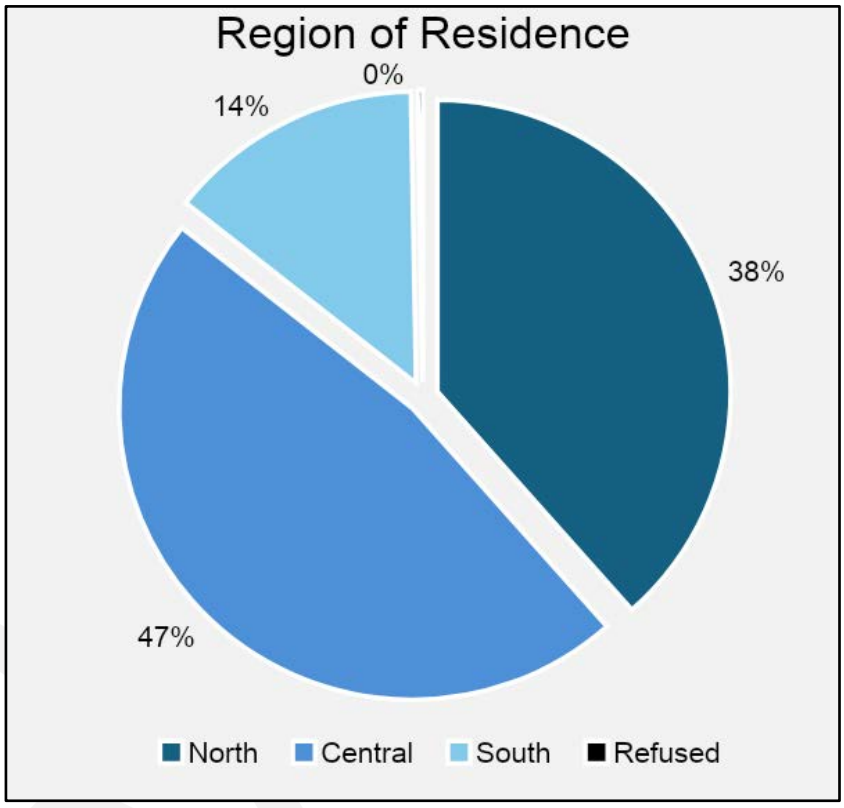


Figure 1-2. Distribution of Respondents by Region of Residence.

The G50SP is grounded in the values and concerns of the people of Guam, from the legislature to agencies and village mayors, to community members. Government voices were critical to identifying important land use challenges and how to improve the governance of land use on the island. Guam is doing important planning work across many agencies, each of which acknowledge the need for collaboration and the integration of government programs that affect land use. Likewise, the mayors have shared challenges, from maintaining village infrastructure to providing important services. Each also expressed land use concerns specific to their village that need to be addressed through the land use plan. And when the residents of Guam were given the chance to share their views, clear and distinct opinions emerged about sustaining a prosperous economy, preserving Guam's thriving environment, maintaining sustainable villages,

and preserving its history and culture. These views, summarized below, help to form the foundation and key sustainability principles of the G50SP.

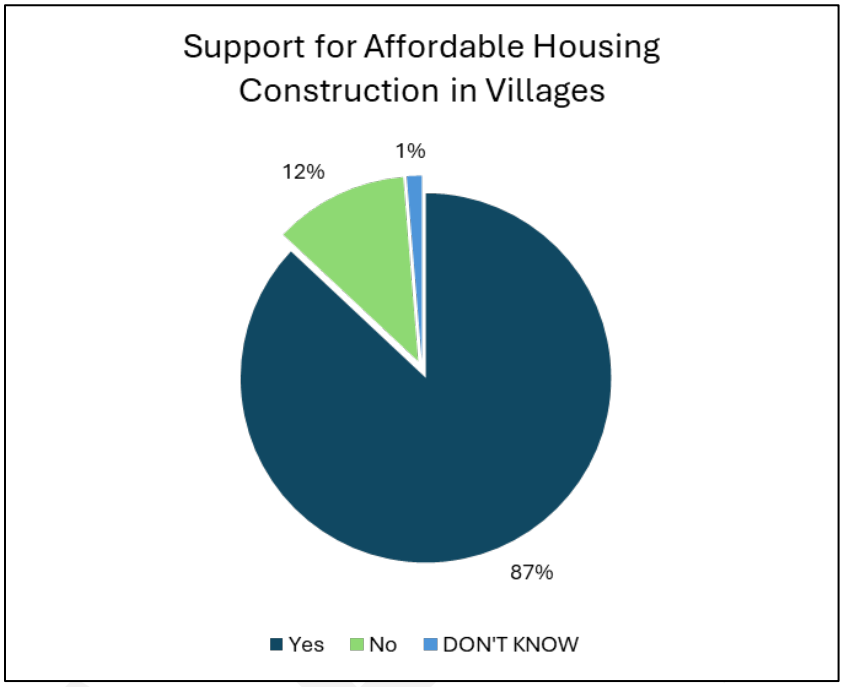


Figure 1-3. Resident Support for Affordable Housing in their Villages.

Sustainable Communities. The availability and condition of Guam's physical infrastructure were generally considered the most important components for creating sustainable communities. Nearly all residents felt that the installation of water, sewer, and power services, as well as roads, must be completed before any development is approved by the government. While the number of recreational areas within each community was deemed sufficient, their maintenance, safety, and the activities offered were less than acceptable. Residents preferred more walking paths and communal areas over more sports fields. Most felt that conservation areas should be preserved or expanded rather than developing new recreational areas.

Another critical component of sustainability was the need for affordable housing (Figure 1-3). Residents were open to both multi-family and single-family housing in their villages. The cost and lack of housing were viewed as primary reasons for the exodus of young families from Guam. Residents were somewhat less concerned about retail development in the village, with about six in ten indicating that they did not feel there should be more businesses within walking distance of their homes.

The Economy. Residents believe that both the government and the community have a responsibility to foster economic growth. They emphasized the need for economic diversity to create sustainability and reduce the economy's fragility. Residents want policies that ensure long-term prosperity without sacrificing future generations for short-term gains. A long-term economic development plan is essential, despite concerns about the political will to adhere to such a vision. This plan is critical for the island's future.

Residents are dissatisfied with the current economic direction and worry that urbanization is eroding Guam's character (Figure 1-4). They feel that capital investment often overshadows the need to preserve family, community, and heritage, which are the essence of life on Guam. While

tourism is important, they suggest renovating existing hotels instead of building new ones and investing in attractions that showcase the island's authentic character.

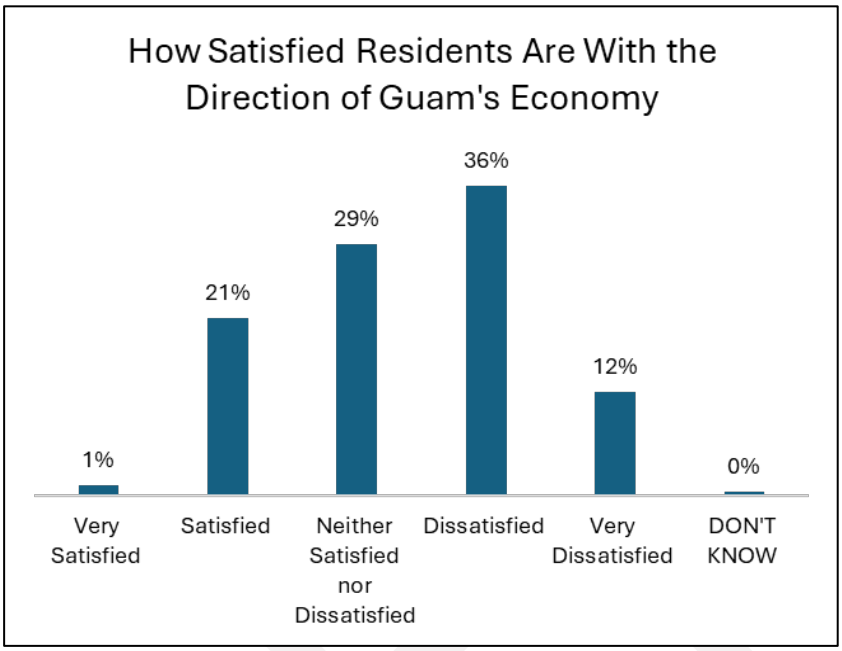


Figure 1-4. Respondent's satisfaction with Current Economic State.

The high cost of living, lack of affordable housing, and scarcity of well-paying jobs are forcing families to consider sending their children to the U.S. mainland for better opportunities. The primary concern is the cost of power. Renewable energy is seen as the most immediate and viable solution to reduce electricity costs. It is also environmentally sustainable and preferred over fossil fuel generators. Residents believe that aligning with global sustainability trends can bring real economic benefits, such as higher-paying, long-term employment opportunities.

The Environment. Residents prioritized environmental conservation over development, including housing development (Figure 1-5). While some agricultural and renewable energy uses were considered appropriate in conservation areas, restricting development in these areas was deemed critical to preserving the island's scenic beauty. Nearly three-quarters of residents surveyed supported restricting development over Guam's northern aquifer (Figure 1-6). However, opinions on how to restrict development varied. A plurality believed development

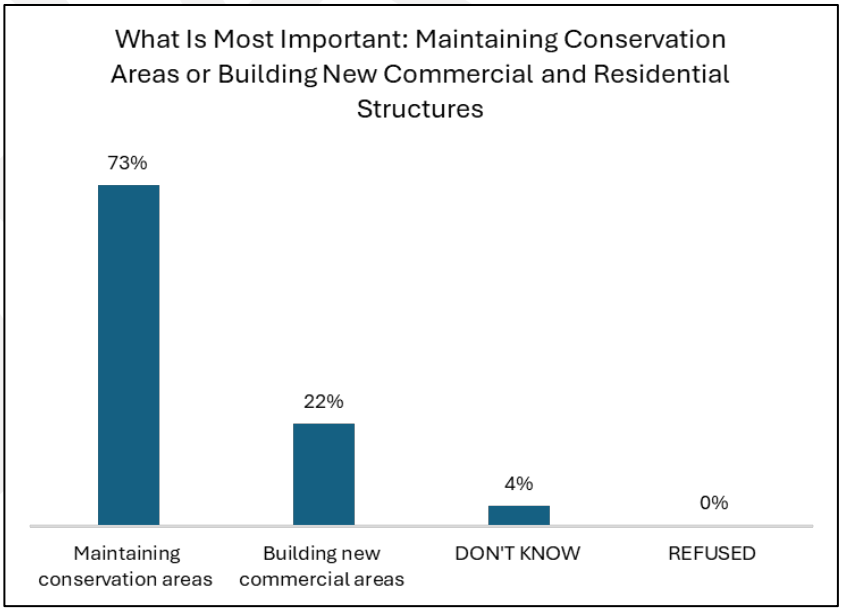


Figure 1-5. Prioritization of Environment and Development Across Respondents.

should only be allowed if a sewer system was installed first. Meanwhile, those who felt development should be allowed with septic systems or without any restrictions made up a similar proportion when combined.

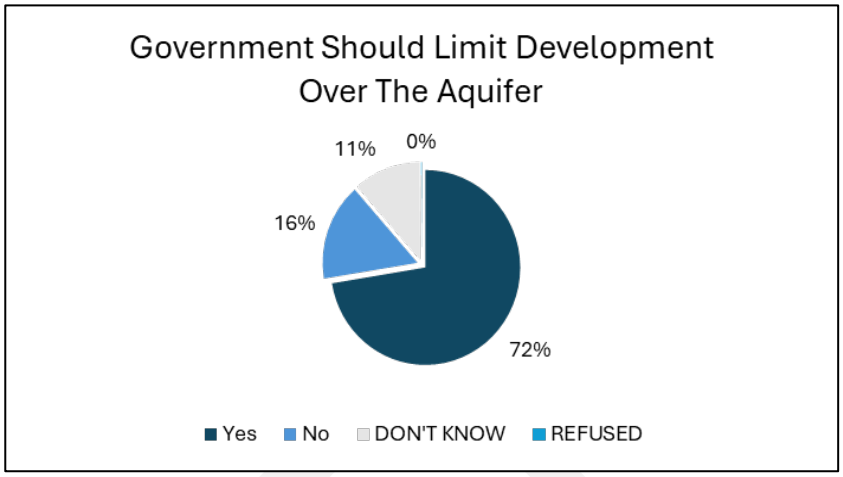


Figure 1-6. Public Support for Development Over the Aquifer.

Residents also viewed climate change as impacting Guam. They felt the island was getting warmer, rainfall was less plentiful, and storms and typhoons had become more extreme. About two-thirds expressed concerns about sea level rise, believing that development should be restricted along the shoreline, particularly in the central part of the island.

The Culture. Residents overwhelmingly believe that protecting cultural and historical sites should be a priority for both the government and the community (Figure 1-7). The promotion and preservation of the CHamoru culture, along with the management of cultural sites and ancestral lands, are seen as essential to maintaining the island's character. The loss of values inherent in Guam's culture and history is perceived as an existential threat to the community. Two-thirds of residents wish there were more cultural and historical sites, and just as many want existing sites to be expanded. The loss of cultural identity is viewed as a core reason for the breakdown of families in the community, contributing to crime and homelessness.

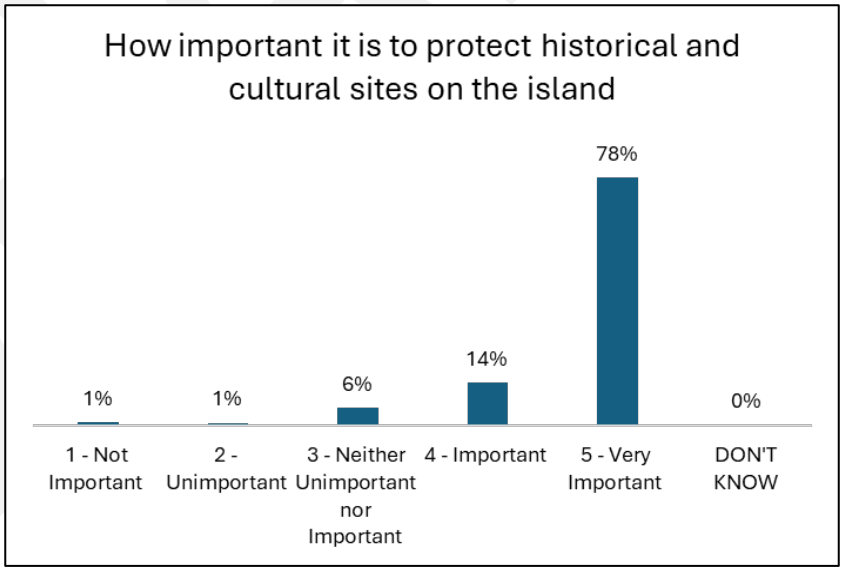


Figure 1-7. Importance of Protection of Historical and Cultural Sites to the Public.

As a whole, the community-wide survey establishes a foundation for certain key principles that guide the G50SP. These principles provide a direction for the policies and programs in the plan that also align with the principles of sustainability and the UN SDGs.

Stability of Community Perspectives Over Time

Two comprehensive surveys, one conducted in 2022 and another in 2024/2025, provide insight into how Guam's residents view the island's future. The results revealed priorities that have remained consistent over time as well as notable changes in emphasis.

Enduring Concerns and Priorities. Across both surveys, residents consistently identified infrastructure as a central concern. In 2022, approximately 74% of respondents considered it a major issue. In the 2024/2025 survey, the priority remained with reliable and affordable power, high living costs, and inadequate housing among the most frequently cited challenges.

Economic stability was also a recurring concern. In 2022, 69% of respondents expressed unease about Guam's economic trajectory. In the 2024/2025 survey, 48% expressed dissatisfaction with the direction of the economy. In 2022, there was some optimism, with 60% believing that economic conditions would improve over time, an outlook less apparent in the later survey.

Tourism's role in the economy was important in both periods, but perspectives evolved. In 2022, 76% supported increasing tourism as a primary strategy for economic growth. By 2024/2025, there was stronger interest in managing tourism expansion. A majority preferred rehabilitating and improving existing hotels rather than building new ones (92%) and supported developing additional tourist-serving attractions and optional tours (77%).

Environmental protection remained a high priority. In 2022, 96% of respondents valued clean air and water, and 80% identified climate change and sea-level rise as significant threats. In 2024/2025, these concerns persisted, with greater focus on renewable energy and conservation as solutions.

Cultural preservation also showed consistency. In 2022, 62% of respondents emphasized the importance of protecting Chamorro heritage. Similar views were expressed in the 2024/2025 survey.

Public safety and social well-being were continuing concerns. In 2022, 56% reported that crime had worsened, and 51% believed Guam was not doing enough to address homelessness. By 2024/2025, attention shifted more toward solutions. 87% supported affordable housing construction in their villages, and 11% linked residential development to improved economic prosperity in their community.

Evolving Emphases and Differences. While the main themes were consistent, certain shifts in emphasis were evident. Sustainability was recognized as a priority in both surveys, but understanding of the concept differed. In 2022, only 56% were familiar with the term and just 27% defined it as meeting present needs without compromising the ability of future generations to meet theirs. The 2024/2025 survey reflected a more operational focus on renewal energy and conservation, suggesting a more developed public understanding.

Some topics in 2022 received less attention in 2024/2025. The role of the U.S. military was examined in greater detail in 2022, with 57% viewing it positively for job creation and economic benefits, while 15% expressed concerns related to land restrictions, cultural impacts, and social issues. This topic was not explored to the same extent in the later survey.

Education and healthcare concerns persisted but were framed differently. In 2022, specific issues such as school maintenance (84%) and teacher pay (76%) were highlighted. Healthcare concerns included high costs (90%), a shortage of doctors (87%), and long wait times (83%). In 2024/2025, these topics were discussed in more general terms without the same level of detail.

Capital improvement priorities also differed. In 2022, the highest priorities included building a new hospital and medical campus (37%), repairing K-12 schools (30%), and investing in waste-to-energy projects (30%). The 2024/2025 survey did not identify capital improvement projects as a distinct category.

Overall, the two surveys show a community with stable priorities around infrastructure, economic resilience, environmental health, cultural preservation, and public safety, but with evolving perspectives on how to address them. While the vision for Guam's future continues to be shaped by long-standing concerns, the strategies favored by residents are adapting in response to changing conditions and a deepening understanding of the challenges and opportunities ahead.

1.1.3. Key Principles of G50SP

The G50SP is founded on five key sustainability principles.

Limits. Sustainability means understanding there are limits to development, especially on a small island. If all of Guam was developed for housing or military defense, for example, the natural resources, beauty, and cultural heritage that are fundamental to the island would be significantly impacted, if not lost. Development is important, but sustainability demands establishing appropriate development locations, types, and intensity in order to conserve other important island values.

Balance. Sustainability also entails balance and tradeoffs between the objectives of the five sustainability sectors. Just as it is important to protect the environment, it is also important to provide for economic investment and growth. The people of Guam need housing and local economic activity, supported by strong education, health, and welfare systems, in order to thrive. Tourism will continue to be central to the island, but it must also respect local culture.

Renewal. Sustainability involves the renewal of existing investments, resources, and infrastructure. The legislature recognized this when adopting Public Law 35-110 and expressed it through the concept of *replenishing* existing systems, as opposed to reliance on increasing consumption, to meet the needs of coming generations. The future must not be sacrificed on the altar of ever-expanding consumption that would necessarily deplete Guam's assets:

In a sustainable society, systems replenish themselves. By ensuring that we are not overly reliant upon the consumption of our economic, social, and environmental assets and that our systems replenish themselves, we are more responsibly assuring the survival of the Guåhan that we grew up with, if not a better one, for ourselves, our children, and our grandchildren.

Equity. Sustainability cannot be achieved without social equity and environmental justice. How can Guam sustain the military buildup or support the economy if there are not enough affordable homes to live in or good jobs for all of Guam's residents? How can Guam thrive if it does not invest in each of the villages to support a vibrant culture of island stewardship and care?

Engagement. The legislature recognized that the success of the G50SP will require an "unprecedented level of a coordinated effort by the community, the private sector, academic research organizations, and institutions of the government of Guam to reach across their divides and work together to develop long-term integrated approaches" (Bill 167-35 (COR), Sec. 2). In short, engagement is key, and sustainability will require that everyone's voice has a chance to be heard.

1.1.4. Social Cohesion – A Touchstone for Sustainability

Guam's long-term sustainability rests not only on protecting its natural resources and infrastructure, but also on supporting socially cohesive, equitable, and culturally grounded communities. *Social cohesion*—the strength of relationships, shared identity, and mutual trust among individuals and groups—is increasingly challenged by trends such as outmigration, economic inequality, intergenerational caregiving demands, and inadequate access to essential services. These dynamics are shaped in part by land use decisions, including the availability and location of affordable housing, schools, health and senior care facilities, and public spaces. As these pressures grow, particularly in the face of climate change and evolving economic conditions, Guåhan must plan intentionally for inclusive, connected communities where cultural values, family structures, and social well-being can be sustained across generations.

The Guåhan 2050 Sustainability Plan responds to these challenges by integrating social equity and cultural sustainability into its land use policies and infrastructure planning. As explained below, the plan promotes compact, walkable, and transit-accessible development to ensure all residents—especially elders, youth, and lower-income households—can access education, health care, recreation, and support services. It encourages the co-location of schools, clinics, childcare, and social service facilities within village centers and mixed-use neighborhoods. Policies also support diverse housing options, including multi-generational and senior-friendly

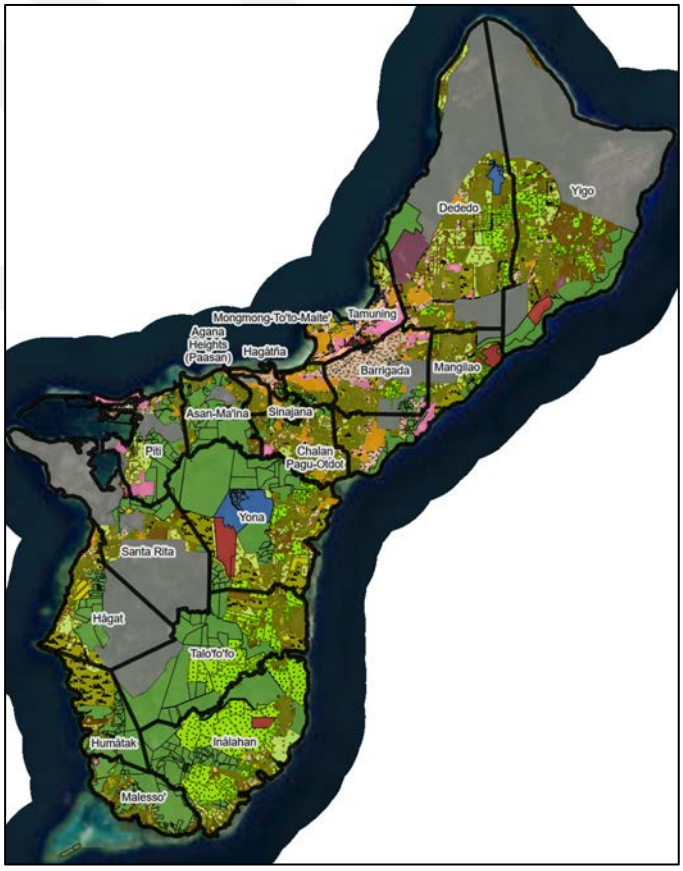
designs, and prioritize the preservation of cultural spaces, community gathering areas, and village-scale identity. They also promote the preservation of Guam's unique environment and island beauty – essential to Guam's way of life. By aligning land use planning with social and cultural needs, the plan seeks to strengthen the social fabric of Guåhan and ensure that future growth supports inclusive, resilient, and culturally vibrant communities.

1.2. G50SP Core Land Use Policies

The Guåhan 2050 Sustainability Plan is a road map for future land use and development to help Guam meet the needs of both present and future generations. At its core, the G50SP proposes land use goals, objectives and policies to address five sectors of life on Guam: community, economy, environment, culture, and village life. Together with a comprehensive land use map for the island, the policies determine the kinds and intensities of development appropriate for different parts of Guam. They also establish basic requirements to assure that new development is sustainable, safe, equitable, and supportive of Guam's special natural resources, beauty, and cultural heritage.

1.2.1. Sustainable Communities: Compact Development, Affordable, Safe Housing, Viable Agriculture, and Aquifer Protection

The core sustainability principles of limits, balance, renewal, and equity provide a foundation for land use designations and policies to promote sustainable communities, including compact urban development patterns supported with essential services, safe and affordable housing for Guam's residents, and preservation of rural agricultural lands, parks, and sensitive natural resources. G50SP policies also build on important predecessor Government of Guam planning efforts, such as the 1965 Territory of Guam Master Plan, 1978 *Kabales Na Planu Para Guåhan,* comprehensive land use plan, the *I Tano'-Ta* planning update in the 1990s, and the North and Central Guam Land Use Plan (2009).

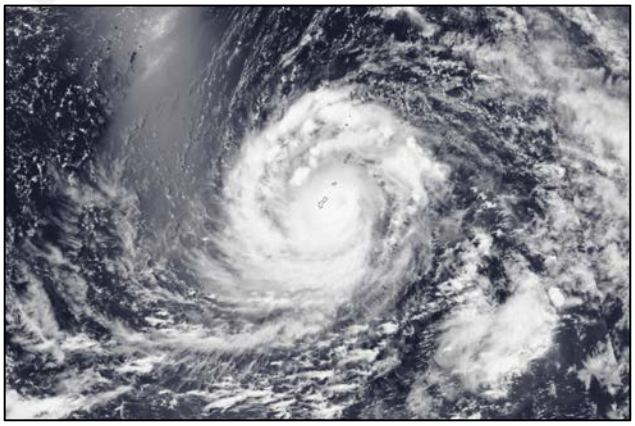


Sustainable Urban Development. The G50SP directs that new development be

Figure 1-8. Parks and Open Space Corridor.

concentrated in the already "urbanized" areas of Guam that have public services, especially wastewater collection, and to the core developed areas of the smaller villages of Guam. Adequate public infrastructure, including water, sewer, roads, drainage control, and power will also need to be planned and assured *before* new construction is authorized. The land use plan also calls for mixed used areas and pedestrian-scale designs, to promote walkable, vibrant urban areas.

In the alternative, the plan calls for maintaining the undeveloped character of most rural and agricultural areas, especially where there are no services. This land use strategy will minimize the construction of new septic systems over the Northern Guam Lens Aquifer to assure a safe drinking water supply. It has the additional benefit of protecting agricultural opportunities and promoting recreational open space and the conservation of sensitive habitat, such as the endemic Limestone Forest. Strict limits on new subdivisions coupled with minimum parcel sizes in rural areas also will support the implementation of a transfer of development program to encourage the relocation of potential development entitlements to existing urban areas. Harkening back to the 1978 comprehensive development plan, G50SP imagines the eventual creation of a parks and recreational corridor across northern Guam, preserving sustainable agriculture, activating community health, and promoting cultural and environmental heritage.



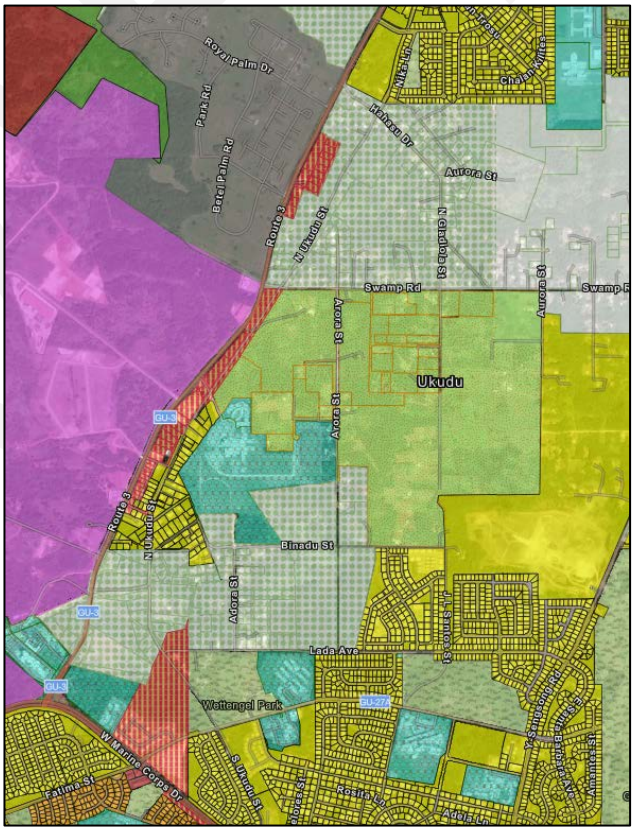
Resilient, Affordable Housing. The G50SP Sustainable Communities policies also assure that new development will be located and designed to be resilient to extreme events, coastal flooding and erosion, wildfire, and other natural hazards. New development will be served by adequate stormwater drainage plans and facilities, and existing development will need to conform to resilient designs, such as elevating habitable structures above flood levels

through the redevelopment process. To address climate readiness and existing development, the plan calls for the development of neighborhood-scale climate adaptation management plans, including through nature-based infrastructure and "living shorelines" to decrease community vulnerability and increase resilience for future generations.

Other G50SP policies provide for priority community development, such as renewable energy and telecommunications infrastructure, and fishing and boating facilities. Most importantly, the plan prioritizes affordable housing, including by identifying areas for higher density multifamily zoning and promoting the construction of accessory dwelling units in existing residential areas. Providing adequate worker housing and assuring that it is located and designed to be smart, long-term investments in Guam's housing stock is also addressed in plan policies. The objective is to plan and construct housing that looks beyond the immediate pressures of the military buildout to provide for future generations of the island.

1.2.2. Prosperous Economy: Redevelopment, Mixed-Use, and Right-sized Expansion

The Sustainable Communities land use strategy is a foundation for additional land use designations and policies that will promote a prosperous economy founded on the principle of *replenishment.* The G50SP policies provide for increased opportunity zoning, rejuvenation of Guam's economy through redevelopment, and support for the tourism sector through right-sized expansion and investment in diverse opportunities across the island.



Economic Opportunity. The G50SP is designed to provide economic opportunities through a diverse mix of commercial and industrial land use designations strategically located in and around Guam's villages. This includes mixed-use development zones where commercial and retail development compatible with residential neighborhoods may provide easy access to jobs, shopping, and activities. The plan also encourages pedestrian-scale developments and identifies priority areas and transportation corridors for expansion, such as the Upper Tumon area along Route 3 and North Marine Drive.

Priority Uses and Agriculture. The G50SP contains policies and land use designations to assure that priority economic development is supported, but in the right places in order to maximize social and community benefits. For example, the plan prioritizes coastal-dependent uses such as boating and fishing facilities, and critical infrastructure, like sustainable energy facilities (e.g., solar farms) and telecommunications facilities (e.g., cable landings), but in compatible locations. The plan also requires the protection of Guam's most productive soils and large undeveloped areas capable of supporting both commercial agriculture and small-scale subsistence farming. Other plan sections seek to minimize any adverse impacts of siting new military defense and energy developments.

Redevelopment and Renewal. Economic prosperity may also flow from investments in the already-built environment through redevelopment and refurbishment of existing buildings. New hotel and commercial development can be important, but the G50SP also calls for the renewal and upgrading of existing hotels, especially in the major tourist and hotel areas adjacent to Tumon and Hagåtña Bay. The same approach is taken with housing, namely, the redevelopment of existing structures and blighted properties should be considered for use as affordable housing, in addition to investing in urban infill areas with adequate public services. Infrastructure improvements are also central to the revitalization strategy of the G50SP, and policies require enhancement of infrastructure in conjunction with new commercial development as well as investments in public transportation and infrastructure projects that support both affordable housing and economic activity, such as ports, airports, and renewable energy facilities.

Sustainable Village-Scale Eco-Cultural Tourism. The G50SP economic development strategy emphasizes new tourism-related development and activities in all of the villages of Guam. This will promote and share the wealth of Guam's tourism economy. Importantly, the plan calls for *appropriately scaled* development, sensitive to each village setting. Taller, resort hotels work in Tumon, but the southern villages need smaller-scale buildings designed to harmonize with their

more rural, natural settings. Related, the plan promotes tourism that is more closely tied to Guam's environment and culture with policies calling for diverse cultural, nature-based, and recreational tourism developments, attractions, and experiences. This could include agricultural tourism, connecting visitors to unique local, small-scale agriculture.

Community engagement is key to smart economic development in the villages. The G50SP will support economic development that respects local-settings by engaging residents in the planning process, ensuring that developments meet their needs and preserve cultural heritage through appropriate siting and design. Policies will also support small businesses and local artisans by enabling markets, workshops, and co-ops that capture and express Guam's cultural heritage, including for visiting tourists. This type of tourism also complements other plan components. It strikes a balance with environmental conservation, protects cultural and historical resources, and activates the villages with pedestrian-scale, engaging commerce. The strategy will benefit all of Guam, connecting north to south through environmental and cultural appreciation.

1.2.3. Thriving Environment - Climate Resilience, Watershed Protection, Habitat Conservation

From ridge to reef, Guam's natural environment is special and must be conserved and protected through comprehensive land use planning. The island's limestone forest is unique, but only a small amount remains. Guam's rich coral reefs and coastal waters are impacted by climate change, land-based pollution, invasive species, and sediment washing out from steep watershed hillsides. The island's remaining open spaces and natural lands provide important recreational areas for people, for use, enjoyment, and relaxation. The G50SP includes policies to protect Guam's ecology for present and future generations by preserving its most important environmental resources and building Guam's resilience in the face of climate change.

Climate Resilience. The G50SP addresses climate change through coastal zone management policies, including measures to protect new development from coastal storms and hazards, and promote nature-based shoreline protection. The plan also calls for maximum use of green infrastructure in urban areas, such as incorporating permeable surfaces, green roofs, and rain

gardens into development projects to reduce urban heat and manage stormwater runoff. New housing must also be designed and constructed to withstand extreme weather events, and incorporate renewable energy systems, such as solar panels and battery storage, where feasible.

Other climate resilience policies address water resource management, including through enforcement of land use regulations that protect watershed areas and limit deforestation, and by buffering aquifers and water sources to prevent both contamination and over-extraction of drinking water supplies. Land use policies that protect agriculture contribute to food security and resilience to climate variability. Supporting sustainable farming practices may improve soil health and reduce greenhouse gas emissions through increased carbon sequestration. The G50SP also supports renewable energy systems and projects, directs a full community education and engagement effort around climate resilience, and establishes adaptive management goals, including funding, monitoring, and periodic updating of plans to adapt to on-going climate changes.

Watershed Protection. Guam's environment cannot thrive without land use policies to protect watershed resources. The G50SP includes standards to protect the Northern Guam Lens Aquifer and other important groundwater resources, including a requirement for development to connect to the public wastewater system whenever feasible. Development using private wastewater systems must comply with all applicable policies and regulations of the Guam Environmental Protection Agency. Other policies address polluted runoff through the implementation of construction and post-construction best management practices and green infrastructure, such as limiting impervious surfaces and retaining and treating stormwater runoff. This will also benefit aquifer recharge.

The G50SP also protects Guam's important wetland and riparian resources through development policies that require setting development back from the edge of identified watercourses and wetlands. Filling of wetlands is strictly prohibited except for certain uses, such as restoration, boating and coastal-dependent industrial uses, and necessary incidental public services. Development in riparian corridors is also limited to such uses as education and research, consumptive uses, habitat restoration and necessary water supply projects.

Forest and Terrestrial Habitats. The terrestrial lands of Guam provide important habitat areas for many unique, endemic, and threatened species. The G50SP policies will protect these habitats through a new *resource conservation* land designation for the most important areas. For example, this designation covers large blocks of contiguous limestone forest – one of Guam's most distinctive and unique terrestrial habitats, as well as much of the steep, forested,

scenic mountain areas in southern Guam. The plan also requires the identification of sensitive terrestrial habitats that may be impacted by development through the best available biological science. The plan builds on and requires coordination with implementation of the Guam Habitat Conservation Plan. This will support mitigation policies in the G50SP also, assuring that habitats will be protected even while development goes forward.

Coastal and Marine Waters. The G50SP policies also express Guam's recognition of the vital connection between land and sea, and continue the island's long participation in NOAA's coastal zone management program under the Coastal Zone Management Act of 1972. The plan requires that marine resources be maintained, enhanced, and where feasible, restored. Special protection must be given to areas and species of special biological or economic significance, and use of the marine environment must be carried out in a manner that will sustain the biological productivity of coastal waters. The plan reinforces protections for the coral reef, such as effective watershed management, and directs increased enforcement of environmental land use policies. Policies also restrict new development in the Seashore Reserve to those uses that enhance, are compatible with, or do not generally detract from the surrounding coastal area's aesthetic and environmental quality; or to those that can demonstrate dependence on a seashore location and that lack a feasible alternative.

1.2.4. Vibrant Culture – Preserving Heritage, Parks and Recreation, Community Health

Guam's culture is diverse and rooted in a rich history. It is welcoming to all who visit and appreciate its intrinsic value. The CHamoru culture in particular is strong and enduring, despite the injustices of Guam's colonial past. Maintaining and enhancing Guam's culture for present and future generations is a fundamental goal of the G50SP.

The plan includes policies to protect cultural and historic resources, and promote cultural expression and connections between people and place, including through a multitude of parks and recreational spaces. Land use policies also promote community health by assuring that all of Guam's residents have access to essential community services and public facilities.

Cultural Heritage and Indigenous Connections. The G50SP policies require the protection of historical and cultural resources, including designated significant sites, to ensure Guam's cultural heritage is preserved and not adversely impacted by new growth and development. Like protection of the natural environment, policies require identifying and surveying resources, conducting impact assessments, and avoiding and/or buffering sensitive locations. The plan also calls for preserving traditional practices and knowledge through the designation of areas for the continuation of traditional CHamoru cultural practices, such as farming, fishing, and weaving. Other policies support public spaces for cultural festivals, educational programs and workshops, and other village activities that preserve and celebrate Guam's heritage.

The G50SP also recognizes that Guam's culture may be preserved and partially expressed through the built environment, economic activities, and tourism. The plan encourages the rehabilitation and adaptive reuse of historic buildings for modern purposes while maintaining their cultural integrity. This includes continuing to implement historic preservation plans such as the Hagåtña Master Plan and the Inalåhan Historic District Revitalization Plan. For new development the plan encourages innovative building designs and construction that will create 'people places' based on architectural designs from pre-WWII era Guam and other Pacific nations.

In tandem with the plan's economic development policies, the G50SP also encourages tourism activities that respect and highlight Guam's cultural heritage without causing degradation to historical sites, natural areas, and Guam's inherent beauty. Tourism will be supported by development of heritage trails and cultural centers to enhance visitor experiences while protecting sensitive areas. Future land use plans and development projects must incorporate measures to protect cultural landscapes, archaeological sites, and traditional CHamoru practices.

Finally, G50SP recognizes that community collaboration is central to cultural preservation. The plan calls for strong partnerships between the Guam State Historic Preservation Office, village communities, the Guam Preservation Trust, and other community members and organizations

interested in furthering the preservation of Guam's cultural heritage. It also directs collaboration with and between BSP and the Hagåtña Restoration and Redevelopment Authority, Ancestral Lands Commission, Department of CHamoru Affairs and the CHamoru Land Trust Commission.

Community Health and Well-Being. A vibrant culture on Guam requires a land use plan that assures the equitable distribution of facilities and resources to support the health and well-being of residents. The G50SP designates multiple locations around Guam as parks and recreation sites, where residents can recreate, exercise, and enjoy the beauty of the island. The plan includes policies to protect and maximize public access to beaches and along the shoreline – an important right and expression of Guam's cultural heritage. Universal access to open spaces enhances community health and social equity, especially for more vulnerable populations. Related, the G50SP requires preservation and enhancement of the island's scenic resources, recognizing their intrinsic cultural value.

UNIVERSITY OF GUAM PHOTO

In this October 2023 photo, a newly installed sign at the Talo'fo'fo' Baseball Field shows several walking routes and public park amenities that residents can use in the area. The sign, created by the Community Nutrition Education Program and Children's Healthy Living Program at the University of Guam and installed by the Talo'fo'fo' Mayor's Office, aims to help residents find convenient areas to be active and improve their health.

Other important community and public facilities are protected by the G50SP. This includes policies planning for the equitable distribution of public health and safety resources such as fire and police stations, as well as the need for health clinics and other public health resources. The plan prioritizes the construction of health clinics and emergency services in underserved areas, and requires that new development include provisions for community health facilities. The G50SP also requires the designation and protection of areas for community gardens, nature reserves, and urban forests to improve air quality and provide mental health benefits, as well as the development of a network of multi-use trails and recreational areas that promote physical activity and social interaction. Last but not least, the plan directs the full enforcement of illegal dumping and public nuisance laws to enhance Guam's cultural and natural landscape.

1.2.5. Village Sustainability - Shared and Unique Local Land Use

Although Guam's nineteen villages share many sustainability challenges, each has its own local land use policy priorities. The G50SP Village Sustainability policies build on and complement policies of other plan sections to underscore the shared yet unique local challenges in Guam.

Island-wide Policy. The G50SP directs that land use decisions recognize and promote development that is sensitive to and reflects the unique built and natural environments in each village. Taller buildings, for example, may make sense in Tumon or Hagåtña, while smaller-scale developments are appropriate in the more rural settings of the southern villages. Each village also has its own character, counseling different architectural styles and designs across Guam. But each village has an interest in development that is sensitive to its particular setting.

Guam's villages also share a need for critical infrastructure and important community facilities. The plan includes policies to assure that each village has adequate public and civic spaces, recreational areas, medical facilities, and essential social services. Likewise, the plan applies the logic of vibrant urban and village centers where pedestrian-scale, mixed use development can contribute to activated community spaces but in different styles and intensities of development. The G50SP also plans for climate and hazard resilience, recognizing common challenges like flooding, but also differing infrastructure needs.

Guam's Villages. The G50SP includes specific designations and directives to address the unique needs of each village. For example, the Tumon area focuses on hotel redevelopment and shoreline adaptation planning in anticipation of sea level rise impacts to the tourist beaches. In Piti, the plan captures the desire for development to emphasize the area's coastal and ecological significance, particularly the coral reefs and marine recreational activities. Other villages have specific land use objectives, like implementing micro farming in Agaña Heights, prioritizing smaller scale commercial development in Asan-Maina, or improving traffic management in Barrigada. In Dededo, there is a policy to create shaded markets and small business hubs, which necessitates upgrading the Flea Market. In Hagåtña, the G50SP supports continued revitalization, including improved public spaces and heritage preservation, to reinforce its identity as Guam's cultural and administrative center. In Malesso', the plan underscores the important functions of the pier and connecting people to coastal waters.

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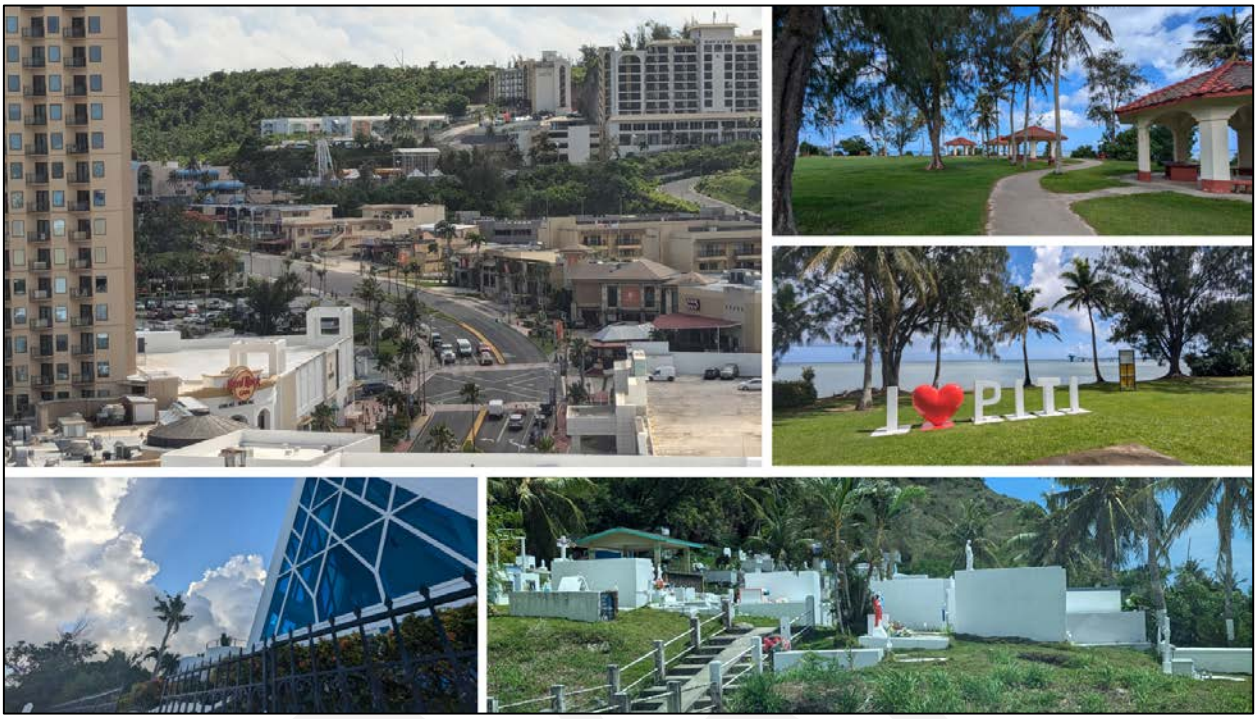
All village needs cannot be captured here - they are too numerous and continually evolving. But the plan attempts to address the diversity of each through context-sensitive policies and programs that are responsive to an ever-changing democratic society.



1.3 Governance and the Path Forward for G50SP

The Guåhan 2050 Sustainability Plan (G50SP) provides a comprehensive roadmap for advancing sustainability across Guam's environment, economy, and society through strategic land use planning. Realizing this vision will require sustained commitment and coordinated action by the Government of Guam. Key to this effort will be transparent and predictable decision-making processes, clear development requirements, and streamlined reviews and approvals, which must be effectively managed through thorough technical reviews to safeguard environmental sustainability and support responsible community development. Investments in modernized information systems and strong community engagement will also be essential.

Effective implementation may require updates to relevant land use statutes and agency mandates to ensure alignment with the G50SP. Central to these efforts is the role of the Bureau of Statistics and Plans (BSP), which must serve as the coordinating body to ensure that the plan's strategies and policies are reflected in land use decision-making across agencies. BSP will help ensure that implementation is both inclusive and grounded in the expertise and mandates of Guam's many agencies, while also ensuring that those efforts are responsive to the shared vision articulated in the G50SP.

Implementing the Plan for the Common Good

Guam benefits from a robust set of government institutions with responsibilities for land use and related areas. Agencies such as the BSP, Department of Land Management (DLM), Department of Public Works (DPW), Department of Parks and Recreation (DPR), and Guam Environmental Protection Agency (GEPA) all contribute to planning, permitting, and infrastructure development. Numerous existing plans—including sector-specific master plans and regulatory frameworks—are referenced and integrated throughout the G50SP to advance shared objectives.

Yet governing for the common good requires more than coordination; it requires a culture of comprehensive planning and shared responsibility across institutions. A central recommendation of the G50SP is to update Guam's public laws and programs to reflect the direction and principles of the plan. Rather than supplant agency roles, the G50SP supports BSP's statutory role in leading and coordinating long-range planning while encouraging every agency to align its work with the vision, policies, and implementation framework of the plan.

To achieve this, Guam's Legislature also plays a critical role. While legislative action will always be needed to adjust to new conditions, incremental or ad hoc zoning changes should be made with caution. Land use decisions should be made within a coherent, long-term strategy rooted in the plan's sustainability principles and guided by the vision of P.L. 35-110, which establishes the required elements of the G50SP.

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Integration Across Social, Cultural, Economic, and Environmental Sectors

The G50SP fully responds to the legislative mandate set forth in Public Law 35-110 by addressing all twenty required elements through an integrated, sustainability-oriented land use framework—within the constraints of the available funding for the project. The plan's five thematic chapters—Sustainable Communities, Prosperous Economy, Thriving Environment, Vibrant Culture, and Village Sustainability— provide a platform for addressing Guam's most pressing planning challenges, from land use and housing to conservation, energy, and hazard resilience. Together, they establish an integrated framework for Sustainability Governance (Figure 1-9).

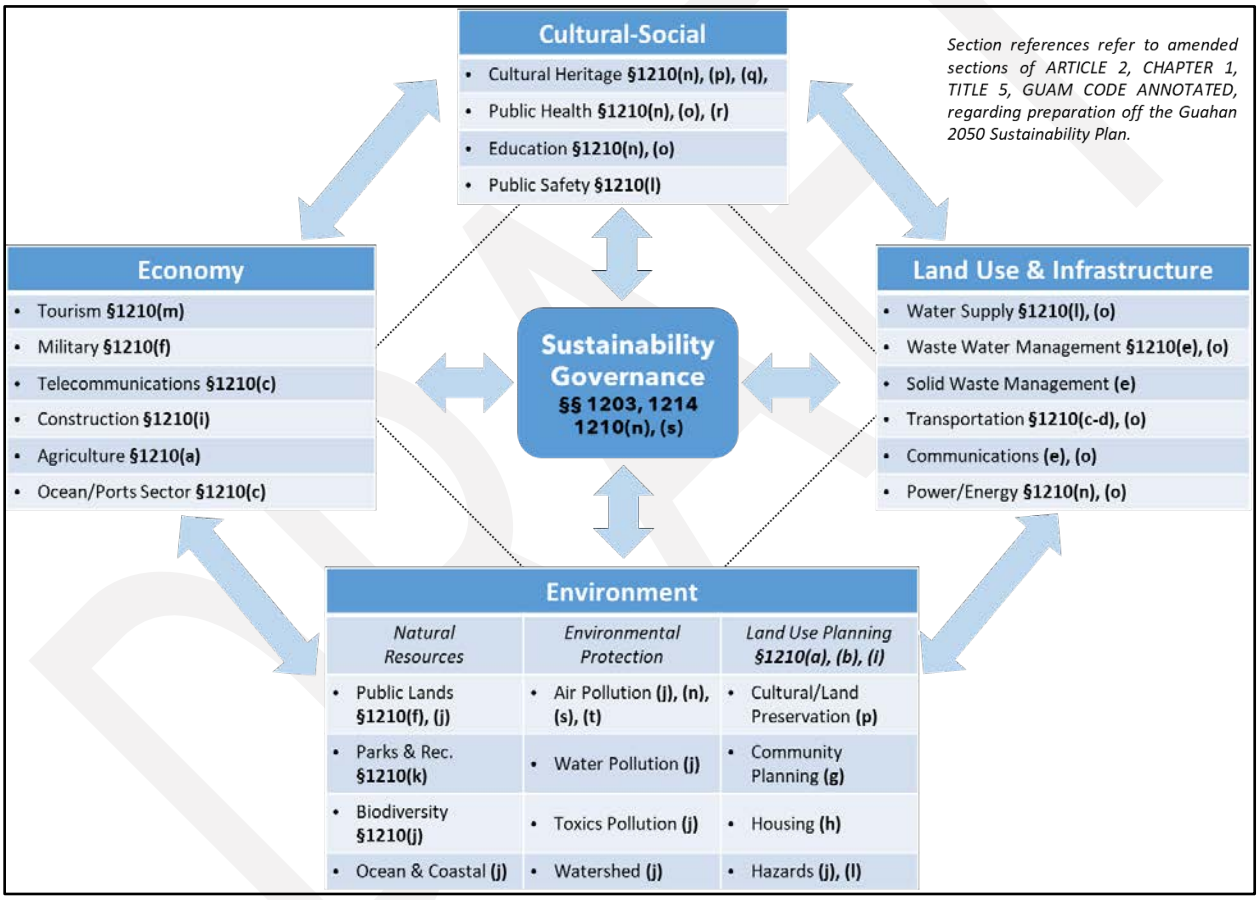

Figure 1-9. Integrated Framework for Sustainability Governance

The plan includes robust policies supporting compact, walkable development, village identity, and strategic infrastructure investments. It weaves environmental and cultural concerns into land use decisions—protecting CHamoru heritage, watersheds, and coastal areas while promoting equitable access to public lands and facilities. Economic diversification is emphasized through sustainable tourism, local agriculture, and community enterprises. Energy

and implementation sections directly support Guam's renewable transition and long-term interagency coordination.

Table 1.1 outlines how each of the elements required by P.L. 35-110 is addressed by G50SP policies and plan sections.

Table 1-1. Required Elements of P.L. 35-110 and G50SP Plan Sections and Policies.[1]

P.L. 35-110 Required Elements	G50SP Sections and Policy References
§ 1210 (a) Land Use	Chapter 3 (3.2 Land Use; Land Use Map, Policies SC-1 to SC-6, SC- 9, 10, 23-26, 55-89); Chapter 4 (Policies PE-1 to PE-23); Chapter 5 (TE-2, 4, 16, 18, 22, 29); Chapter 6 (VC-1, 2, 4, 10, 15, 19, 31, 35); Chapter 7 (VS-3, 5, 7, 8, various village policies)
§ 1210 (b) Community Design	Chapter 3 (Land Use, Village Centers, Mixed-Use Zoning: SC-2, 3, 4, 5, 6, 24, 25, 59-63), Chapter 4, PE-2, 7, 8, 9, 12, 14, 19) Chapter 6 (VC-17), Chapter 7 (VS-1 to VS-11)
§ 1210 (c) Transportation	Chapter 3 (3.3.5, Transportation and Mobility; SC-18 to SC-28), Chapter 8 (Infrastructure/Investment Actions)
§ 1210 (d) Regulations (parking, setbacks, street naming)	Chapter 3 (Land Use Table and Zoning Districts, Policies SC-21, 23, 24, 25, 26, 27)
§ 1210 (e) Public Facilities	Chapter 3 (3.4 Public Services; SC-7 to SC 41)
§ 1210 (f) Public Lands	Chapter 3 (3.2.3 Public/Federal Land Ownership; Table 3.1, Land Use Map), Chapter 6 (Land Use and Cultural History, 6.6.2)
§ 1210 (g) Public Buildings	Chapter 7 (Village Land Use Maps, VS-3), Chapter 6 (VC-17)
§ 1210 (h) Housing	Chapter 3 (3.4 Housing; SC-36 to SC-46), Chapter 4 (PE-13), Chapter 5 (Disaster-Resilient Housing section, TE-9 to TE-12)
§ 1210 (i) Redevelopment	Chapter 3 (Land Use objectives, SC-3), Chapter 4 (4.6, PE-12-14)
§ 1210 (j) Conservation	Chapter 3, (Land Use Map - Conservation designation), Chapter 5 (TE-1 to TE-114)

[1] The G50SP focuses on the land use planning dimensions of sustainable development policy and requirements of P.L. 35-100 as provided for under the funded scope of the project.

P.L. 35-110 Required Elements	G50SP Sections and Policy References
§ 1210 (k) Recreation	Chapter 6 (Parks, 6.3.5-6, VC-30-38); Chapter 5 (Conservation, TE-31, 32, 76, 84, 89, 99, 110, 11), Chapter 7 (VS-4, 19, 22, 36, 38, 42, 54, 62, 67, 71, 72, 83, 87)
§ 1210 (l) Safety	Chapter 3 (3.7, SC-71 to SC-124), Chapter 5 (5.2.3, Hazard Avoidance, Green Infrastructure, TE-9 to TE-12)
§ 1210 (m) Tourism	Chapter 4 (4.3.1 Tourism Land Use, ; PE-18 to 23); Chapter 3, (Hotel Zones, Agri-tourism, SC-70); Chapter 6 (Cultural Tourism, VC-13-14)
§ 1210 (n) Sustainable Development Policy (Land Use)	Chapters 1-8 generally, including: Chapter 3-4 (redevelopment, affordable housing, access to services, energy); Chapter 5 (Environmental health); Chapter 6 (Cultural heritage preservation; public recreation/health); Chapter 7 (Village Sustainability)
§ 1210 (o)Capital Improvements	Chapter 8, 8.2 (Framework), 8.3 (Action Strategy and Financing)
§ 1210 (p) Preservation	Chapter 3 (Land Use, SC-1-6, Agricultural protection, SC-55-70, Chapter 5 (Conservation designation, habitat protection); Chapter 6 (Cultural Heritage/History Preservation)
§ 1210 (q) Indigenous Connections and Rights	Chapter 6 (Cultural Heritage, History, Landscapes, Resources)
§ 1210 (r) Community Mental Health, Physical Health and Well-being	Chapter 6 (6.3, Community Well-Being, VC-24-29, Parks, VC-37, 38, Chapter 7 (Resilient villages and public health, VS-58)
§ 1210 (s) Policy Statements	Chapters 1-8, Core Principles, Goals, Objectives, Policies.
§ 1210 (t) Other Elements	Chapter 2, Coordination with Defense Dept. (IP-3, 4); Federal Consistency Review (IP-5)
§ 1211 (a) Plan Implementation and Financing	Chapter 8 (Entire chapter; Implementation Goals, Monitoring, Timeframes, Agency Roles)

Integrating Guam's Planning Landscape – Regulatory Streamlining

Guam's agencies and programs have undertaken significant planning efforts in recent years, including the Guam Watershed Plan, Guam Transportation Improvement Program (GTIP), Guam Energy Master Plan, Statewide Comprehensive Outdoor Recreation Plan (SCORP), Climate Change Resilience Framework, and the Guam Green Growth (G3) Action Framework. These initiatives – at least xx in the last ten years – reflect the island's dedication to sustainability across sectors and its ability to engage federal and regional partnerships (Table 1.2).

Table 1-2. Recent Planning Efforts in Guam [to be updated].

Category/Agency	Planning Effort	Year(s)
LAND USE & INFRASTRUCTURE		
	Guam Hazard Mitigation Plan	2024/2019
	Guam Transportation Improvement Plan	2023
	GPA Clean Energy Master Plan / Integrated Resource Plan	2022
	Hagåtña Master Plan	2022
	Guam Hazard Mitigation Plan	2019
	Zero Waste Plan	2013
	Inalahan Revitalization Plan	2011
	North and Central Guam Land Use Plan	2009
	2030 Transportation Management Plan	2008
	Integrated Solid Waste Management Plan	2006
	I Tano'-Ta, The Land Use Plan for Guam (Repealed by P.L. 25-20)	1994 / 1999 repeal
	GWA Water Resource Master Plan (V1, V2)	N/A
ECONOMY		
	Guam Comprehensive Economic Development Strategy	2023 / 2019
	Guam Housing and Urban Renewal Authority Consolidated Plan	2021
	GVB Guam Tourism 2020 Plan	2020
ENVIRONMENT		

Category/Agency	Planning Effort	Year(s)
	Guam Forest System Plan	2022
	Guam Coral Reef Restoration Action Plan	2021
	Guam Forest Action Plan 2020–2030	2021
	Guam REPI Habitat Conservation Initiative Implementation Plan 2022–2027	2021
	Guam Shoreline Atlas	2021
	Guam Comprehensive Flood Study	2020
	Guam Marine Conservation Plan	2020 or 2017?
	Guam Coral Reef Resilience Strategy	2019
	Guam Wildlife Action Plan	2018
	CNMI and Guam Stormwater Management Manual (V1, V2, Supp.)	2010 / 2006
	Guam Habitat Conservation Plan	In process
CULTURE / SOCIETY		
	Guam Preservation Trust Strategic Plan	2023 / 2018
	Guam Historic Preservation Plan	2016
	Comprehensive Outdoor Recreation Plan	2014
	Supplemental EIS Guam and CNMI Military Relocation (2012 Roadmap Adjustments)	2015

However, the complexity of Guam's interdependent systems—energy, water, housing, mobility, culture—underscores the need for stronger alignment across planning efforts. Many sectoral plans operate in isolation, resulting in gaps, inefficiencies, or missed opportunities for synergy. While some may worry that the G50SP adds another layer of regulatory process, its intent is precisely the opposite: by serving as a unifying framework, the plan seeks to clarify development priorities, align agency actions, and create more transparent, efficient, and predictable land use decisions. When followed, the G50SP should reduce uncertainty for both public and private actors by sending clear, shared signals about where and how development can be pursued to be sustainable.

By anchoring this integration in a land use–based strategy, the G50SP links spatial decisions—such as where Guam grows, conserves, and invests—with broader sustainability values. This coordination not only supports better environmental and social outcomes but also helps streamline the permitting and review process by reducing conflict, clarifying agency expectations, and guiding infrastructure investment. Ultimately, the G50SP reflects the collective aspirations of Guam's people and institutions—shifting from fragmented and reactive decision-making to a proactive, cohesive, and future-ready planning approach.

Aligning with the Guam Green Growth Action Framework

The G50SP and the Guam Green Growth (G3) Action Framework are mutually reinforcing initiatives that together guide Guam's journey toward a resilient, equitable, and sustainable future. The G50SP serves as the government's long-range land use and policy framework, while G3 functions as a cross-sectoral platform for implementation—engaging academia, civil society, and the private sector in advancing shared goals.

G3's five focus areas and the G50SP's priorities closely align, including healthy communities, sustainable infrastructure, thriving ecosystems, and strong cultural identity. G3's biennial updates and stakeholder-driven projects—such as aquaponics, conservation workforce training, and community gardens—provide mechanisms for operationalizing the values articulated in the G50SP. In turn, the G50SP provides the spatial and regulatory foundation needed to institutionalize such efforts through land use policy and infrastructure planning.

Together, the two initiatives promote alignment across planning, investment, governance, and community engagement, helping build momentum for long-term change rooted in Guam's environmental assets, cultural heritage, and development vision. Chapter 8 discusses the alignment of the two initiatives in the context of G50SP implementation.

Toward Coordinated, Shared Governance

Ultimately, the success of the G50SP depends on the ability of Guam's agencies to coordinate their efforts under a shared vision. As described in Chapter Eight, this will require BSP to lead ongoing collaboration with DLM and other permitting and regulatory agencies, as well as with agencies in health, education, economic development, and the environment.

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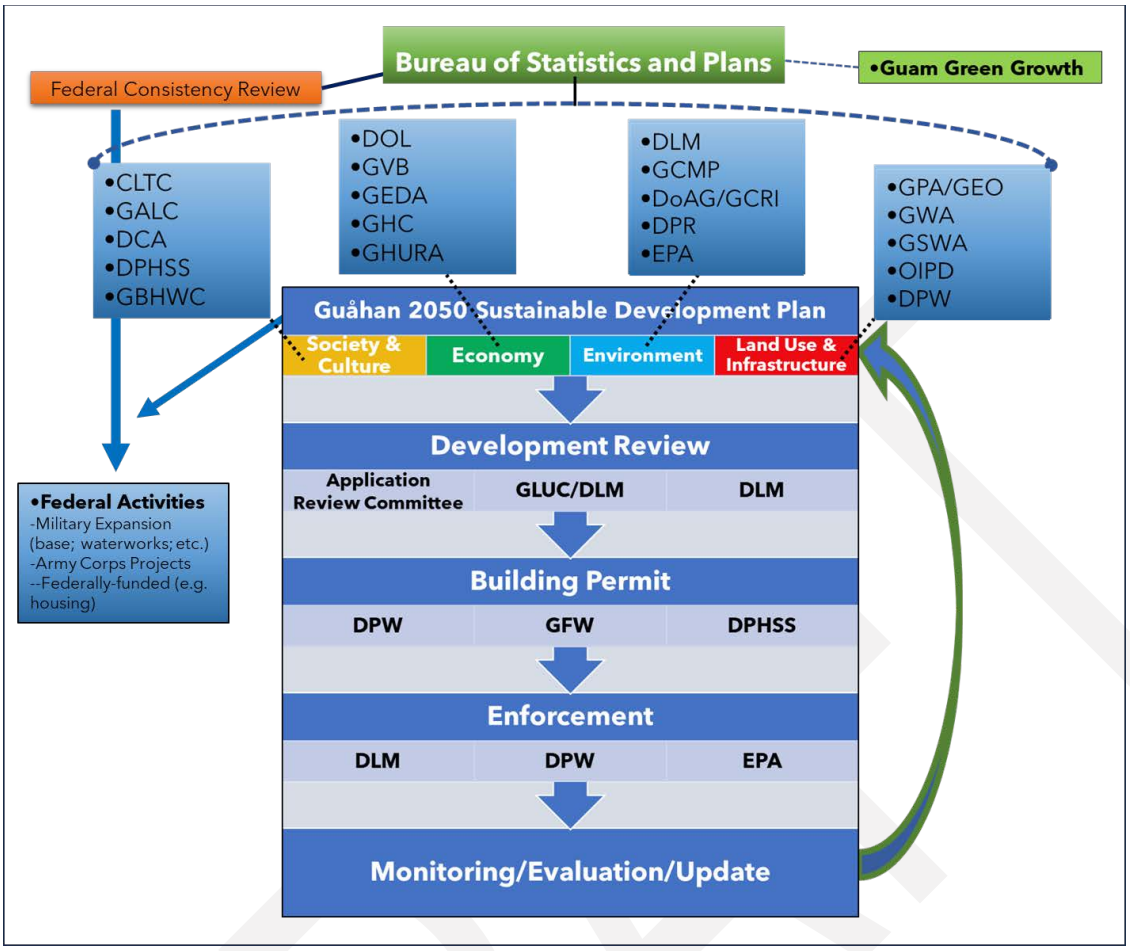

Figure 1-10. Institutional Architecture Envisioned for BSP

Guam's limited land base and overlapping development needs demand a deliberate and disciplined approach to land use governance. Effective implementation means managing competing priorities—housing, infrastructure, public access, and resource conservation—within a framework that ensures sustainability and equity. Figure 1-10 illustrates the institutional architecture envisioned: BSP functions as the central node coordinating across all relevant agencies to guide plan-aligned decisions.

Importantly, successful implementation will depend not just on top-down guidance but on the everyday decisions made by agencies, communities, and individuals. When those decisions align with the vision of the G50SP, the common good becomes not just a goal, but a shared reality.

Chapter 2. **The Island and People of Guam**

2.1. The Island of Guåhan

This chapter of the G50SP frames a broad land use goal to "plan for population and land use growth that supports Guam's sustainability capacity and cultural integrity." The discussion includes an overview of Guam's geography and demographics, and a short discussion of the critically important relationship between the Government of Guam and the U.S. military. The chapter addresses three planning objectives to meet the goal of sustainability planning for population and land use:

Objectives:

- Use best-available population data to align infrastructure, housing, and services.
- Coordinate proactively with the U.S. Department of Defense to mitigate impacts.
- Apply federal consistency review to support plan implementation.

The chapter concludes with five land use policies to meet these objectives and the broad aspirations of the United Nations Sustainable Development Goals (SDGs).

2.1.1. Geography

Guam is a United States (U.S.) territory in the western Pacific Ocean, approximately 3,500 miles west of Hawaii, 1,500 miles south of Japan, and 1,500 miles east of the Philippines. It is the southernmost island in the Mariana Islands archipelago. At nearly 212 square miles, it is the largest island in Micronesia. The northern part of Guam is composed of a mostly flat limestone plateau approximately 850 feet above sea level. The southern part of the island is more mountainous. Mount Lam Lam is the highest point at 1,332 feet. Much of Guam is fringed with coral reef habitat; at its southern tip, a barrier reef and Cocos Island enclose Cocos Lagoon. Apra Harbor, located along the west coast, is a large lagoon bounded by Cabras Island and the Orote Peninsula to the south (USGS, 2005).

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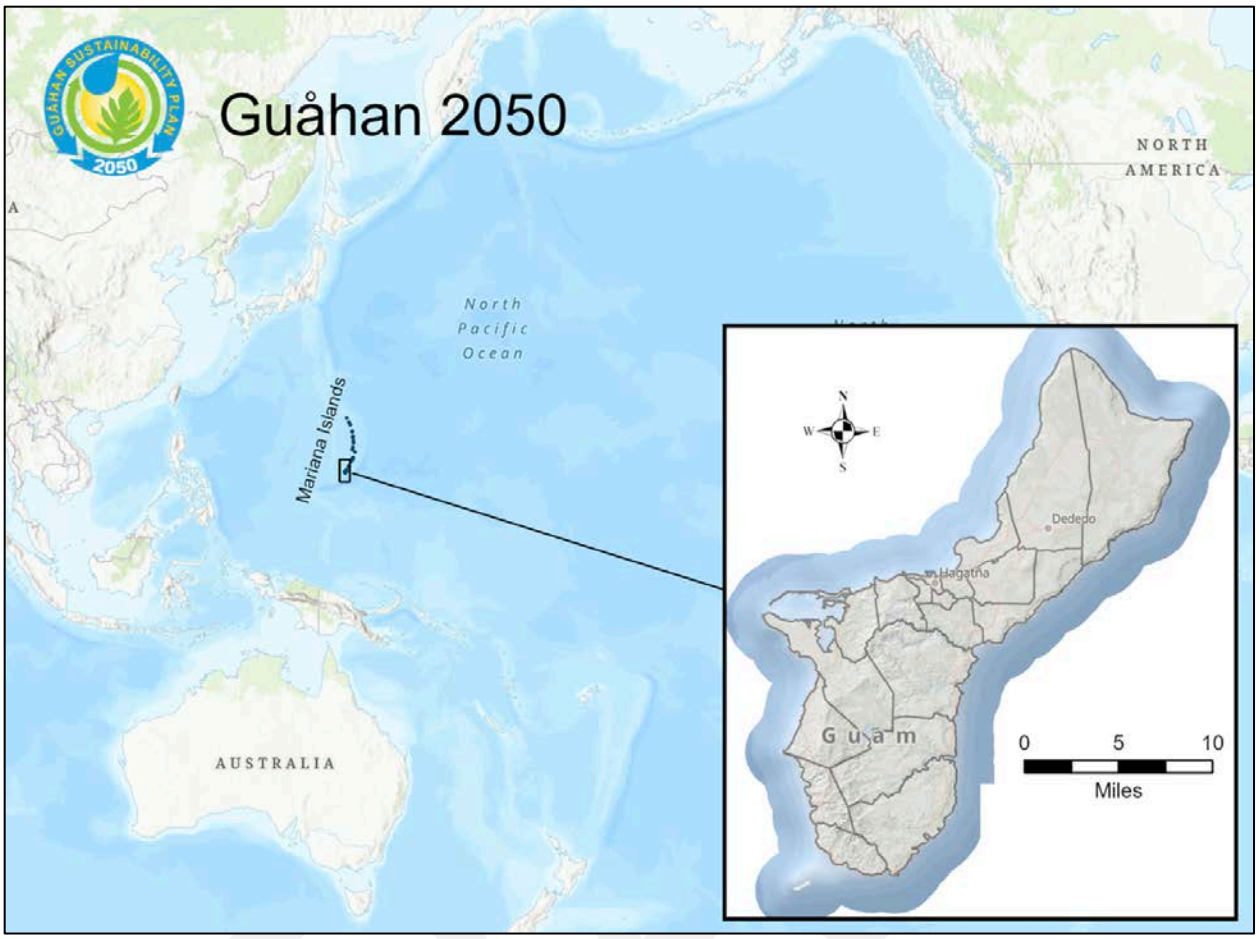

Figure 2-1. Guam global location map.

Guam is a tropical island located 13˚ north of the equator. It is uniformly warm and humid year-round, with temperatures ranging from the low 70s to the mid-80s Fahrenheit and annual precipitation between 80 and 110 inches. The coolest, least humid months are December through February when westerly trade winds prevail. The warmest months are March through August. The rainy season generally runs from July to December (Pacific RISA, 2024). Guam is periodically hit by tropical storms and typhoons - some severe - with an average of three tropical storms and one typhoon passing within 180 nautical miles (330 km) each year (Id.). As discussed in later plan sections, climate change is expected to continue increasing the temperature and number of hot days in Guam, and result in a drier climate overall but with more extreme rainfall events every year. Experts also project fewer though more intense tropical typhoons (Grecni et al., 2020). Along with global sea level rise, these climate changes will have significant implications for the sustainability of Guam.

2.1.2. Population

Guåhan (the CHamoru term for Guam) and the Marianas Archipelago were settled approximately 4,000 years ago by the CHamoru people. While estimates vary, the indigenous

population of the Marianas ranged from 20,000 to 100,000 people before Spanish colonization in the 17th century (Guam Bureau of Planning, 1978; Guampedia, 2024). There is little doubt that the indigenous population suffered a precipitous decline to perhaps 4,000 people over the next several hundred years, though whether this was due to warfare and colonial violence, disease, or other causes is a matter of on-going scholarly debate (Guampedia, 2024). Spanish colonization gave way to U.S. colonization in 1898 following the Spanish-American War. The Japanese then occupied Guam for about three years during World War II. The U.S. reclaimed Guam in 1944.

Guam officially became a U.S. unincorporated territory in 1950 under the Guam Organic Act (64 Stat. 384, 48 U.S.C. 1421 et seq.). Guamanians are U.S. citizens and represented by a non-voting member in the U.S. Congress, but cannot vote otherwise for U.S. officials (President, Vice-President). As established in the Organic Act, Guamanians are represented on island by a unicameral legislature (I Liheslaturan Guåhan) consisting of 15 senators elected at large for two-year terms, and an executive branch headed by an elected Governor (four-year term).[2] The Act also established a judicial branch for the island.

2.1.2.1. Trends

Since 1900, Guam's population grew steadily, with a significant increase immediately following the end of WWII (Figure 2-2). The rate of population growth has slowed in recent years, and perhaps was negative as measured by the 2020 U.S. Census. However, there may be some uncertainty about the reliability of census data collected during the COVID-19 global pandemic, despite assurances (Khubba, et al., 2022; Pacific Daily News, 2021). The most recent estimate of Guam's population suggests that it is continuing to increase, though perhaps at a slower pace.

[2] The Organic Act originally provided for the appointment of a Governor by the President. In 1968, the Guam Elective Governor Act amended the Organic Act to provide for the popular election of the Governor of Guam (Pub.L. 90-497, 82 Stat. 842). 3 GCA §6101 establishes the at-large election of 15 senators for 2-year terms.

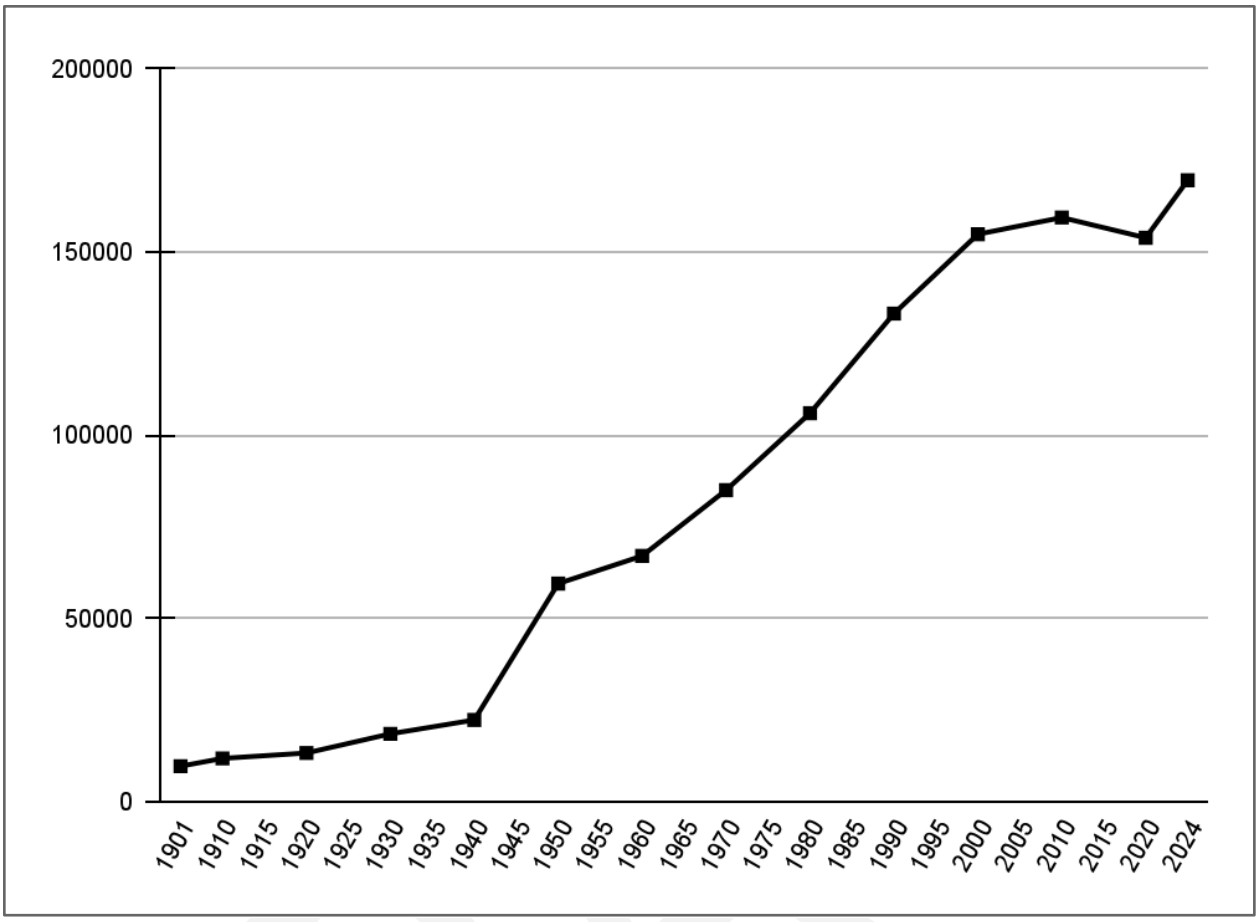

Figure 2-2. Guam Population, 1900 to present (U.S. Census; CIA, 2024).

2.1.2.2. Diversity

Guam's population has become more ethnically diverse over the last 100 years, with a corresponding and notable decline in the proportion of those identifying as CHamoru (Figure 2-3). According to the 2020 U.S. Census, Guam's population is 32.7% CHamoru, 29.1% Filipino, 13.2% other Pacific Islander, 6.8% White, 6.7 % Chuukese, and much smaller proportions of Chinese, Korean and other races. The median age on the island in 2020 was 33.7, and census data show a marked aging of the population from 1990 (25.0) to 2000 (27.4) to 2010 (29.5) to 2020 (33.7).

2.1.2.3. Distribution

Guam's residents reside in nineteen villages, with the highest population found in the more northern villages of Dededo (44,908), Yigo (19,339) and Tamuning (18,489). The smallest village populations are in the central and southern parts of the island, including Humåtak (647), Hagåtña (943), Piti (1,585), and Malesso' (1,604). Table 2.1 shows the population of each village documented in the 2020 census. Figure 2-4 shows the villages of Guam and the population

density per square mile of Guam by census tract. The northern island is the most urbanized, while the south is mostly a coastal population ringing the more mountainous interior.

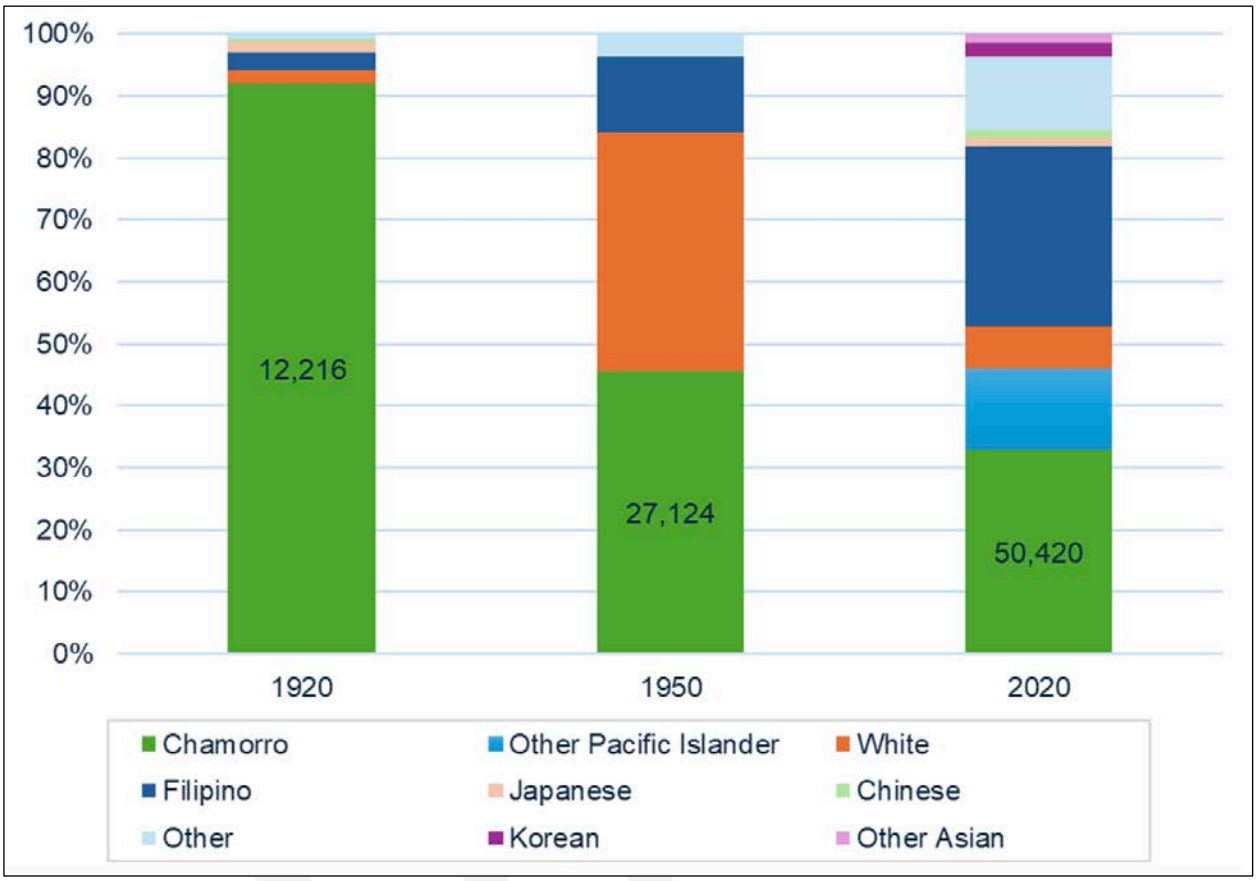

Figure 2-3. Guam's Racial Composition, 1920, 1950 and 2020.

Table 2-1. Guam's Villages and Populations from 2020 U.S. Census.

Village	Population	Village	Population
Agaña Heights	3,673	Mongmong-To'to-Maite'	6,380
Hågat	4,515	Piti	1,585
Assan-Ma'ina	2,011	Sånta Rita-Sumai	6,470
Barigåda	7,956	Sinahånña	2,611
Chålan Pågu-Otdot	7,064	Talo'fo'fo	3,550
Dededo	44,908	Tamuneng-Tomhom	18,489
Hagåtña	943	Humåtak	647
Inalåhan	2,317	Yigu	19,339
Mangilao	13,476	Yo'ña	6,298
Malesso'	1,604		

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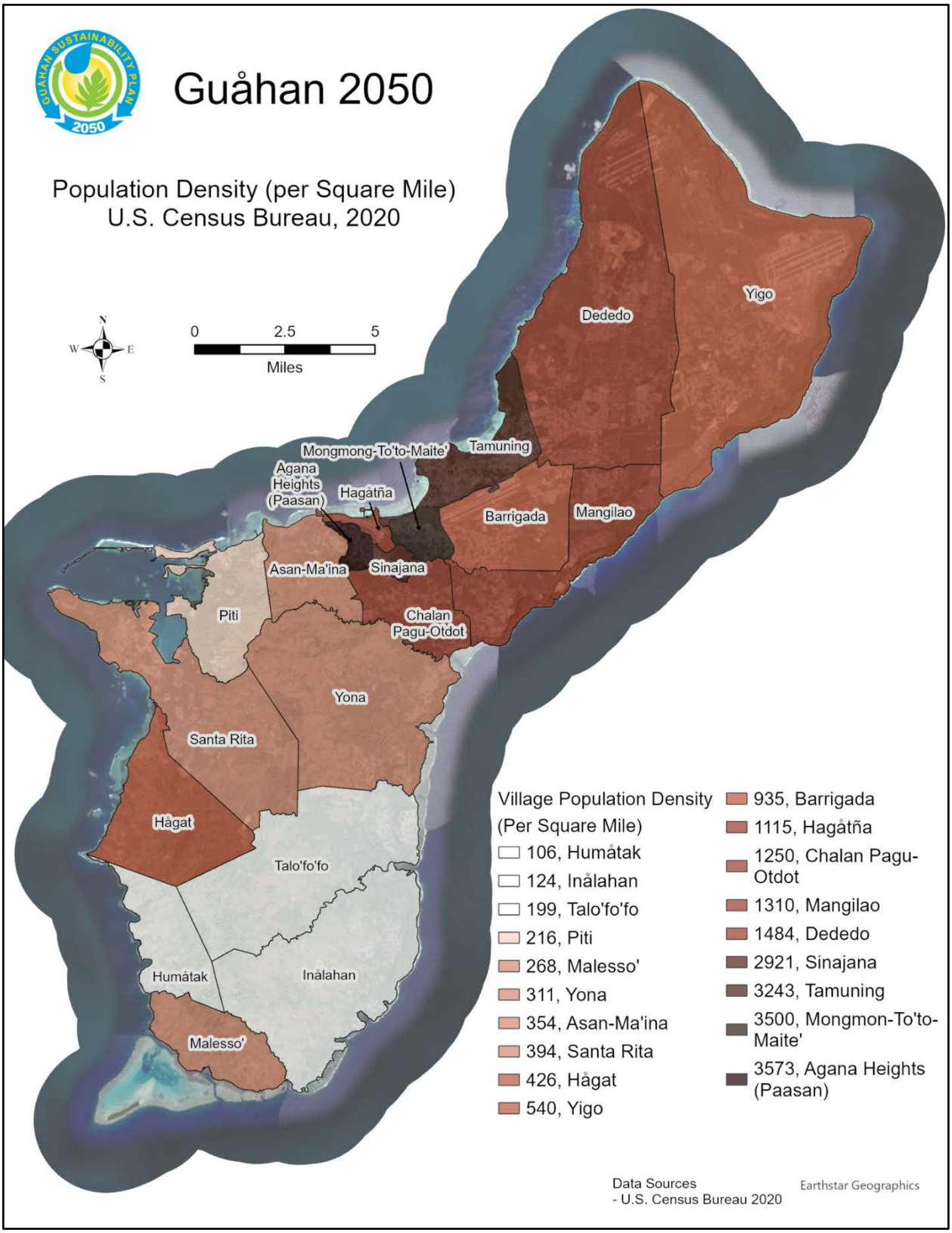

Figure 2-4. Guam's Population Density by Village.

2.1.2.4. Projections

The United Nations Population Division projects a steady increase in Guam's population through 2050, with a leveling out occurring through 2075, followed by declining population through 2100 (Fig 2-5). There is a significant uncertainty in the curve, though, with the range of possible futures driven by probabilistic projections of total fertility and life expectancy at birth (United Nations, 2022). For purposes of addressing island sustainability, including land use and infrastructure capacities and demand, the G50SP assumes that Guam's population generally will continue to increase, perhaps 14% or more through the 2050 planning horizon, based on U.N. projections (172,000 in 2022 to 196,000 in 2050). The population will continue to age, with the number of persons over the age of 65 nearly doubling by 2050 according to U.N. projections (Figure 2-6).

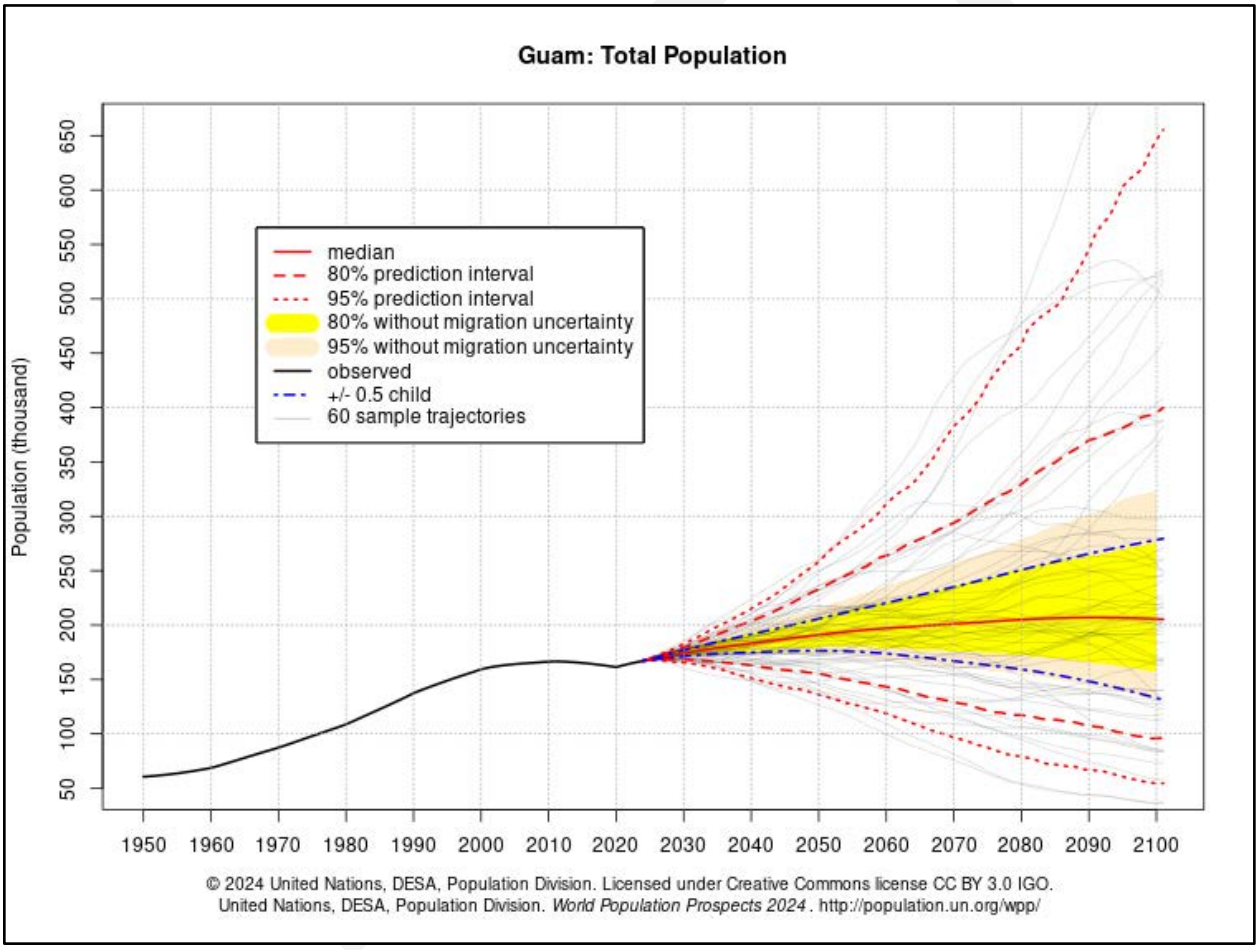

Figure 2-5. Guam Projected Population, United Nations.

One of the critical factors driving Guam's population growth in the near future is the expanding U.S. military presence. The 2020 census identified 21,700 service members and dependents on Guam, equal to about 14% of the total population measured at the time (153,836) (Pacific Island

Times, 2022). As of March 2023, the U.S. Department of Defense reported a total of 11,616 military personnel on Guam, including active-duty service members, reservists, and civilian

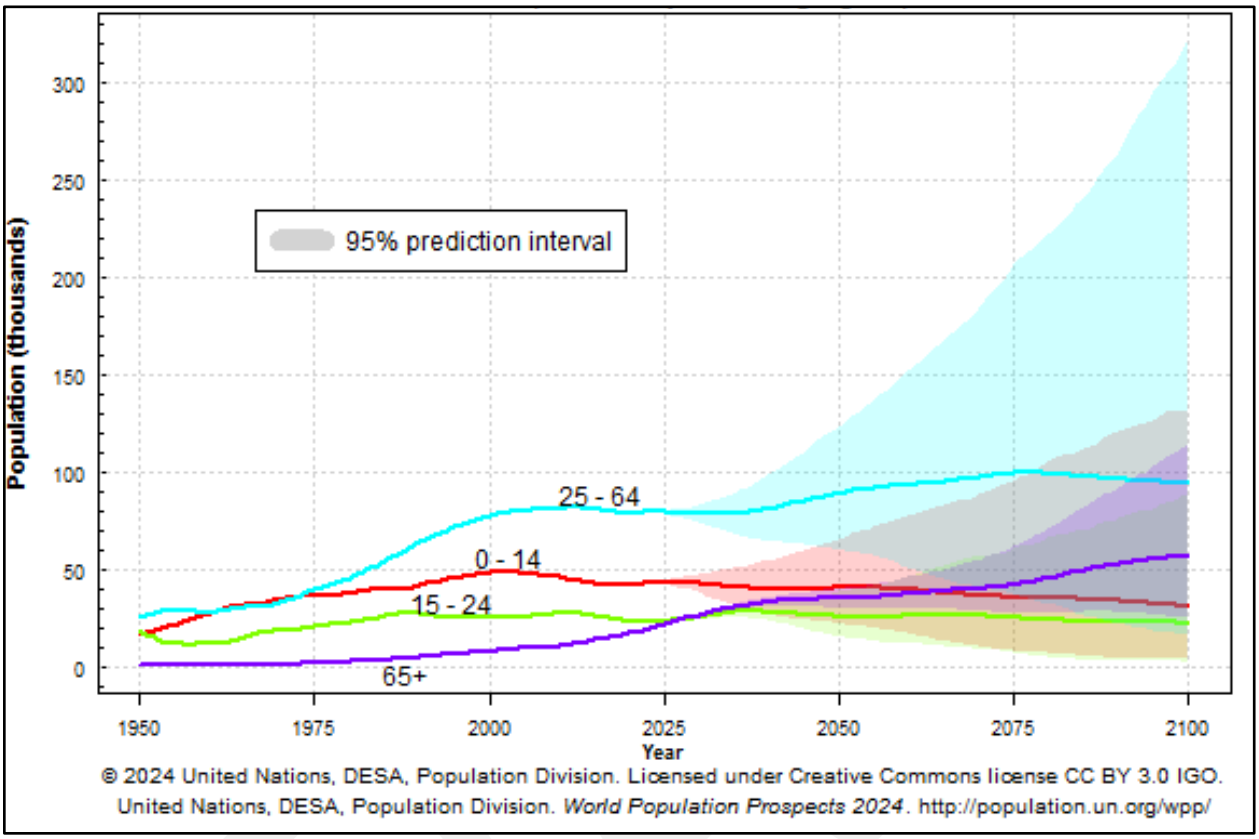

Figure 2-6. U.N. population projections for Guam by age groups.

employees (CRS, 2023). This number is expected to increase in the next five years as a planned relocation of marines from Okinawa, Japan gets underway. According to a Congressional Research Service (CRS) report, marines and their families will begin moving from Okinawa to Guam in 2024 with 2,500 service members arriving by 2026, and another 2,500 by 2028 (Id.).

In April 2025, the Committee on Economic Investment, Military Buildup, Regional Relations, Regulatory Affairs, Technology, Justice, Elections, and Retirement conducted an informational briefing. The Joint Region Marianas (JRM) reported that the total military-related population on Guam was anticipated to be close to 35,000 by 2037, a more than 50% increase from 2024 and nearly a tripling since 2015 (Figure 2-7, Guam Legislature, 2025). This expansion is and will continue to have significant implications for all aspects of Guam's economy, housing, infrastructure, culture, and more. This anticipated growth in the population related to the military expansion also is well-reflected by the planned construction budget for Guam and the CNMI, shown in Figure 2-8.

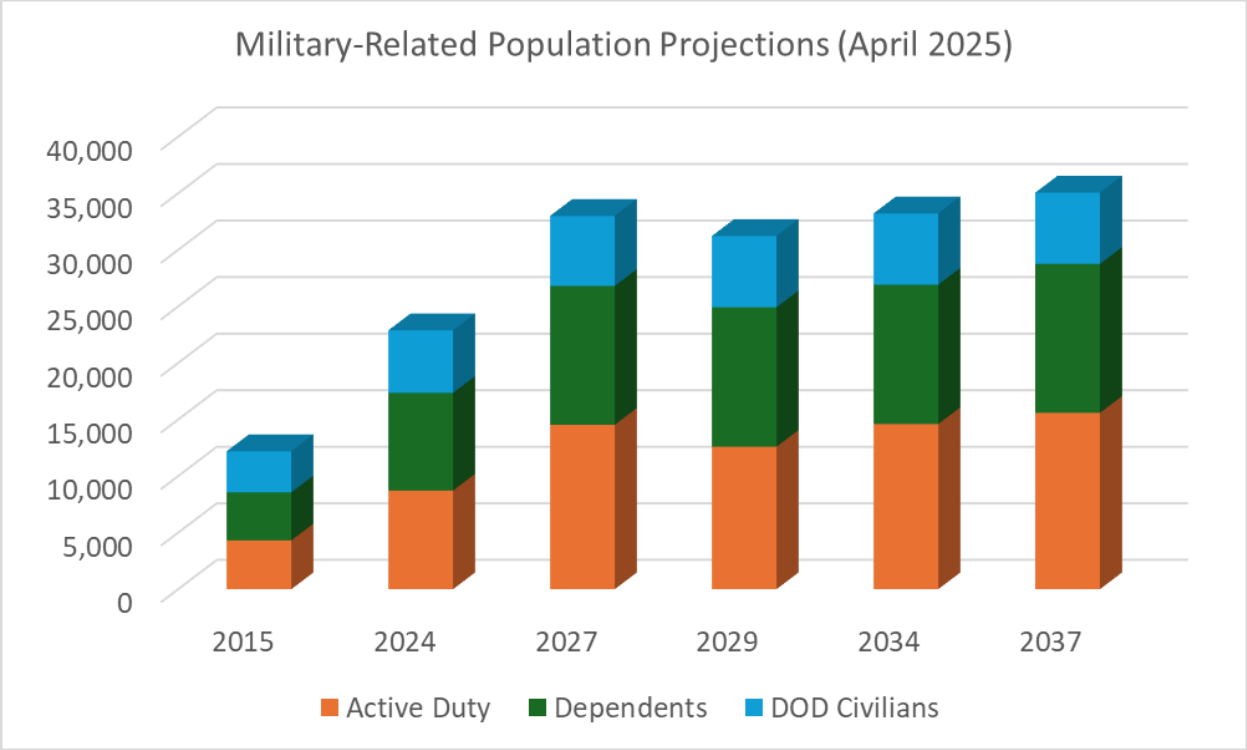

Figure 2-7 Military Related Population Projections

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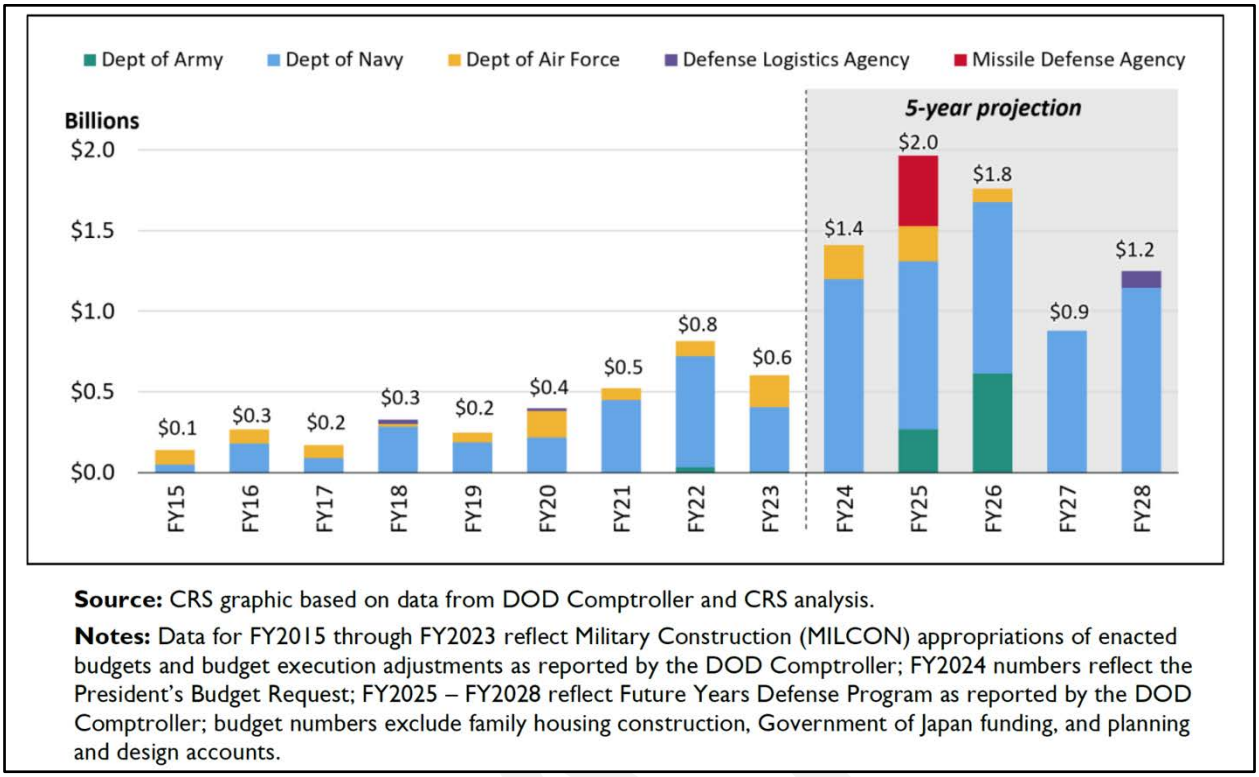

Source: CRS graphic based on data from DOD Comptroller and CRS analysis.

Notes: Data for FY2015 through FY2023 reflect Military Construction (MILCON) appropriations of enacted budgets and budget execution adjustments as reported by the DOD Comptroller; FY2024 numbers reflect the President's Budget Request; FY2025 – FY2028 reflect Future Years Defense Program as reported by the DOD Comptroller; budget numbers exclude family housing construction, Government of Japan funding, and planning and design accounts.

Figure 2-8. Military Construction Funding ($ billions) for Guam and CNMI from FY15-FY23, and projected funding through FY28.

2.2. Coordination with the Department of Defense

The CRS has identified multiple important questions about the U.S. military and Guam, including the following that relate directly to sustainability planning (CRS, 2023):

- What is the optimal disposition of operational forces and military personnel within the limited space available on Guam?
- What is the optimal configuration of military infrastructure on Guam within the limited space available?
- Should Congress consider providing direct support for civilian infrastructure on Guam as a component of military readiness?
- How might U.S. immigration policy related to Guam support military readiness on the island?
- How might Congress support and ensure positive civil-military relationships between DOD and the U.S. citizens who live on Guam?

The CRS notes that land use is a recurring issue on Guam, and that Congress may consider whether to appropriate funding for critical infrastructure outside of military installations on Guam to increase readiness, such as improving electrical system robustness, drinking water and stormwater management systems, transportation infrastructure (e.g., roads or the civilian

airport), and mitigation of risks related to extreme weather or climate change. Congress might also consider measures to expand housing options in Guam, including for a potential influx of military contractors to support emerging missions, or the temporary labor force possibly needed for military construction plans. As noted: "[e]nsuring a supply of available and affordable housing could reduce strain on the relationship between the people of Guam and the military community . . ." (CRS, 2023, p. 39). The CRS 2023 report also notes that the federal government has provided $186 million to Guam to fund civilian infrastructure, including a new medical facility (Id.).

As discussed in more detail in Chapter 5, Guam participates in the U.S. Federal government coastal zone management program. Section 307 of the Coastal Zone Management Act (CZMA) gives the Government of Guam a federal consistency authority, intended to ensure that federal actions affecting coastal use or resources, including actions by the Department of Defense, align with approved Guam Coastal Management Program enforceable policies. This provision ensures that federal actions contribute positively to the long-term health and sustainability of coastal and natural resources. Given the numerous shared land use concerns between the Government of Guam and the federal government, it is important for the two governments to collaborate as much as possible on land use planning issues and impacts, including through the federal consistency review process.

2.3. Land Use and Sustainability for the Island and People

Addressing population growth and the implications for a sustainable Guam is foundational to all of the United Nations Sustainable Development Goals (SDGs). The U.N. Population Division provides data essential for the global monitoring of about one-quarter of the 231 SDG indicators monitored by the U.N. (U.N., 2024). Consistent with P.L. 35-110, the Guåhan 2050 Sustainability Plan recognizes this with policies directing the Bureau of Statistics and Plans (BSP) to use the best available population data and analysis in support of sustainable population growth on Guam. Policies also direct that the Government of Guam coordinate with the U.S. Department of Defense to address population growth and related impacts, including potential mitigation to the Island of Guam.

These policies align with the U.N. SDGs by promoting sustainable urban growth, environmental stewardship, and responsible governance. Through data-driven planning and demographic analysis (SDG 11, SDG 17), BSP will ensure that population growth is managed within Guam's economic, social, cultural, and environmental capacities (SDG 3, SDG 12). Coordination with the U.S. Department of Defense (DOD) will facilitate strategic planning for military-related

population and land use impacts, helping to secure mitigation investments that enhance infrastructure resilience and social equity (SDG 9, SDG 10, SDG 16). Additionally, the federal consistency review process reinforces Guam's sustainability goals by ensuring federal actions align with the G50SP (SDG 13, SDG 14). These policies collectively support sustainable development, economic resilience, and environmental protection, fostering a balanced approach to growth that meets the needs of both present and future generations. By integrating these principles, Guam strengthens its capacity for long-term sustainability while enhancing quality of life for its residents.

2.3.1. Land Use Policy Goal Statement and Objectives

This land use plan embodies an overarching goal to plan for population growth and related land uses that will support both the sustainability of all other aspects of Guam's environment, society, and economy, and long-term cultural integrity. This chapter also frames three objectives and five policies to achieve this goal.

> **Goal:** *Plan for population and land use growth that supports Guam's sustainability capacity and cultural integrity.*
>
> **Objectives**:
>
> - Use best-available population data to align infrastructure, housing, and services.
> - Coordinate proactively with the U.S. Department of Defense to mitigate impacts.
> - Apply federal consistency review to support plan implementation.

2.3.2. General Island Demographics and Land Use Planning Policies

Planning

IP-1. BSP Clearinghouse.
BSP shall continue to serve as a clearinghouse for population and other demographic data and analysis for the Island of Guam. Support G50SP implementation with regular monitoring, data collection, analysis, and reporting.

IP-2. Sustainable Population.
BSP shall, through coordinated government action, plan for a population that can be sustained within the economic, social, cultural, environmental, land use and infrastructure constraints of the Island of Guam. Use best available population data and projections to plan for island sustainability and meet the needs of present and future generations.

Coordination with DOD

IP-3. Intergovernmental Coordination.

The Government of Guam shall coordinate as necessary with the U.S. Department of Defense and the Joint Region Marianas concerning the military population, including personnel and their families, and other related demands, as well as land use, economic, social, infrastructure, and other impacts.

IP-4. Mitigation Monies.

As warranted, GovGuam shall seek mitigation monies (such as infrastructure investments) from the U.S. Department of Defense to offset impacts of the military population and activities on Guam's social fabric, economy, land use, infrastructure, environment, and culture.

Federal Consistency Review

IP-5. Federal Consistency Review.

GovGuam shall use the certified federal consistency review process to the maximum extent feasible to support the planning and development goals of the Guåhan 2050 Sustainability Plan.

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Chapter 3. **Sustainable Communities**

3.1. Introduction

Guam's long-term well-being depends on how wisely its land is used to shape healthy, resilient, and thriving communities. With limited land and growing pressures from population growth, military expansion, economic transitions, and climate change, coordinated and responsible land use planning is essential. This chapter provides the foundation for shaping land use decisions that balance environmental stewardship, cultural identity, housing and infrastructure needs, and economic opportunity. It builds on the core principles of the Guåhan 2050 Sustainability Plan—limits, balance, renewal, equity, and engagement—to establish a forward-looking strategy for development that enhances quality of life while protecting the island's most vital natural and cultural resources.

The chapter introduces a comprehensive land use framework organized into six interrelated sections. Each section identifies a specific component of sustainable community development, along with clear goal statements and planning objectives to guide policy and zoning decisions. Together, these goals and objectives form the strategic architecture for a land use system that is inclusive, place-based, climate-resilient, and grounded in Guam's unique context.

General Land Use

Section 3.2 addresses the spatial structure of growth and conservation across the island. It addresses how future development is distributed, the balance between urban and rural areas, and how land use decisions can protect aquifers, forests, and other sensitive landscapes. The overarching goal is to guide new development and redevelopment to the best locations and patterns to balance economic growth with environmental and cultural preservation.

> **Goal**: *Direct growth to appropriate locations to balance development with environmental and cultural preservation.*
>
> **Land Use Objectives:**
>
> - Concentrate new development within designated urban zones with existing public services.
> - Establish and maintain urban-rural boundaries to prevent sprawl and protect open space.

- Protect aquifers, sensitive lands, and watersheds through low-intensity zoning and special overlays.

Public Services

Section 3.3 considers Guam's infrastructure and public services as the backbone of sustainable land use. This section includes policies to ensure that all development is matched with adequate water, sewer, stormwater, energy, and transportation services, and that those systems are planned for long-term resilience.

Goal: *Ensure that all development is supported by adequate public infrastructure.*

Land Use Objectives:

- Require water, sewer, and stormwater infrastructure to be in place before subdivision or development approvals.
- Coordinate utility expansion with the land use map and growth boundaries.
- Promote green infrastructure and resilient design to manage runoff, reduce flooding, and mitigate heat.

Housing

Recognizing Guam's rising housing costs and increasing population, section 3.4 focuses on how land use planning can expand access to affordable, climate-resilient, and well-located housing. Policies and objectives promote higher-density and mixed-use development patterns, infill and reuse of existing structures, and flexibility for family-oriented solutions such as accessory dwelling units (ADUs).

Goal: *Provide safe, resilient, and affordable housing for all Guam residents.*

Land Use Objectives:

- Expand zoning for multifamily housing and accessory dwelling units (ADUs) to meet diverse needs.
- Prioritize infill and redevelopment in existing built areas and reuse of vacant or underutilized buildings.
- Encourage climate-resilient building practices in areas exposed to flooding, typhoons, or sea level rise.

Commercial, Industrial, And Priority Development

Section 3.5 discusses the availability of land for economic growth while maintaining compatibility with surrounding communities and sensitive resources. It supports strategic redevelopment, eco-cultural tourism, and protection of essential sectors like fisheries and telecommunications.

Goal: *Encourage economic growth through strategic and context-sensitive development.*

Land Use Objectives:

- Promote mixed-use corridors and redevelopment in already urbanized areas.
- Preserve land for priority economic uses including agriculture, fishing, telecommunications, and small-scale manufacturing.
- Support village-scale employment, entrepreneurship, and eco-cultural tourism that reflects local character.

Rural and Agricultural Lands

Rural and agricultural areas are essential to Guam's cultural heritage, food security, and environmental health. Section 3.6 thus addresses the preservation of open space and farming lands and promotes sustainable agricultural practices and land tenure reform through various rural and agricultural land policies.

Goal: *Preserve rural landscapes and support sustainable agriculture*.

Land Use Objectives:

- Limit subdivision and enforce minimum parcel sizes in rural zones to prevent fragmented land use patterns and development unsupported by public services.
- Support traditional and commercial farming through appropriate zoning and infrastructure.
- Consider a transfer of development rights (TDR) program to facilitate the movement of development potential from rural to urban zones to incentivize conservation.

Natural Hazards

Guam faces increasing risks from coastal erosion, flooding, typhoons, sea level rise, and other natural hazards. Section 3.7 includes policies and objectives designed to integrated hazard mitigation into land use planning through science-based land use hazard overlays, coastal adaptation, and nature-based solutions.

Goal: *Reduce vulnerability and build resilience to natural hazards and disasters*.

Land Use Objectives:

- Adopt hazard overlays and risk-based zoning to guide development away from high-risk areas.
- Promote living shorelines and nature-based solutions for coastal protection.
- Integrate hazard mitigation and resilience planning into land use decisions, infrastructure design, and housing policy.

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LAND USE POLICY AND SUSTAINABLE DEVELOPMENT GOALS

Together, the six sections of Chapter 3 form the land use policy backbone of the Guåhan 2050 Sustainability Plan. They seek to direct growth wisely, safeguard the island's natural and cultural systems, and ensure that development enhances rather than undermines quality of life. In so doing, the goals, objectives, and policies advance multiple United Nations Sustainable Development Goals (SDGs), including:

- **SDG 11: Sustainable Cities and Communities:** *Make cities and human settlements inclusive, safe, resilient and sustainable.*
- **SDG 6: Clean Water and Sanitation**: *Ensure availability and sustainable management of water and sanitation for all.*
- **SDG 7: Affordable and Clean Energy**: *Ensure access to affordable, reliable, sustainable and modern energy for all.*
- **SDG 13: Climate Action:** *Take urgent action to combat climate change and its impacts.*

Each section of the chapter provides more detail on the issues and on how the policies align with the UN SDGs. Overall, by combining planning discipline with cultural respect, Chapter 3 provides a roadmap for communities that are sustainable, climate-ready, and rooted in the spirit of Guam.

3.2. Land Use on Guam

3.2.1. Background on Existing Land Use

The Island of Guam encompasses approximately 212 square miles or 135,680 acres of land. It also includes approximately 234 square miles of submerged land (out to 3 miles). The history of this land on Guam – its tenure, stewardship, and ownership, is deeply complex, shaped by centuries of colonialism and the island's strategic role in U.S. military operations, especially in the post-WWII era. Following the Spanish-American War in 1898, Guam was ceded to the United States, initiating a period of American naval administration. During this time, the U.S. Navy assumed ownership of all Spanish crown lands—roughly one-quarter of the island—and designated Guam as a naval station. After World War II, the U.S. dramatically expanded its military footprint, acquiring between one-third and one-half of the island's land, including large areas of ancestral CHamoru territory. The legacy of these takings persists today, as Guam continues to grapple with efforts to recognize and return traditional CHamoru lands. The potential expansion or reconfiguration of U.S. military land use remains a dynamic and contested issue with significant land use, cultural, and political implications. Overall, current and

future land ownership patterns play a significant role in determining both where and how Guam might grow, and the opportunities available for preserving Guam's special culture and natural lands (Rogers, 2011; NPS, 2004; Bevacqua, 2005; Underwood, 1998; GAO, 2021).

3.2.2. Current Distribution of Land Uses.

The locations and intensities of existing land uses on Guam largely reflect patterns of land ownership and geography. The north and central limestone plateau is significantly urbanized, with large areas of land held by the military. Southern Guam is more rural, with most development occurring on the lower elevation coastal areas that fringe a mountainous terrain of steeply sloping lands. Figure 3.1 shows the current geographic distribution of urban and rural land cover on Guam. Figure 3.2 shows the approximate percentage of land in different land use categories prior to this plan's proposed land use designations. About two-thirds of the island is either military land or designated for agriculture. Some of this "agricultural" land was recently included in the Forest System Plan as conservation lands with the plans formal adoption (see Chapter Five).[3] Very little land, relatively speaking, is found in urban categories, such as residential and commercial development. As discussed in Chapter Two, most of Guam's population lives in the north and central parts of the island. This is clearly reflected in the distribution of development in Figure 3.1. This land use plan updates existing designations and designates land uses for a significant portion of the island heretofore undesignated (see below).

[3] Guam P.L. 37-143 _Bill No. 363-37.

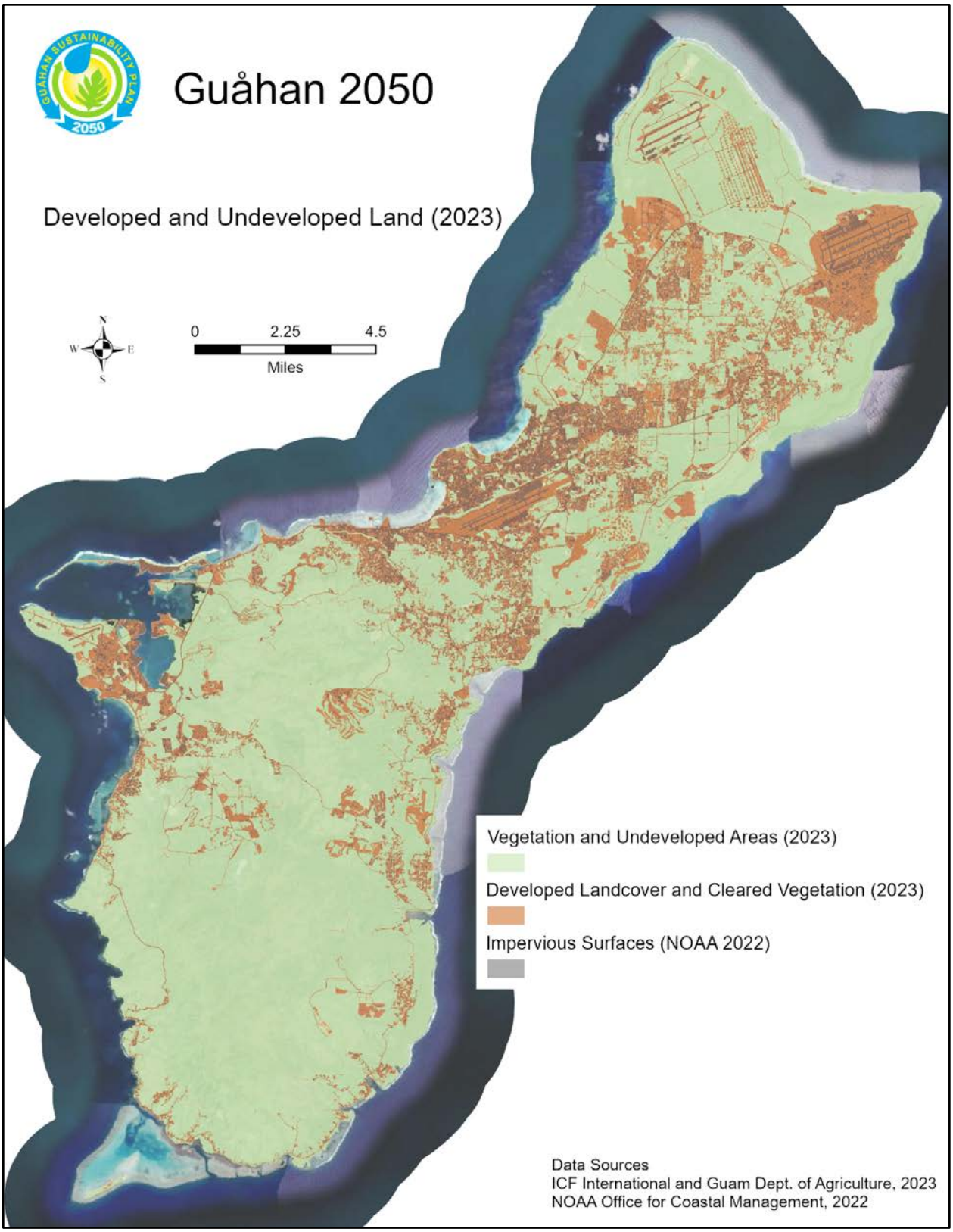


Figure 3-1. Current Developed and Vegetated Land Cover on Guam.

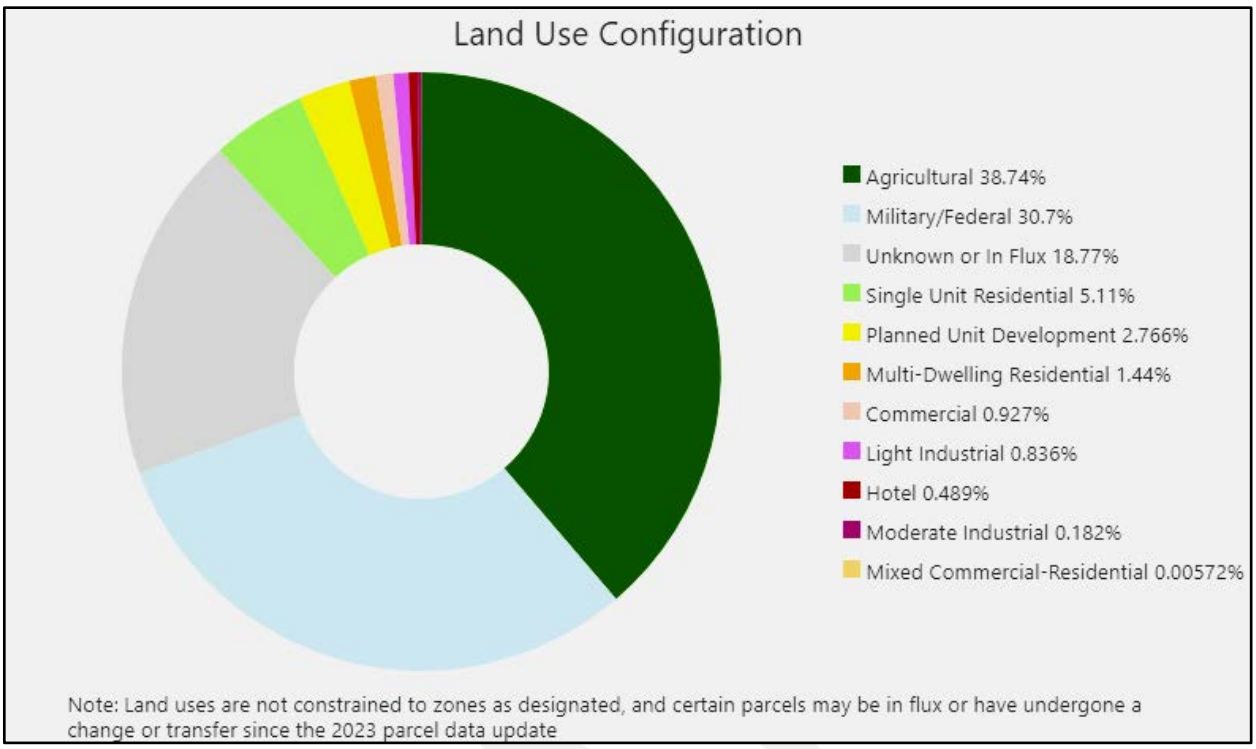


Figure 3-2. Guam's Land Use Designations prior to G50SP Land Use Plan (BSP, 2024).

3.2.3. Land Ownership

Table 3.1 summarizes the current ownership of Guam's land by private parties, the Government of Guam, and the federal government land (including U.S. military land). The vast majority of federal land (about 28% of the island) is held by the U.S. Department of Defense, including Andersen Air Force Base in Yigo and Naval Base Guam in Santa Rita. The Department of Interior holds the Guam National Wildlife Refuge, Ritidian Unit. Land ownership, and the transfer of land between the federal government and the Government of Guam, is an on-going and dynamic situation. Based on recent public lands data from Guam Bureau of Statistics and Plans (January 2025), the Government of Guam holds approximately 50% of the island, including 17,758 acres held by the Department of Parks and Recreation, 16,884 acres by the Guam Water Authority, and 15,577 acres held by the CHamoru Land Trust Commission. Multiple other agencies hold land making up the total 68,535 acres of land held by the Government of Guam. About 28,000 acres or 21% of the island is held by private parties, which includes residential, commercial, and agricultural properties. This distribution reflects Guam's historical and strategic significance, particularly its role as a pivotal U.S. military outpost in the Pacific. The considerable federal and government land holdings have implications for local development, land use planning, and the availability of land for private and commercial purposes. Figure 2-3 shows the land ownership in Guam as of 2025.

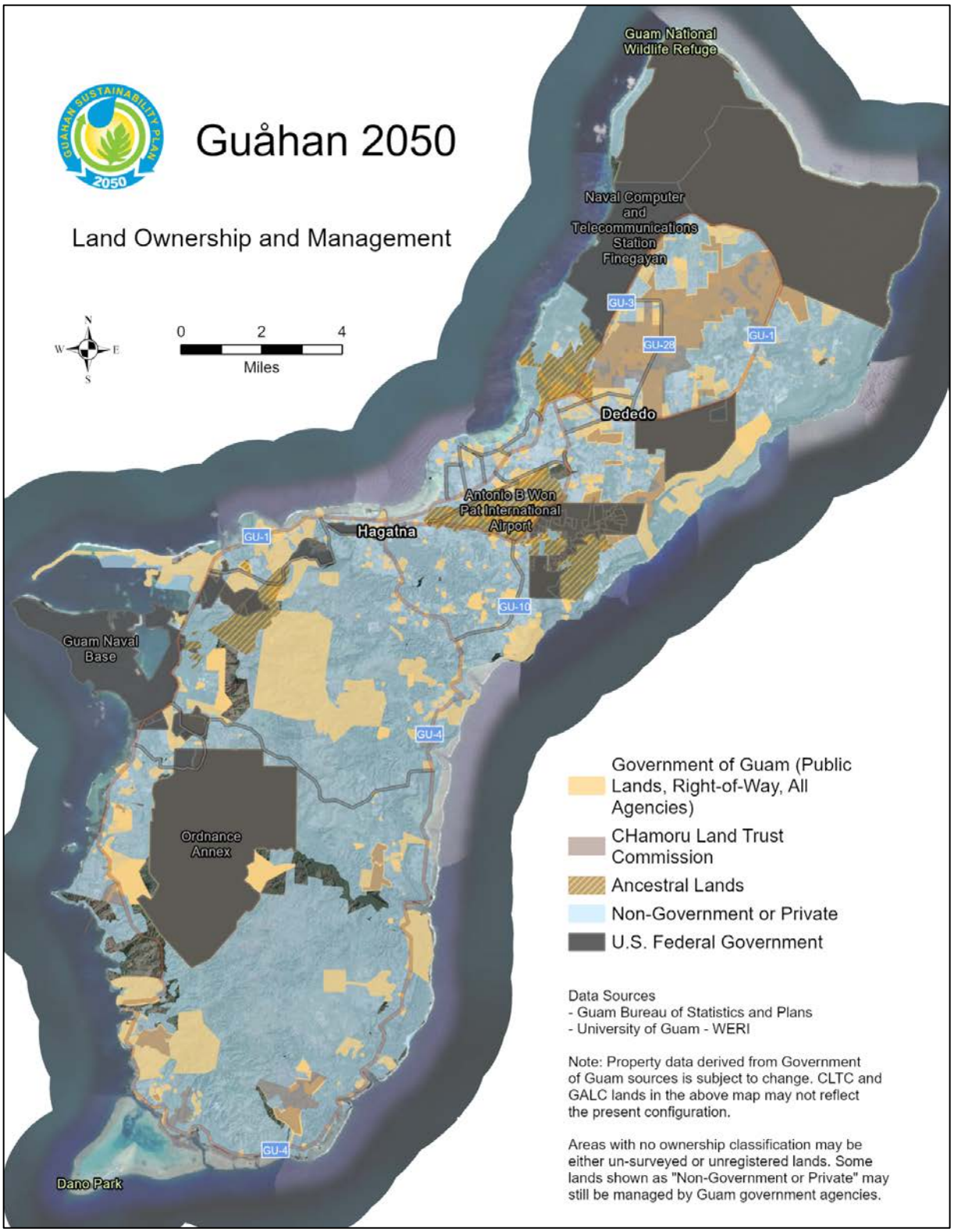


Figure 3-3. Map of Land Ownership and Management.

The land holdings of the U.S. military and the Government of Guam are somewhat fluid. Currently, 27% of the island is managed by the Federal Government, while 52% is held as public land by the Government of Guam, including lands of the CHamoru Land Trust Commission (CLTC) and the Guam Ancestral Lands Commission (GALC). These numbers have changed over the years (and will continue to change) as additional lands have been transferred between the two governments (e.g., PDN, 2025). Most of the federal military land is pretty evenly split between the U.S. Navy and the Air Force. As discussed in this plan, the on-going expansion of federal military presence on Guam, including base expansion, the proposed missile defense system, and construction activity related to the expansion, raise significant land use issues for Guam.

Table 3-1. Land Ownership on Guahan.

Ownership	Acres (acres)	Percent of Island
Private	28,405	21%
Government of Guam	68,535	50.5%
Federal Government	38,740	28.5%
Totals	**135,680**	**100%**

Table 3-2. Government of Guam Public Land Ownership (BSP, 2025).

Agency	Acres	Percent of GovGuam Lands
Department of Parks and Recreation	17,758	25.9%
Guam Water Authority	16,884	24.6%
CHamoru Land Trust Commission	15,577	22.7%
Department of Agriculture	7,522	11.0%
Guam Ancestral Lands Commission	3,616	5.3%
Port Authority of Guam	1,551	2.3%
Department of Land Management	1,337	2.0%
Department of Energy	1,127	1.6%
N/A	577	0.8%
Department of Public Works	474	0.7%
University of Guam	395	0.6%
Guam Housing and Urban Renewal	368	0.5%

Agency	Acres	Percent of GovGuam Lands
Authority		
Guam Community Colleges	347	0.5%
Village Mayors	217	0.3%
Miscellaneous	788	1.1%
Total	**68,536**	**100.0%**

3.2.4. Overview of Land Use Planning on Guam

Comprehensive land use planning is essential for balancing development needs with environmental conservation and sustainability goals. By carefully identifying the proper locations, types, and intensities of land uses, this plan seeks to ensure that growth occurs in a way that meets community needs while minimizing negative impacts on natural resources. For example, designations for Single-Family Dwellings (R-1) and Multi-Family Dwellings (R-2) are strategically placed near infrastructure and essential services to support residential communities. Planned Unit Development (PUD) and Mixed-Use Residential/Commercial (MU) zones encourage walkability and efficient land use by integrating housing, businesses, and public spaces. At the same time, commercial areas (C – Commercial) and village center (VC) designations are concentrated in accessible, high-traffic locations and village centers to support economic activity without disrupting residential neighborhoods.

The land use plan will also play a crucial role in protecting environmentally sensitive and resource-rich areas. Prime Agriculture (AG-P) and Non-Prime Agriculture (AG) designations ensure that potentially valuable farmland remains available for food production, while Parks and Recreation (PR) and Resource Conservation (RC) designations help preserve natural ecosystems, recreational spaces, and watersheds. Rural Lands (RL) provide a transition area between urban and protected areas. Industrial zones (M-1 – Light Industrial and M-2 – Heavy Industrial) are placed strategically to minimize environmental hazards while supporting economic growth. Similarly, the Hotel Resort Zone (H) is positioned to promote tourism without overburdening infrastructure or harming coastal ecosystems. Federal and military lands (F) are largely established, though careful coordination with adjacent areas is still needed to align them with civilian land use while ensuring national security needs are met. By thoughtfully designating and regulating these land uses, Guam can promote sustainable development,

protect its natural and cultural heritage, and enhance the quality of life for current and future generations.

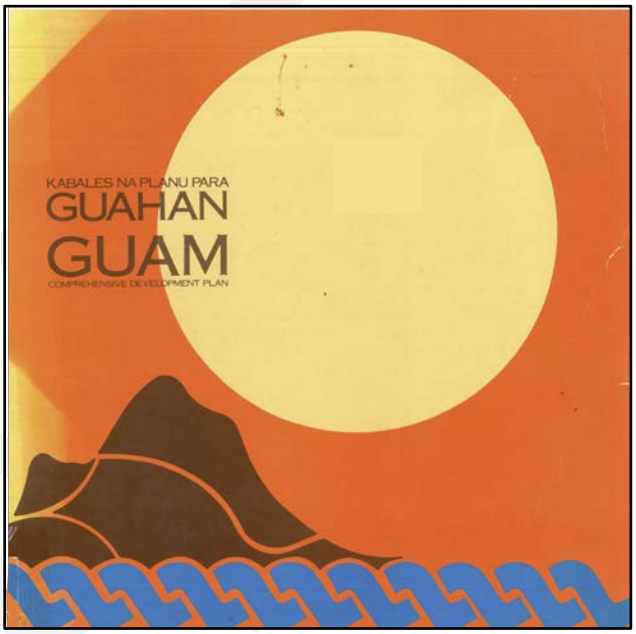
Land Use Constraints. Various delineated constraints in the Guåhan 2050 Sustainability Plan serve as an additional layer of land use planning, ensuring that specific areas receive targeted management strategies based on their unique characteristics and needs. These constraints work alongside existing land use designations to guide development while considering environmental, economic, and social factors. For example, policies direct the concentration of development into identified urban areas, and encourage mixed-use and pedestrian-friendly developments within Guam's villages to enhance community livability. Urban areas are also considered *redevelopment areas* that focus on revitalizing aging or underutilized urban spaces to stimulate economic growth and improve infrastructure. Similarly, overlays such as *Flood* (FEMA 100-year floodplain) and *Shoreline Hazards/SLR* (Sea Level Rise) aim to mitigate risks associated with climate change and natural disasters by implementing stricter development regulations in vulnerable areas.

Other constraint maps prioritize ecological and cultural preservation, economic activities, and infrastructure needs. *Critical Habitat Areas* and *Scenic Areas/Viewsheds* protect Guam's biodiversity and maintain the island's natural beauty by restricting development in sensitive areas. Meanwhile, policies to provide for *Priority Coastal Dependent Uses* ensure that essential industries like fisheries and maritime activities have the necessary access to coastal resources. Special *Community Character* policies safeguard culturally significant areas by preserving historical and architectural integrity. Economic and infrastructure policies, such as *Priority Industrial/Government Uses*, support renewable energy, waste management, and military operations, while *Airport Compatibility* ensures that land uses near the airport align with safety and operational requirements. These designated constraints and priorities collectively contribute to a more resilient, sustainable, and well-planned future for Guam.

3.2.5. Balancing Urban and Rural Land Use for Sustainability

The G50SP directs that new development be concentrated in existing urban areas with adequate public services, a principle that aligns with the concept of a stable *Urban-Rural Boundary* to manage growth. This approach delineates specific areas where urban development is encouraged, ensuring that places with established infrastructure—such as water, sewer systems, roads, power, and communications—are used efficiently. By directing growth to these designated urban zones, Guam aims to balance economic development with environmental preservation, thus preventing the adverse effects of urban sprawl on rural and ecologically sensitive areas. This approach reflects and builds on past planning efforts in Guam, including the 1978 Guam Comprehensive Development Plan (*Kabales Na Planu Para Guahan*) and the

1994 Land Use Plan for Guam (*I 'TANO'-TA*), as well as the more recent North and Central Land Use Plan for Guam (2009).[4]



Implementing balanced development zones is central to this strategy. By designating specific areas for commercial, residential, agricultural, and industrial purposes, as well as mixed use zones to promote compact, walkable communities, Guam seeks to harmonize economic growth with the conservation of natural resources. This ensures that each land use is situated in the most appropriate location, minimizing conflicts between land uses and protecting the environment. For instance, concentrating industrial activities in areas with adequate infrastructure reduces the potential for environmental degradation in rural zones.

The policy of *Concentration of Development* directs new projects to urban areas capable of supporting increased density. This not only maximizes the use of existing public services but also reduces the need for costly infrastructure expansions into undeveloped regions. Such a focus on urban centers helps preserve Guam's rural landscapes and agricultural lands, thus maintaining the island's ecological balance and cultural heritage. This policy also seeks to address the on-going challenge of residential sprawl and fragmentation of rural lands in Northern Guam brought about from development that was unsupported with urban services. More detailed discussion and policy to address the lack of urban services for new development is presented below.

Promoting *Compact, Walkable Communities* is another key aspect of the G50SP. Encouraging mixed-use development within urban centers fosters vibrant neighborhoods where residential, commercial, and recreational facilities coexist. This development pattern reduces land

[4] Concerned with the "random pattern" of expansion of residential, commercial, and industrial uses the 1978 plan included direction to "[c]oncentrate uses requiring high levels of support facilities within designated urban districts." Likewise, the 1994 I Tano'-Ta proposed new development "in areas where existing infrastructure or planned improvements are available or planned to be available." The North and Central Guam Land Use Plan includes Policy LU-10: "Provide for incremental growth in already developed areas to take advantage of existing investments in transportation and utility systems and to reduce impacts on the Northern Aquifer. In providing for infill growth, assure the adequacy of water, roads and other public services."

consumption, supports public transit, and enhances walkability, contributing to a reduction in traffic congestion and greenhouse gas emissions. By prioritizing pedestrian-friendly infrastructure, Guam aims to improve public health and create more livable communities.

Similarly, the emphasis on *Village Centers* through designation of urban areas in the plan focuses on creating diverse, compact hubs that integrate residential, commercial, and community facilities. These centers may serve as focal points for community life, providing accessible services and amenities while preserving the surrounding rural areas. By concentrating development in these centers, Guam will support efficient land use and strengthen community identity.

Finally, to further protect rural and environmentally sensitive areas, the G50SP includes a policy to consider developing a *Transfer of Development Rights (TDR)* Program. This initiative would allow for the transfer of potential development from rural agricultural zones, particularly in the Northern Guam Lens Aquifer groundwater protection area, to designated urban areas more appropriate for urban intensification. Implementing such a program would safeguard critical water resources and agricultural lands by redirecting development pressures to urban centers that are better equipped with the necessary infrastructure. It may also be effective at promoting traditional CHamoru stewardship on ancestral lands (see below).

3.2.6. G50SP General Land Use Map and Policies

The core land use strategy and policies seek to manage growth sustainably, ensuring that development is concentrated in areas with adequate public services while protecting the island's environmental integrity and cultural heritage. The key to effective implementation will be to observe and follow the essential patterns of land use established in the G50SP.

Figure xxx shows the new land use map for Guam to implement the vision and policies of the G50SP. In many respects it is the same as Figure xxx, above that shows current residential, commercial, industrial and other major land uses, such as the federal military lands. But this new land use map also includes changes in land use designations and other planning mechanisms working in conjunction with various policies to support the new sustainability objectives of the plan. These changes include:

- Establishment of urban-rural boundaries separating the major existing urban or central development areas of the island from more rural, agricultural areas;
- Land use changes in the NGLA protection zone supporting lower density development, including agriculture, parks and open space., and a new *Rural Lands* designation for transitional areas between less developed and residential areas;
- Economic opportunity, mixed-use commercial, and redevelopment focused in urban areas;
- A new *Resource Conservation* designation for sensitive natural lands and watersheds, especially unique, sensitive habitat areas such as the limestone forest;

- Policies to designate areas for priority industrial and coastal-dependent land uses;
- Multi-family areas allowing increased residential densities, including the support of affordable housing;
- Distinguishing viable/prime Agricultural lands (P) from non-prime Agricultural and Rural Lands; and
- Use of various land use constraint designations to indicate hazard areas (e.g. erosion and flooding, landslide, seismic) and other sensitive development zones (riparian corridors, wetlands, steep slopes, sensitive viewsheds).

All but the last of these proposed land use designations and indications are shown in Figure xx. The land use constraint maps are presented later in the plan in relevant sections (e.g. natural hazards). Following sections of the plan elaborate on the proposed land use designations and policies to promote their role in realizing a more sustainable Guam. Table xx summarizes the proposed permitted and conditional uses in each land use designation and corresponding zone.

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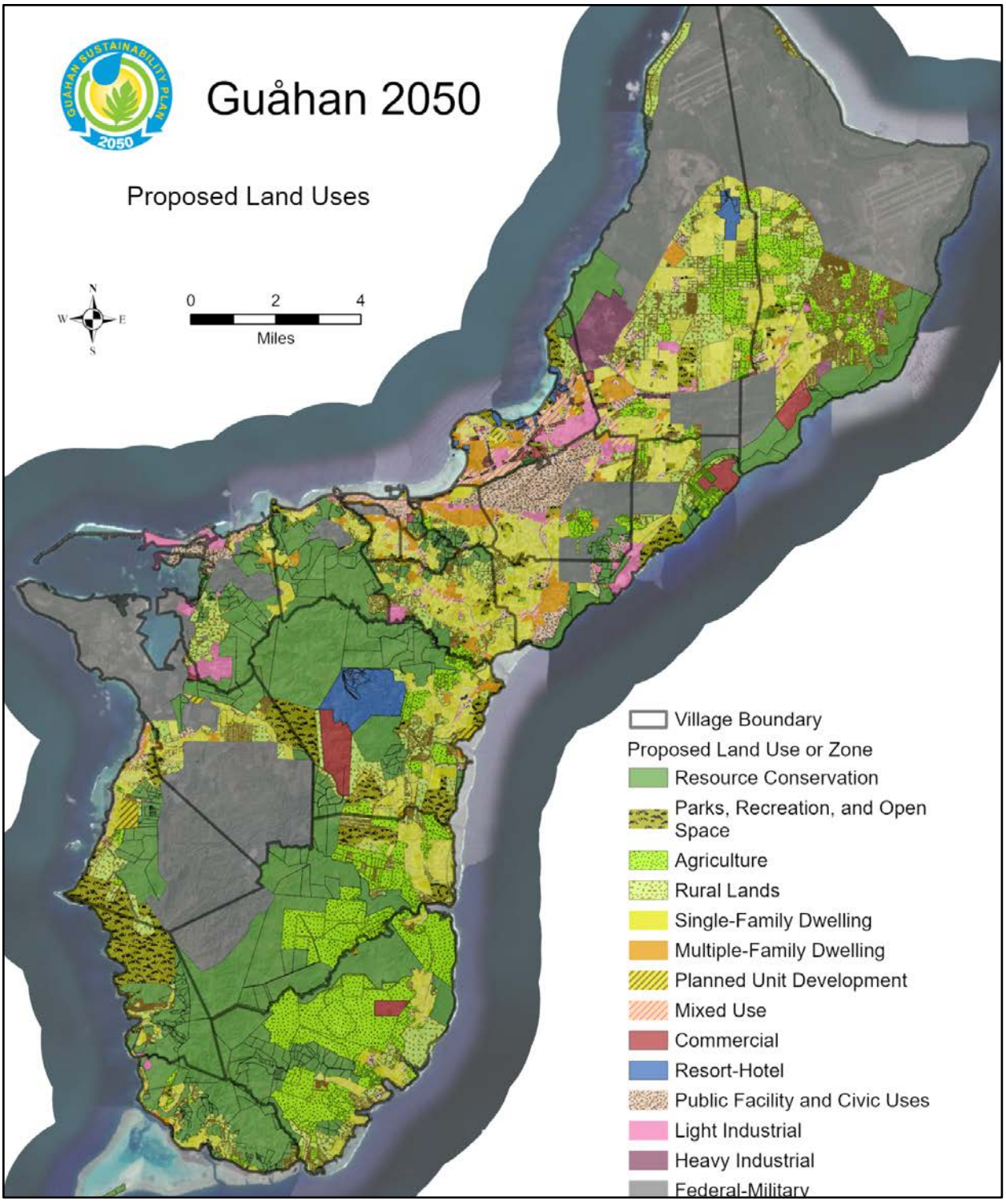

Figure 3-4. G50SP Land Use Designations for Guam.

Table 3-3. SC-1 Island Land Use Designations (see Proposed LU Designation Map).

Land Use	Permitted Uses	Conditional Uses
Land Use	**Permitted Uses**	**Conditional Uses**
R-1 Single-Family Dwelling Minimum lot size: 5,000 sq. ft	1. Single-family dwellings, with minimum lot size of 5,000 sq. ft. 2. Gardening and the keeping of domesticated animals for noncommercial purposes. 3. Uses customarily accessory to any of the above uses, including home occupations and private parking areas with accessory buildings and structures 4. Accessory dwelling units	1. Duplexes. 2. Schools and churches. 3. Parks, playgrounds, and community centers. 4. Health service office, outpatient with laboratory. 5. Utilities and public facilities.
R-2 Multi-Family Dwelling Residential zoning for multifamily housing at density up to 30 units per acre	1. Single-family dwellings. 2. Duplexes 3. Multi-family dwellings (maximum of 30 units/acre) 4. Hotels, private groups and institutions 5. Gardening and the keeping of domesticated animals for noncommercial purposes. 6. Accessory uses and structures for the above	1. Any conditional uses permitted in the “R-1” zone 2. Health clinics 3. Utilities and public facilities 4. Air, bus, taxi, auto, rental terminals 5. Accessory uses and structures for the above 6. Temporary workforce housing
MU Mixed Use C/R-2	1. R-2 permitted uses: Single-family dwellings, Duplexes, Multi-family dwellings, Hotels, private groups and institutions, Accessory uses and structures for the above 2. C permitted uses: Wholesale and retail stores, shops and businesses, Amusement enterprises, Limited automobile service stations, including minor repairs, Offices, business or professional, inclusive	Conditional Uses 1. Schools and churches 2. Parks, playgrounds, and community centers 3. Health service office, outpatient with laboratory. 4. Utilities and public facilities 5. Hospital 6. Shopping Centers 7. Hotels, Motels, Tourist Infrastructure 8. Temporary workforce housing

Land Use	Permitted Uses	Conditional Uses
	of professional healing arts offices and clinics and banks, Personal service shops, Repair shops, Restaurants and cafes, Studios	
PUD Planned Unit Development	1. Single and multi-family residential uses (R-1, R-2) 2. Temporary workforce housing 3. Mixed commercial-residential uses 4. Public facilities and Civic uses (community centers, recreational facilities, etc.)	• Small-scale commercial uses compatible with planned residential development • Small scale Agricultural uses • M-1 uses • RC uses
VC Village Center	• Compatible mix of residential, commercial, public facility, medical and other service uses, and open space uses at a scale and pattern that is consistent with traditional CHamoru villages and neighborhoods - R-1, R-2 - PF, PR - MU, C	• No conditional uses in this zone - targeted as an overlay
C Commercial	1. Wholesale and retail stores, shops and businesses 2. Amusement enterprises 3. Automobile service stations, including minor repairs 4. Bakeries 5. Mortuaries 6. Offices, business or professional, inclusive of professional healing arts 7. Offices and clinics and banks 8. Personal service shops, including barber shops, beauty parlors, laundromats, and the like 9. Repair shops and service shops, including shoe repair shops, plumbing	1. Hospital. 2. Public utility and other public buildings 3. Shopping center 4. Recreation, including amusement centers, drive-in theaters 5. Multi-family residences 6. Hotels, motels, tourist accommodations 7. Air, bus, taxi, auto rental terminals 8. Auto sales and car wash 9. Parking garage and lots 10. Service vehicle storage 11. Laundries and cleaning and dyeing establishments. 12. Schools and churches 13. Parks, playgrounds, community centers. 14. Utilities and public facilities

Land Use	Permitted Uses	Conditional Uses
	shops, dressmaking shops, and the like, but not including automobile repair shops for major work 10. Restaurants and cafes 11. Studios 12. Other uses which, in the judgment of the Commission as evidenced by resolution in writing, are similar to those listed herein 13. Uses customarily accessory to any of the above listed uses, including only those accessories to manufacturing, storage, compounding, or processing activities which are necessary for the ordinary conduct of said listed uses and which are an integral part thereof 14. Accessory structures for the above	15. Accessory uses and structures for the above.
H Resort- Hotel Zone	1. Cultural and recreational facilities, hotels, restaurants, tourism related shops, and offices, dwellings, parks, marinas, zoos, amusement activities and supportive service 2. Permitted Accessory uses and structures. Uses and structures which are customarily accessory and clearly complementary to permitted principle uses and structures shall be permitted. Service stations shall be permitted only within, and as accessory to parking garages containing two hundred fifty (250) or more parking spaces.	• "H" - Resort Hotel Zone • There are no conditional uses in this zone
PF Public Facility and Civic Uses	• Schools, police stations, fire stations, community centers, historic and	• Single family and multi-unit residential uses and structures (R-1, R-2)

Land Use	Permitted Uses	Conditional Uses
	cultural sites, recreation centers and sports fields, senior citizen centers, public health centers, libraries, government buildings and other related facilities • Non-industrial/commercial boat access and public marinas	• All PR uses (Parks, Recreation, Open/Green Space), including large open spaces or green corridors designated for public uses
M-1 Light Industrial	1. Any use permitted with or without condition in the commercial zone. 2. The manufacturing, compounding, processing or treating of such products as drugs, cosmetics, and food products (not including fish and meat products nor the rendering of fats and oils) 3. The manufacturing, compound, assembling or treating of articles or merchandise from previously prepared materials 4. Automobile repair shops including painting, body and fender work, and rebuilding; truck and tractor repairing; and tire retreading 5. Bottling and packaging plants 6. Ceramic products manufacturing 7. Laundries and cleaning and dyeing establishments 8. Machine shops and sheet metal shops 9. Warehouses and cold storage plants 10. Lumber yards, building material sales yards, contractor's equipment storage yards, and the like 11. Other uses which, in the judgment of the Commission as evidenced	1. Other industrial uses not objectionable, obnoxious or offensive by reason of odor, dust, smoke, noise, gas fumes, cinders, vibration, flashing lights, or water-carried waste 2. Utilities and public facilities 3. Accessory uses and building for the above. 4. Temporary Workforce Housing

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Land Use	Permitted Uses	Conditional Uses
	by resolution in writing, are similar to those listed herein 12. Uses customarily accessory to any of the above listed and accessory buildings	
M-2 Heavy Industrial	1. Any uses permitted in the "M-1" zone, except residential use 2. Junk yards, under the special provisions set forth in Chapter X of Title XVIII, Government Code of Guam 3. Any other uses not specifically prohibited by law, including those which are or may be objectionable, obnoxious, or offensive by reason of odor, dust, smoke, noise, gas fumes, cinders, vibrations, or water-carried waste 4. Uses customarily accessory to any of the uses herein permitted, and accessory buildings and structures	1. All residential uses 2. Accessory uses and structures for the above
RL Rural Lands	1. One-family dwellings and duplexes 2. Farming and fisheries, including all types of activities and pursuits customarily carried on in the field of agriculture and fisheries including the raising of crops and fruits, poultry and livestock, grazing and dairying, and tree and other vegetative production, whether for commercial or personal uses. 3. Uses customarily accessory to any of the above uses, including home occupations and private automobile parking	1. Parks, playgrounds and community centers. 2. Biological gardens. 3. Schools and churches. 4. Hospitals, sanitariums, and institutional uses. 5. Cemeteries. 6. Recreational uses including golf courses, cockpits, marinas, beaches, swimming pools, and accessory residential and commercial uses. 7. Extractive industry. 8. Utilities and public facilities. 9. Wholesale and retail stores, shops and businesses. 10. Automobile service stations, including service shops.

Land Use	Permitted Uses	Conditional Uses
	areas as well as accessory buildings and structures such as private garages, warehouses, barns, corrals, or other similar structures.	11. Accessory uses and structures for the above.
A Agriculture AG-1 (Prime). Agricultural lands with soils that meet the requirements for prime farmland when irrigated (Units 27, 39, 48, 50). AG-2 (non-Prime). Lands suitable for agriculture Minimum Lot Sizes: • 10,000 square feet with public sewer connection • 19,200 square feet without public sewer connection only 9,600 square feet if located over the Northern Guam Lens Aquifer with public	1. Uses include subsistence and commercial farming and accessory uses normally associated with farming 2. One-family dwellings and duplexes. 3. Farming and fisheries, including all types of activities and pursuits customarily carried on in the field of agriculture and fisheries including the raising of crops and fruits, poultry and livestock, grazing and dairying, and tree and other vegetative production, whether for commercial or personal uses 4. Both subsistence and commercial farming 5. Accessory uses associated with small-scale commercial agricultural production	All rural land uses
PR Parks and Recreation; Open Space and Green Space		
Public and private lands for recreational use and open space.	-	
RC Resource Conservation Sensitive natural lands and waters to be conserved in perpetuity.	-	
F Military/Federal	• Uses critical to the operations of the U.S. Department of Defense	No conditional uses in this category

Land Use	Permitted Uses	Conditional Uses
	• RC uses under direct management and stewardship of federal agencies (USFWS) • PR uses under direct management and stewardship of federal agencies (National Park Service)	

3.2.7. Community Land Use Policies and Sustainability

The G50SP emphasis on concentrating urban development in existing developed areas while protecting rural and sensitive lands directly aligns with the United Nations Sustainable Development Goal 11: Sustainable Cities and Communities. This approach promotes sustainable urbanization by directing growth into well-planned, infrastructure-supported urban areas, thereby reducing urban sprawl, minimizing environmental degradation, and enhancing resilience to climate change.

The policies below also support specific targets of SDG 11. Compact, mixed-use urban development fosters affordable and accessible housing (SDG 11.1) and improves public transportation and walkability (SDG 11.2), contributing to healthier, more inclusive communities. Protecting rural and ecologically sensitive lands supports SDG 11.4, which calls for safeguarding cultural and natural heritage, and SDG 11.6, which focuses on reducing the environmental impact of cities, including air quality and waste management. Overall, by prioritizing smart growth strategies, the comprehensive land use planning approach of G50SP will help create livable, efficient, and sustainable urban centers while preserving biodiversity and ensuring the responsible management of Guam's natural resources.

Sustainable Community Land Use Policies

SC-1. Balanced Development Zones.

Designate specific zones for commercial, residential, agricultural, and industrial development to balance economic growth with environmental preservation. Assure that new development is consistent with designated land uses, densities, and other requirements of the G50SP.

SC-2. Urban-Rural Boundary.

Maintain an urban-rural boundary to distinguish areas with adequate public services (water, sewer, roads, power, communications) that are appropriate for concentrating new

urban development from more rural, agricultural, and sensitive resource areas not suitable for urban densities.

SC-3. Concentration of Development and Redevelopment.
New development shall be directed to designated urban areas with adequate public services (water, sewer, roads, power, communications) able to accommodate it. Designate urban areas as redevelopment zones. Prioritize redevelopment opportunities over intensive development outside urban areas.

SC-4. Compact Walkable Communities.
Promote high density residential and commercial development patterns that support walkable, vibrant communities. Encourage mixed-use development in urban centers to reduce land consumption and promote walkability.

SC-5. Village Centers.
Prioritize a diverse mix of residential, commercial, and community facilities development in compact village centers, sensitive to the cultural landscapes, designs, and scales of each village, and consistent with policies VS-1 to VS-8.

SC-6. Transfer of Development to Urban Areas.
Evaluate and if feasible implement a program to facilitate the transfer of development potential from rural agricultural areas to urban areas and support potential creation of a cultural heritage parkway corridor within the Guam Northern Lens Aquifer groundwater protection zone.

3.3. Public Services

3.3.1. Public Services and Sustainable Development

Overview of Public Service Policies

Ensuring that new development in Guam is supported by adequate public services is crucial for achieving sustainability and enhancing the quality of life for its residents. The Guåhan 2050 Sustainability Plan emphasizes the importance of aligning urban development with the availability of essential infrastructure, such as water supply, wastewater systems, roads, power, and communications. By concentrating growth in areas already equipped with these services, Guam can prevent the overextension of resources, protect its natural environment, and foster resilient communities.

Urban Development and Public Services. The plan mandates that new developments in designated urban areas must be served by adequate and sustainable public services prior to occupancy. This includes ensuring a reliable and safe water supply, efficient wastewater connections, accessible roads, dependable power, and modern communication networks. By adhering to this policy, Guam aims to create urban spaces that are both livable and sustainable,

reducing the environmental impact associated with sprawling and unplanned growth. Moreover, appropriately sizing new infrastructure to support planned development prevents unintended growth that could strain resources and disrupt ecological balances.

Protecting the Northern Guam Lens Aquifer. A significant aspect of Guam's sustainability efforts involves safeguarding the *Northern Guam Lens Aquifer*, the island's primary source of fresh drinking water. The plan prohibits the subdivision of parcels over the aquifer that are not served by public wastewater systems. This measure is designed to prevent contamination of the aquifer from inadequate septic systems, ensuring the long-term viability of Guam's freshwater resources. By enforcing stringent wastewater management practices in these sensitive areas, Guam demonstrates a commitment to preserving its natural resources for future generations.

Sustainable Water and Wastewater Management. The sustainability plan also emphasizes that groundwater withdrawals should not exceed the aquifer's sustainable yield, aligning water usage with natural replenishment rates. New developments are required to have access to adequate public water supplies or, in rural areas, sustainable and safe water sources. Wastewater infrastructure must be designed to accommodate planned, sustainable growth without inducing unsanctioned expansion. These policies ensure that water and wastewater systems are capable of supporting current and future populations without compromising environmental integrity.

Transportation Infrastructure and Multi-Modal Connectivity. Adequate transportation infrastructure is vital for the functionality of urban areas. The plan stipulates that new developments must be accessible via public roadways that meet federal standards and support multi-modal transportation options, including automobiles, bicycles, and pedestrian pathways. By promoting diverse transportation modes, Guam aims to reduce traffic congestion, lower greenhouse gas emissions, and enhance public health. Additionally, integrating public transit systems and rideshare programs into new developments encourages residents to utilize alternative transportation, further contributing to sustainability goals.

Stormwater Management and Environmental Protection. Effective stormwater management is essential to prevent flooding and protect water quality. The sustainability plan requires that new developments incorporate adequate stormwater detention, treatment, and conveyance systems, adhering to best management practices outlined in the *CNMI and Guam Stormwater Management Manual.* Properly designed stormwater facilities mitigate the risks associated with peak storm events, safeguard natural habitats, recharge the aquifer, and maintain the health of aquatic ecosystems. Flood hazard policies also direct the consideration of programs to remove or relocate existing development in flood hazard areas that may exacerbate existing flooding problems (see SC-83 and SC-90).

Renewable Energy and Sustainable Power Supply. Transitioning to sustainable energy sources is a cornerstone of Guam's long-term sustainability strategy. The plan advocates for the prioritization of non-fossil fuel energy developments, aiming to achieve 100% affordable,

resilient, and equitable renewable energy for Guam by 2045, in line with existing law.[5] This includes supporting rooftop solar installations on residential, commercial, and industrial buildings to minimize impacts on undeveloped areas and enhance energy grid resilience. By investing in renewable energy infrastructure, Guam reduces its dependence on imported fuels, decreases greenhouse gas emissions, and promotes energy security.

Modernizing Communication Infrastructure. In the digital age, robust communication networks are indispensable. The sustainability plan requires that new developments are equipped with state-of-the-art telecommunications, including equitable access to advanced transmission technologies. Where feasible, communication infrastructure should be installed underground or utilize wireless technologies to preserve Guam's scenic character and reduce vulnerability to environmental hazards. Co-locating and consolidating telecommunication facilities further minimizes visual impacts and optimizes land use.

In summary, the Guåhan 2050 Sustainability Plan outlines comprehensive policies that integrate urban development with the provision of adequate public services, environmental stewardship, and community well-being. By ensuring that new developments are supported by sustainable infrastructure and services, Guam is proactively addressing the challenges of growth while preserving its unique natural and cultural resources for future generations.

3.3.2. Urban Services and Growth Management

Ensuring that new development in Guam is supported by adequate public services is essential for sustainable growth and environmental protection. The Guåhan 2050 Sustainability Plan emphasizes that new developments in designated urban areas must be supported with essential public services—including water supply, wastewater connections, access roads, power, and communications—*prior to occupancy*. This proactive approach ensures that infrastructure keeps pace with development, preventing resource strain and maintaining quality of life for residents. Moreover, by sizing new public service infrastructure to support planned development, the plan aims to prevent unplanned or induced growth that could conflict with sustainability objectives.

[5] For example, Guam Code Annotated §8311.

An important element of the plan is the protection of Guam's freshwater resources, particularly the Northern Guam Lens Aquifer (NGLA), which serves as the island's principal source of fresh drinking water, supplying approximately 80% of the island's potable water. To ensure sustainable development while safeguarding the NGLA, the plan mandates that new subdivisions and habitable development over the aquifer be connected to public sewer systems or comply with EPA septic discharge requirements, as stipulated in Public Law 37-105 and implemented by Guam EPA. These policies work to prevent contamination of the aquifer through inadequate wastewater management systems, reinforcing the importance of infrastructure planning to protect Guam's water supply. The plan also includes a policy to potentially incentivize the transfer of development potential away from more rural and agricultural areas over the aquifer to existing urban areas better able to accommodate it, including with public services (Figure 3-5 and Appendix xx). This vision is to gradually connect rural and agricultural lands to create a continuous parkway cutting across northern Guam that could protect agriculture, conserve open lands, and promote cultural heritage and habitat restoration. This idea is consistent with prior iterations of land use planning beginning with the Territorial Plan of 1965, continued in mostly conservation zoning in 1978, followed by parks and recreation zoning in the 2009 North and Central Land Use Plan.

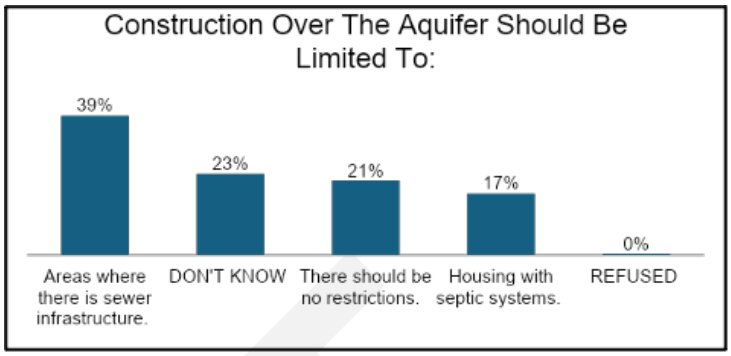

Figure 3-5. Public Agreement with Construction Restriction Types Over the Aquifer

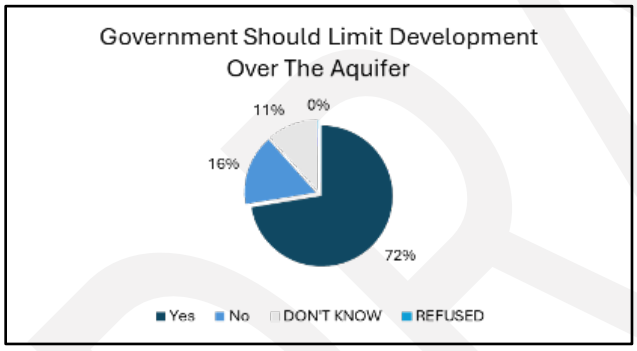

Figure 3-6. Public Agreement with Development Over the Aquifer

Public sentiment strongly supports limiting development over the aquifer. According to the G50SP Community Engagement Survey, nearly 72% of respondents agreed that development over the aquifer should be restricted (Figure 3-6). Notably, nearly 4 in 10 supported limiting new construction to areas with sewer connections. Another 17% supported the current regulation allowing construction with septic systems over the aquifer. A segment of the population expressed reservations, with 21% opposing restrictions while 23% remaining unsure. The survey underscores the need for continued public engagement and careful policy implementation to ensure protection of water resources and while maintaining public support for the protection of the NGLA.

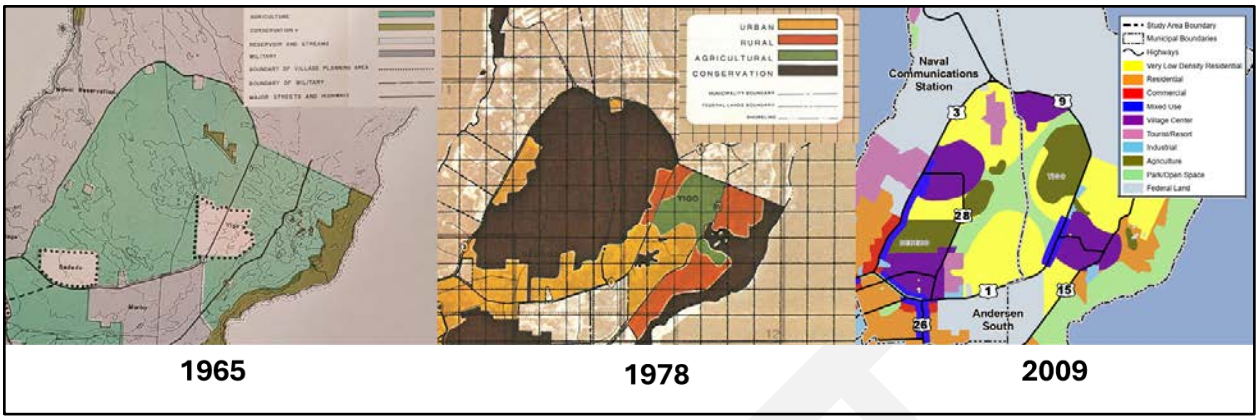

Figure 3-5. Conservation Land Use Over the NGLA in Previous Guam Development Plans.

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Figure 3-6. Parks and Open Space Corridor.

3.3.3. Water Supply

3.3.3.1. Supply and Capacity

The Guam Waterworks Authority (GWA) supplies water to the majority of Guam's residents.[6] About 80% of Guam's freshwater supply comes from the Northern Guam Lens Aquifer (NGLA). As shown in Figure xx, the majority of GWA's wells are in the NGLA with 2 production wells located in the south. Other sources of water operated by GWA include the Ugum Surface Water Treatment Plant and Santa Rita Springs. Fena Lake, which is operated by NAVFAC Marianas (NAVFACMAR) is a water source for military bases.

Water is delivered throughout the island to its customers through GWA's piping system of approximately 586 miles of pipeline ranging from 2 to 24 inches in diameter. As of 2023, GWA delivered water to about 43,650 customers producing about 85% of the total freshwater supply on Guam.[7] The remaining 15% is supplied by the Navy Water System, which through a 1982 Memorandum of Agreement (MOA), allows GWA to purchase up to 4.39 million gallons a day (mgd) from the Navy Water System.

GWA's northern and southern wells are estimated to produce about 44.79 mgd and surface water sources are estimated to produce about 4.1 mgd. NAVFACMAR's Fena Lake has a capacity to produce a max of 13.5 mgd.

Gaum's average daily demand (ADD) for water calculated for the year 2016 was 38.65 mgd and the maximum daily demand (MDD) was 43.06 mgd (Brown and Caldwell, 2018).

According to the U.S. Census, in 2020 Guam's population was 153,836. With the military buildup, though, Guam's population is expected to grow substantially by 2037 with perhaps close to 35,000 military-related persons (Guam Legislature, 2025). Overall population on Guam could be around 200,581, driving ADD for water to 46.18 mgd and MDD of 52.07 mgd (Brown and Caldwell, 2018). The sustainable yield of the NGLA is

[6] Guam Waterworks Authority is a public authority governed by the Consolidated Commission on Utilities (CCU). The Authority also is subject to regulation by the Guam Public Utilities Commission (PUC). GWA provides water to all of the civilian population of Guam. They also provide sewer service to a large percentage of the civilian population, Andersen Air Force Base and several United States Navy facilities.
[7] During FY2023, GWA served more than 43,650 water customers and 30,750 wastewater customers. (GWA Citizen Centric Report, FY2023.

80 mgd (Mink, 1991). Though this increase in demand is well within the estimated sustainable yield of the NGLA, it does indicate significantly expanding demands of the water delivery system. So, while it appears that the aquifer has enough water to provide for the population in 2035, GWA's current infrastructure is incapable of meeting the water demand. Currently, GWA makes up the deficiency by purchasing water from the Navy. For GWA to reduce its reliance on this purchasing, it would need to provide new production wells and address its water losses due to leaks, as well as aging storage systems and water tanks. The 2018 Water Master Plan summarized the major concern of "non-revenue water":

> *The overall condition of equipment in the water system varies depending primarily on its age. The condition of some production wells and booster pump stations is poor, with significant corrosion evident in some areas. In addition, non-revenue water (NRW) represents one of the most significant issues facing GWA. NRW is defined by the American Waterworks Association (AWWA) as "unbilled authorized consumption (water for firefighting, flushing, etc.) plus apparent losses (customer meter inaccuracies, unauthorized consumption and systematic data handling errors) plus real losses (system leakage and storage tank overflows)" (American Water Works Association (AWWA), 2012). Aging water storage tanks and dividing the water system into appropriate pressure zones are also an issue. GWA is in the process of repairing or replacing storage tanks with the program anticipated to be complete in 2021. A program to properly separate the GWA water system into pressure zones is also in progress*. (Brown and Caldwell, 2018).

In interviews conducted with local mayors, infrastructure challenges, particularly concerning water, were frequently mentioned. One pointed out that "low water pressure in some areas of the village" remains an issue and emphasized the need for infrastructure improvements to meet basic needs such as water for residents who lack these utilities such as those along Route 15. Constituents in the southern villages of Guam identified inadequate infrastructure development as a significant hurdle, with water issues being most frequently mentioned. Notably, residents in certain subdivisions were said to be restricted by the cost of upgrading water infrastructure, such as a $5,000 fee to connect to a 6-inch water pipe for example. "Disparities in water pressure and frequent leaks" was another comment made by the mayors. The aging infrastructure in areas such as Nimitz Hill was cited as an example.

As shown in Figures 3-9 and 3-10, survey responses from residents who attended the G50SP Workshops also emphasized the importance of addressing infrastructure issues. During workshop engagement activities, residents conveyed the need for greater protection of water resources and improved access to water services. The comment highlighted the community's concern over sustainable growth due to the inadequacy of water supply and capacity.

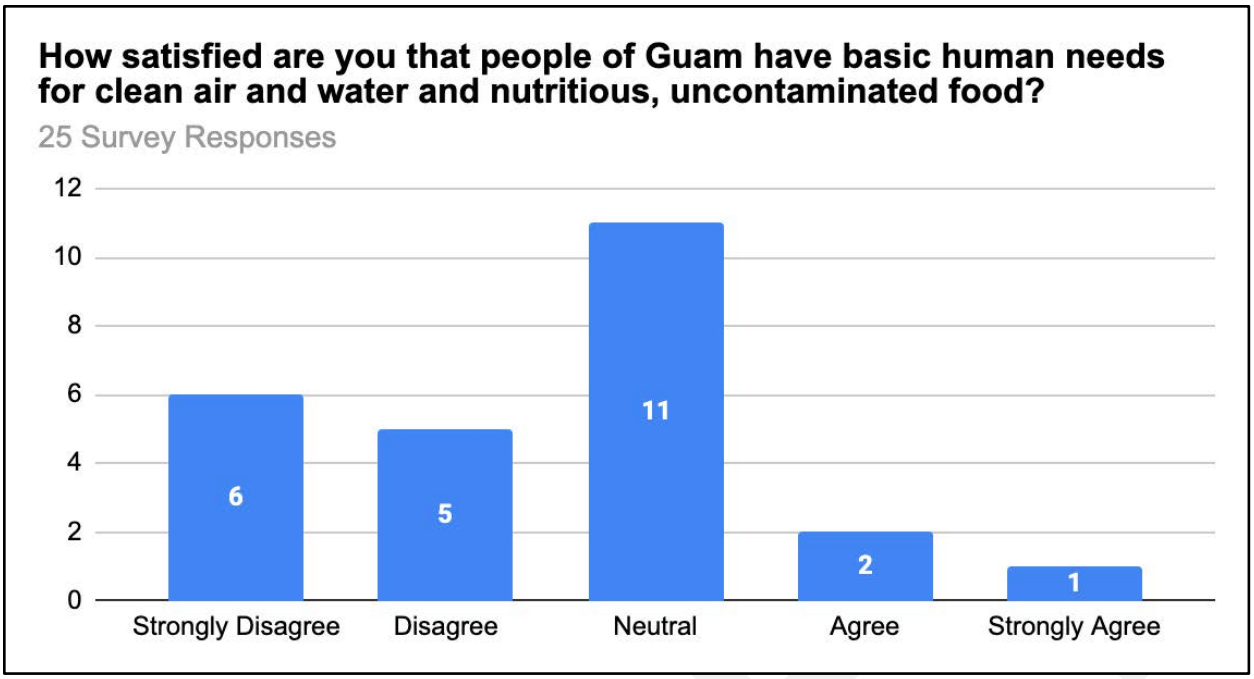

Figure 3-7. Public Satisfaction with Basic Human Needs

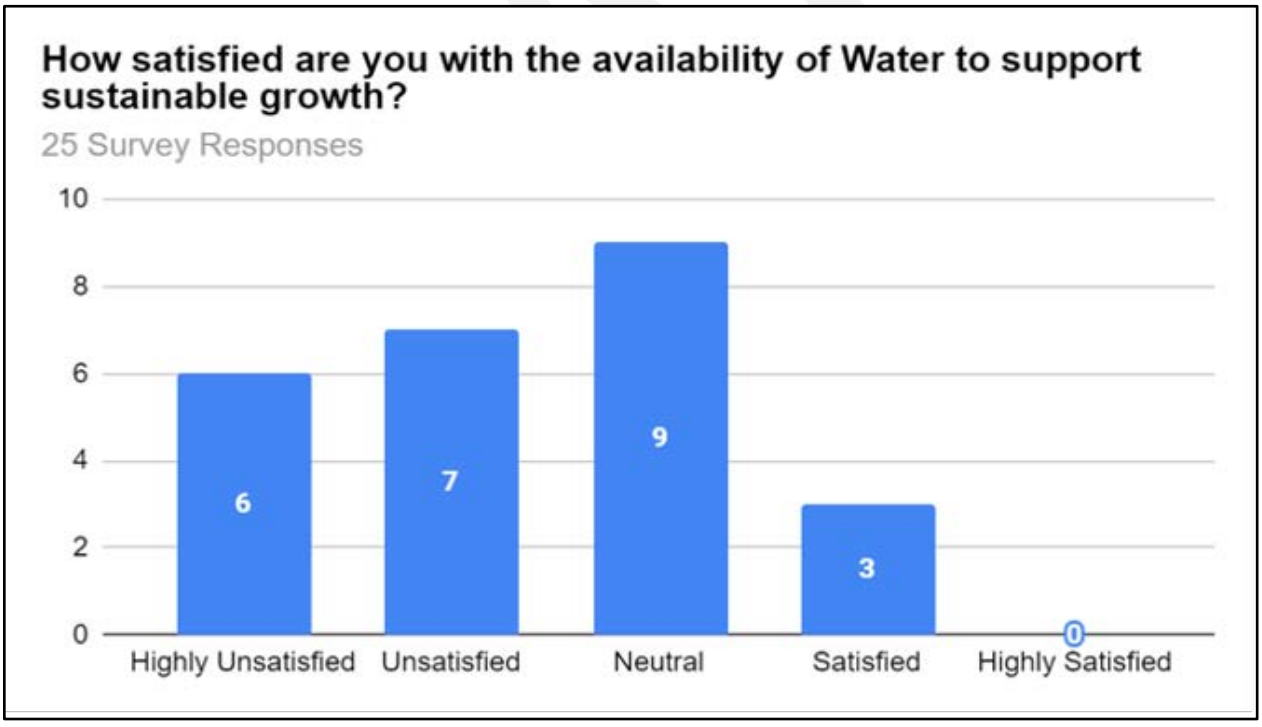

Figure 3-8. Public Satisfaction with Water Supply.

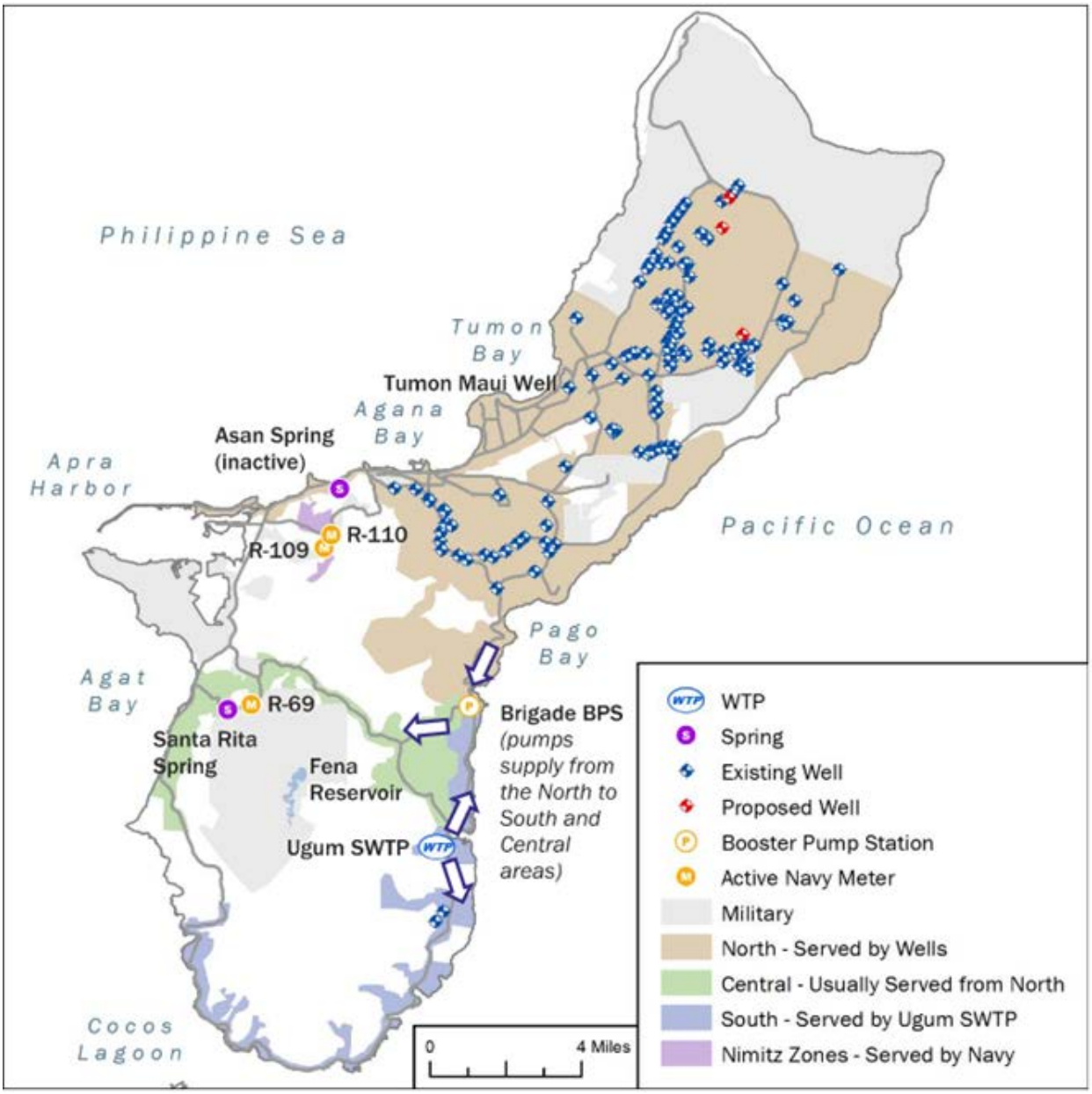

Figure 3-9. Water System Supply Map (Brown and Caldwell, 2018).

3.3.3.2. Threats to Water Sources

Guam's water supply, including the Northern Guam Lens Aquifer, is threatened by a range of contaminants—both legacy and emerging—that pose serious risks to public health, environmental integrity, and long-term water security.

Rising Chloride Concentrations

One of the most persistent indicators of aquifer stress is the steady increase in chloride concentrations observed in production wells across the NGLA. Between 1973 and 2010,

chloride levels rose in 118 of 153 monitored wells. This trend suggests saltwater intrusion, likely exacerbated by over-pumping, sea level rise, and reduced aquifer recharge due to impervious surface expansion. Elevated chloride levels not only degrade water quality but also signal the potential for irreversible salinization of the aquifer if extraction exceeds sustainable yield (GWRMP Vol. 1, 5-16).

Nitrate Contamination from Unsewered Development

Another major concern is nitrate-nitrogen contamination, primarily from unsewered properties that rely on septic systems. Inadequately treated wastewater from these systems can percolate through the porous limestone geology of northern Guam, introducing nitrates into the aquifer. Elevated nitrate levels are associated with serious health risks, including methemoglobinemia (blue baby syndrome). As development continues over the NGLA, the expansion of sewer infrastructure and enforcement of wastewater regulations are essential to prevent further degradation (GWRMP Vol. 1, 5-21).

Legacy Contaminants: Dieldrin

Dieldrin, a banned pesticide, has been detected in soils and groundwater in parts of Guam. Though its use was discontinued decades ago, its persistence in the environment continues to pose a threat to groundwater quality. Dieldrin is classified as a probable human carcinogen. Its presence in the aquifer—even at trace levels—underscores the importance of monitoring legacy contaminants and remediating contaminated sites, particularly near drinking water wells (EPA, 2024).

Emerging Contaminants: PFAS

Per- and polyfluoroalkyl substances (PFAS), often referred to as “forever chemicals,” represent a growing concern for the NGLA. These synthetic compounds, used in firefighting foams, industrial processes, and consumer products, are highly persistent and have been linked to a range of adverse health effects, including cancer, immune system suppression, and developmental issues. PFAS contamination has been detected on Guam, raising concerns about the potential migration of these substances into the aquifer. Given their resistance to conventional water treatment methods, PFAS requires advanced remediation technologies and proactive source control (Guam Hydrologic Survey, 2025).

Military Expansion and Marine Base Relocation

As discussed above, the ongoing military buildup and the relocation of Marine Corps forces to Guam also poses risks to the aquifer. As detailed in the 2013 Environmental Impact Statement (EIS) for the buildup and the Guam Forest Action Plan (2021), the projected population increase will drive up water demand and groundwater extraction. Additionally, the establishment of firing ranges and ammunition training areas introduces the risk of lead contamination and other

hazardous substances infiltrating the aquifer. Large-scale land clearing, particularly of Guam's limestone forests, further threatens aquifer recharge by removing vegetation that facilitates infiltration and stabilizes soil. These combined pressures highlight the urgent need for integrated land and water resource planning to safeguard the island's primary freshwater source.

3.3.3.3. The Guam Water Authority Water Resource Master Plan

Land use development must take into consideration its effects on the freshwater supply. Development can alter the existing land surface and limit the amount of precipitation that reaches the aquifer. Pollutants making their way into the freshwater supply must be mitigated as well to limit the required treatment and to keep more wells on-line. The island's land use plan should take into consideration the projected population growth, while also understanding the possible effects of development on the availability and quality of water supply.

The GWA 2018 Water Resource Master Plan (WRMP) outlines a 20-year roadmap for sustainable water management and provides policies, programs, and recommended capital improvement projects to help increase Guam's water supply to meet the anticipated demand. The plan specifically assesses the increased demands on Guam's infrastructure from the military buildup, including water supply. The G50SP recognizes the GWA master planning efforts, summarized below, and supports them through its more general land use policies SC-11 to SC-14 presented later in this chapter. This includes land use policies to protect the NGLA (including through coordination with the CHamoru Land Trust (CLT)), assure sustainable water supply systems, manage growth, and protect environmental resources in the watershed, such as sensitive limestone forests (see Chapter 5).

Key policy recommendations of the GWA 2018 Water Resource Master Plan include:

- **Ensure Sustainable Use of the NGLA**
    - Develop policies based on supply-demand ratios and integrate economic and sustainability considerations in future expansions.
    - Continue backing NGLA monitoring efforts by the Water and Environmental Research Institute (WERI) and the United States Geological Survey (USGS). Expand groundwater modeling capabilities to analyze maximum demand withdrawal scenarios.
- **Reduce Water Losses**
    - Reduce wasteful water losses before expanding supply through meter replacement, overflow reduction, leak detection repair, and deteriorated infrastructure replacement.
- **Enhance System Resiliency**
    - Implement programs to adjust/reduce pumping during droughts and optimize source water quality using both DoD and GWA sources.
    - Develop contingency operational plans and wellhead protection plans.

    - Southern Guam sources: Explore new water resource options, such as private wells, rehabilitate the Asan Spring, and rehabilitate inoperable wells.
- **Protect Water Quality**
    - Expand sewer lines and connect unsewered areas to reduce contamination risks. Engage the CHamoru Land Trust (CLT) early in planning to ensure easements for new utilities exist. Inform CLT lessees of costs associated with installing new utilities on their properties. Connect GWA with the Mayors Council of Guam to identify all homes not connected to the sewer system. Propose policy changes to address the financing burdens for existing homeowners not currently connected to the sewer system.
    - Enforce the law that new construction install the required advanced nitrogen-reducing septic systems for pocket areas with no public sewer systems. Enforce the law that requires existing properties to connect to the sewer system if they are within 200 feet of the system. Develop a map of older, existing properties that are on septic systems and are not within 200 feet of sewer for policy makers to evaluate.
    - Strengthen enforcement of the existing Wellhead Protection Program regulations and develop contingency plans for both groundwater and surface water supply.
    - Support and expand data collection efforts of the NGLA to aid in policymaking.
    - Southern Guam System: Develop policies related to Ugum for surface water intake improvements, watershed protection from contaminants, and contingency planning for when the treatment plant is offline.
    - Northern Guam System: Engage CHamoru Land Trust (CLT), Department of Land Management (DLM), and neighboring developers at the planning stage to ensure that easements and land exists for utility infrastructure and to allow neighboring landowners to connect to new sewer systems.
    - Additional Green Spaces: Develop parks, open spaces, and reestablish native forests for watershed protection and water quality improvement. (Guam Forest Action Plan 2020-2030).
- **Maintain a Designated Supply-to-Demand Ratio**
    - Develop and maintain a 1.2 supply: demand factor. The excess supply ensures that GWA can provide water to its customers in case of an emergency or source water interruption.
    - Develop new wells as laid out by Vann et al (2013), as cited in Brown and Caldwell (2018), Vol. 1. Rehabilitate existing wells to further increase the supply ratio
    - Southern Guam Supply: Develop policy that improves service reliability and redundancy, such as more water tanks in southern villages.
- **Integrate Civilian and Military Systems**
    - Have a One Guam approach, and combine DoD and GWA infrastructure to optimize source water quality during regular operations and drought conditions.

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The Guam Water Master Plan

Guam's Water Future: Key Challenges and Recommendations

The 2016 Water Resources Master Plan Update by the Guam Waterworks Authority (GWA) outlines a 20-year roadmap (2018-2037) to improve Guam's water and wastewater systems. It responds to regulatory requirements, aging infrastructure, and future demand driven by population growth and military buildup.

Major Challenges

- Aging Infrastructure: Many wells, tanks, pipelines, and pump stations require rehabilitation or replacement.
- Non-Revenue Water (NRW): Water loss from leaks, faulty meters, and unbilled use remains high.
- Vulnerable Water Supply: Guam depends heavily on the Northern Guam Lens Aquifer (NGLA), which is threatened by contamination and overuse.
- Wastewater Compliance Needs: Several wastewater treatment plants (WWTPs) require upgrades to meet federal discharge standards.
- Growth Pressures: Planned developments and population increases from the military relocation demand system expansion.

Key Recommendations

- Protect and Manage Source Water: Implement wellhead protection policies, expand NGLA monitoring, and develop alternative supply options in the south.
- Upgrade Infrastructure: Replace degraded pipes, storage tanks, booster stations, and fire hydrants; expand leak detection and smart metering.
- Improve Wastewater Systems: Complete upgrades at WWTPs, connect septic systems to sewer networks, and reduce sanitary sewer overflows.
- Strengthen Operations: Enhance asset management, GIS, and SCA DA systems for better planning, maintenance, and response.

Plan for Resilience

Coordinate with the Department of Defense through the OneGuam initiative and prioritize climate-resilient investments.

Vision

A safe, sustainable, and efficient water system that meets the long-term needs of Guam's people, economy, and environment.

3.3.4. Wastewater Infrastructure and Capacity

3.3.4.1. Capacity and Demand

GWA also provides wastewater service to the majority of the island's civilian population. It has a network of approximately 320 miles of pipe ranging from 3 to 48 inches in diameter, 82 lift stations, 7 wastewater treatment facilities, and 7 sewer basins. Approximately 26,000 customers are serviced by GWA. Other wastewater systems on the island are the Andersen Airforce Base wastewater system, Naval Base waste water system, Leo Palace Resort Guam wastewater system, and other military areas (Brown and Caldwell, 2018, Vol. 3).

Wastewater collection and treatment systems are essential in protecting the ground, surface, and coastal waters of Guam. Wastewater collection systems collect and transport wastewater from the source to the wastewater treatment plant where it can get treated and harmful pollutants can be removed before final discharge.

Guam's 2018 Water Resource Management Plan projects the population to increase to 200,581 by 2035 from 153,836 in 2020. The projected increase in average daily flow is shown in Figure xx. Collectively, GWA's wastewater treatment facilities have a design capacity for an average daily flow of 25.96 mgd, which is greater than the projected 2035 average daily flow of 17.36 mgd. The management plan estimates that direct and indirect wastewater flows specifically attributed to the military build-up represent a 36 percent increase from the 2015 baseline (Brown and Caldwell).

Table 3-3. Flow Summary

Region	Basin	2015–2016 Average Billing Data (mgd)	Existing Average Daily Flow (2015) (mgd)	Future Average Daily Flow (2035) (mgd)
North	Northern District	3.19	3.75	4.33
North	Tumon	2.00	1.99	2.82
Central	Hagåtña	4.64	7.59	8.92
South	Agat-Santa Rita	0.45	0.47	0.58
South	Baza Gardens	0.09	0.21	0.28
South	Inarajan	0.06	0.12	0.14
South	Umatac-Merizo	0.10	0.24	0.28
Total		**10.54**	**14.38**	**17.36**

Figure 3-10. Existing and Future Wastewater Flow Summary (Brown and Caldwell, 2018).

3.3.4.2. Infrastructure Improvements

GWA has been actively working to address wastewater infrastructure over the last 15 years. In November 2011, U.S. EPA issued a court order that established deadlines for required GWA infrastructure improvements for several wastewater treatment plants to meet the requirements of their respective National Pollutant Discharge Elimination System (NPDES) permits. There

were also several improvements required for the lift station, gravity piping, and force main rehabilitation. A Sewer System Evaluation Study (SSES) was also mandated by the court order. As of 2025, GWA had completed most of the wastewater treatment plant improvement projects and was actively working on projects to address the remaining infrastructure improvement projects.

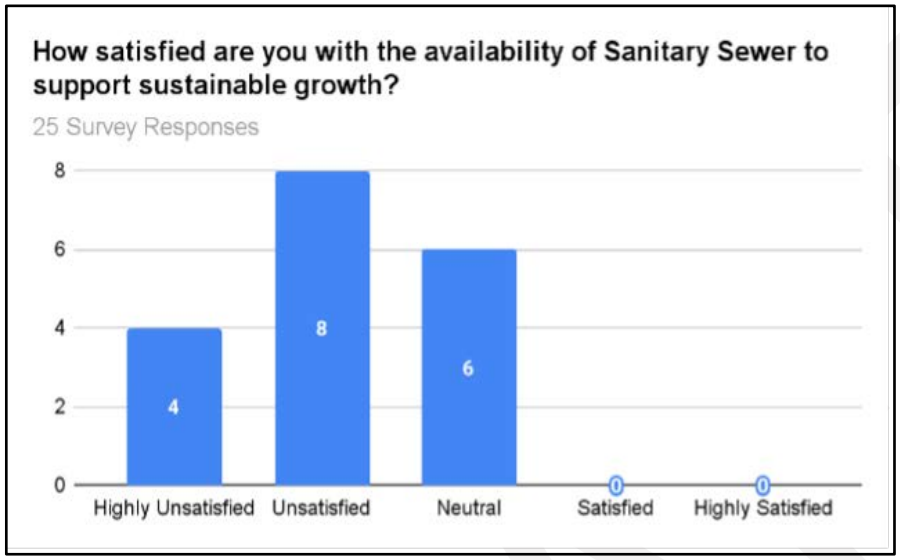

Figure 3-11. Public Satisfaction with Sewer Services

Resident feedback from the G50SP Workshops further emphasized the critical need for sewer infrastructure investment. When asked what the most important infrastructure actions to support sustainable growth are, responses highlighted the need for improvements in sewer, water, and electricity services. Also, the installation of sewer and water lines in northern subdivisions such as Zero Down, Gil Baza, and Gil Breeze were mentioned. Overall, the most frequent concern was the availability of sewer services to support sustainable growth (see Figure 3-13).

Mayor interviews also underscored the importance of ensuring that other infrastructure, such as roadways, is not damaged during water and wastewater improvement projects, highlighting the need for a coordinated infrastructure approach that not only improves wastewater systems but also minimizes unintended consequences of improving roadways and other essential services.

Coordination with the Villages and mayors is also important to continue moving existing development located over the NGLA onto wastewater systems. Current law requires existing development to hook up to the public sewer if within 200 feet of the system. The GWA should coordinate with local community members to identify those residential homes and areas that may have been built decades ago, without sewer hookups, to determine the feasibility of connecting to the public wastewater system.

3.3.4.3. Wastewater's Effect on Water

The wastewater system directly affects Guam's water resources since a failing wastewater system can contaminate Guam's fresh water sources. Leaking sewer pipes underground can infiltrate down to the aquifer potentially increasing nitrogen-nitrate concentrations. Surging

manholes due to infiltration and inflow (I/I) can also make its way to surface water sources downstream. The wastewater system should minimize possibilities of contamination to freshwater and coastal waters.

The island land use plan must take into consideration the capabilities of the wastewater system, while also accounting for the population growth. Available land should also be considered for possible expansions of the existing wastewater system due to the population growth. Land use development should also be limited in unsewered areas in the NGLA. Sewer infrastructure should be in place prior to development in order to limit the need for septic systems in the NGLA, and existing development on septic currently should be connected to the sewer system if within 200 feet of the system as required by law. Finally, although the master plan did not recommend pursuing a biosolids program at the time, future land use plan iterations may need to consider the need for additional land if Guam decides to adopt a management plan for the biosolids from the wastewater treatment plants.

3.3.4.5. The WMP Strategies, Programs, and Actions

The 2018 GWMP recommended multiple strategies and actions for addressing wastewater infrastructure and its potential impacts on water resources. Many of these are complementary of other strategies and policies put forth in this plan, such as requiring watershed best management practices, green infrastructure, and other softer storm water management strategies (see Chapter 5). The WMP strategies and programs included:

- Establish a comprehensive lift station preventative maintenance program to enhance system reliability and reduce emergency repairs.

- Implement a 15-year equipment replacement cycle for major infrastructure at the Baza Gardens Wastewater Treatment Plant to ensure operational efficiency and resilience.
- Develop a long-term flow measurement and monitoring program to assess system capacity and support data-driven planning.
- Initiate 15-year rehabilitation plans for the Agat-Santa Rita, Northern District, and Hagåtña Wastewater Treatment Plants to maintain performance and extend asset life.
- Establish a five-year visual inspection program for the Hagåtña ocean outfall pipe and diffuser to ensure environmental compliance and marine ecosystem protection.
- Develop a sustainable solids management strategy that addresses primary and secondary sludge, explores composting and indirect drying, and aims to upgrade biosolids classification to Class A through policy reform and public engagement.
- Continue and expand Sewer System Evaluation Surveys (SSES) and I/I assessments to reduce excess flow and improve treatment efficiency.
- Maintain and regularly update a sewer system model to support infrastructure planning and climate resilience.
- Establish policies to ensure adequate wastewater service in new development areas, prioritizing underserved communities.
- Implement a Fats, Oils, and Grease (FOG) control program to reduce blockages and improve system performance.
- Eliminate septic systems and cesspools with sewer connections, particularly in areas over the Northern Guam Lens Aquifer (NGLA), to protect groundwater quality.
- Minimize variances for new septic installations within the NGLA and enforce sewer connection requirements for properties within 200 feet of existing lines. Collaborate with agencies like the CHamoru Land Trust and developers early in the planning process to secure easements and protect wellhead zones.

Similarly, the GWMP recommended various actions for the wastewater system, categorized by system type, to address the need for adequate infrastructure and minimizing impacts to the environment, including the NGLA. These address such things as improved data collection and inspections for the gravity piping system, improving force mains and lift stations, and continuing upgrades to wastewater treatment facilities (Brown and Caldwell, 2018). Such actions will continue to be important for assuring a sustainable, environmentally-sound wastewater management system for existing and new development.

3.3.5. Transportation and Mobility

Guam's transportation system is central to the island's long-term sustainability, economic and environmental vitality, and social resilience. As a geographically constrained island in the Western Pacific, Guam faces unique challenges in planning and managing transportation infrastructure, particularly as it contends with increasing population pressures, typhoon-related hazards, the effects of climate change, and a major military buildup. The Guåhan 2050 Sustainability Plan presents a critical opportunity to align transportation policy with broader

sustainability goals related to land use, climate adaptation, public health, and economic development.

Guam's transportation network remains a vital system supporting residents, visitors, and the US military. It includes roadways, bridges, transit services, sidewalks, bicycle and pedestrian facilities, harbors, and airports. The system connects civilian and military destinations through a combination of federal-aid highways, village streets, fixed-route and demand-responsive transit, and privately operated tourist services. The Guam Department of Public Works (DPW) continues to serve as the lead agency for the island's roadway infrastructure, overseeing roads, bridges, sidewalks, and stormwater drainage systems. DPW also manages capital improvement projects and collaborates with federal agencies to secure funding for infrastructure upgrades.

Over the past two decades, transportation planning in Guam has been guided by the 2030 Guam Transportation Plan (GTP), supported by successive Guam Transportation Improvement Programs (GTIPs). These plans have identified key infrastructure needs, prioritized investments, and coordinated funding across federal and territorial agencies. The most recent GTIP (FY 2024–2027) outlines a multi-year, multi-agency strategy for road capacity improvements, safety upgrades, multimodal transportation, and resiliency projects totaling more than $690 million. These investments are aimed not only at maintaining existing infrastructure but also at addressing the cumulative demands of increased vehicular use, military activity, and climate-related vulnerabilities.

3.3.5.1. Road Capacity, Safety, and Investment Priorities

Roadway infrastructure continues to be the primary component of Guam's transportation strategy. As of 2025, Guam's roadway system includes approximately 155 miles of federal-aid highways and 860 miles of secondary and local roads. These roads serve as critical connectors between residential areas, employment centers, and military installations. Route 1 (Marine Corps Drive) remains the island's primary arterial, stretching from Naval Base Guam in the south to Andersen Air Force Base in the north. It supports commercial activity, freight movement, and daily commuting. Other key connectors include Routes 3, 4, 8, 10A, and 16, which link central and southern villages to Route 1 (Figure 3-14).

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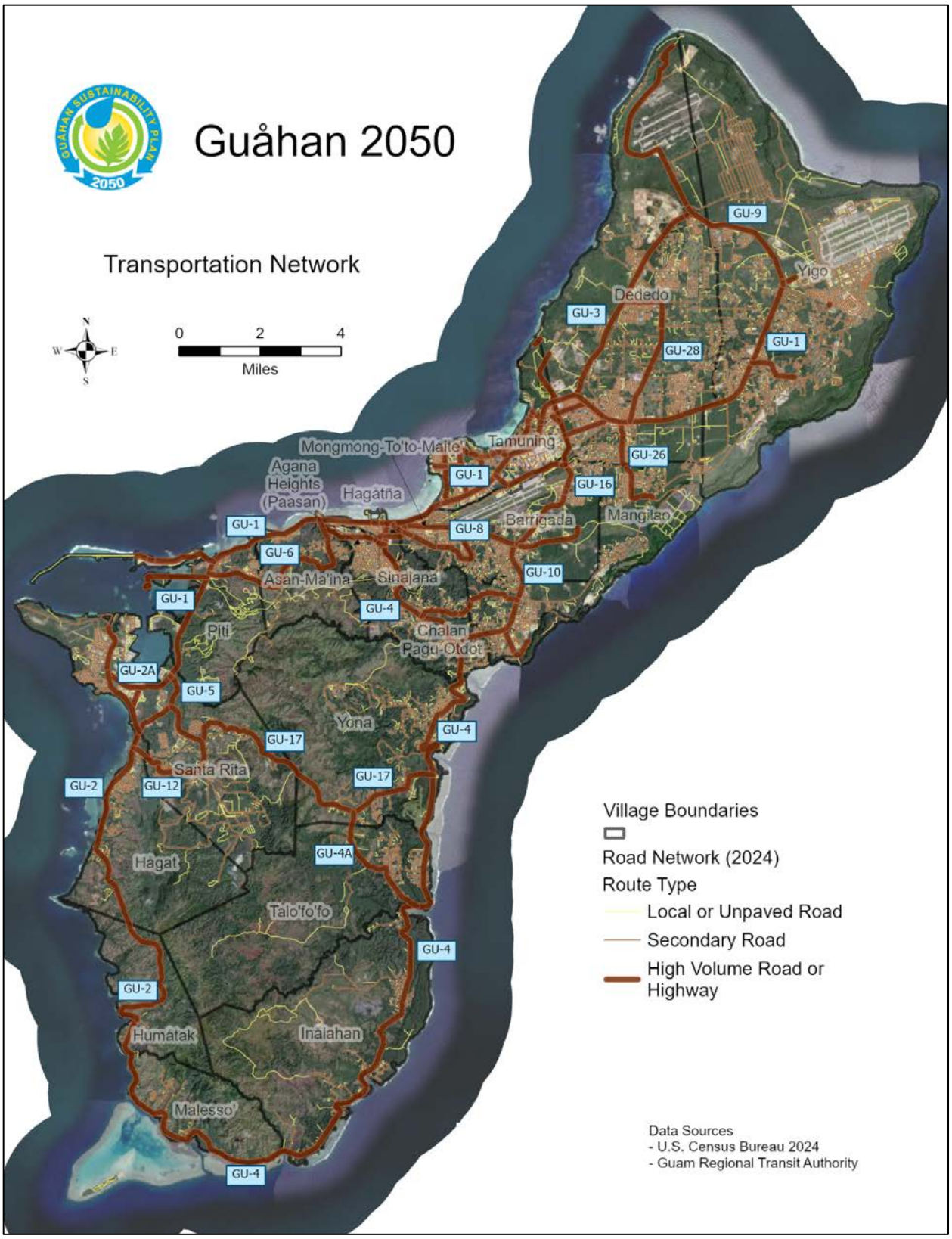

Figure 3-12. Transportation Network

The territory's heavily utilized primary and secondary road network suffers from congestion, aging infrastructure, and limited resilience to extreme weather events. In the last two decades Level of Service (LOS) issues have been documented in several corridor studies, particularly along Routes 1, 2, 4, 10, and 17, where peak-hour congestion, aging intersections, and limited signal coordination result in travel delays and safety concerns (GTP Ch. 3; GTIP 2020–2023). The ongoing military buildup, projected to bring thousands of new residents and increased freight movement, is further straining existing infrastructure (GAO-10-90R, GAO-11-459R). Recent traffic data indicates continued growth in vehicle volumes, particularly in urban centers like Dededo, Tamuning, and Barrigada. Congestion remains a concern on Routes 27, 27A, 28, 29, and 10A, especially during peak hours. While Route 1 handles high volumes efficiently due to its design capacity, operational issues such as traffic signal timing still contribute to delays (Figure 3-15).

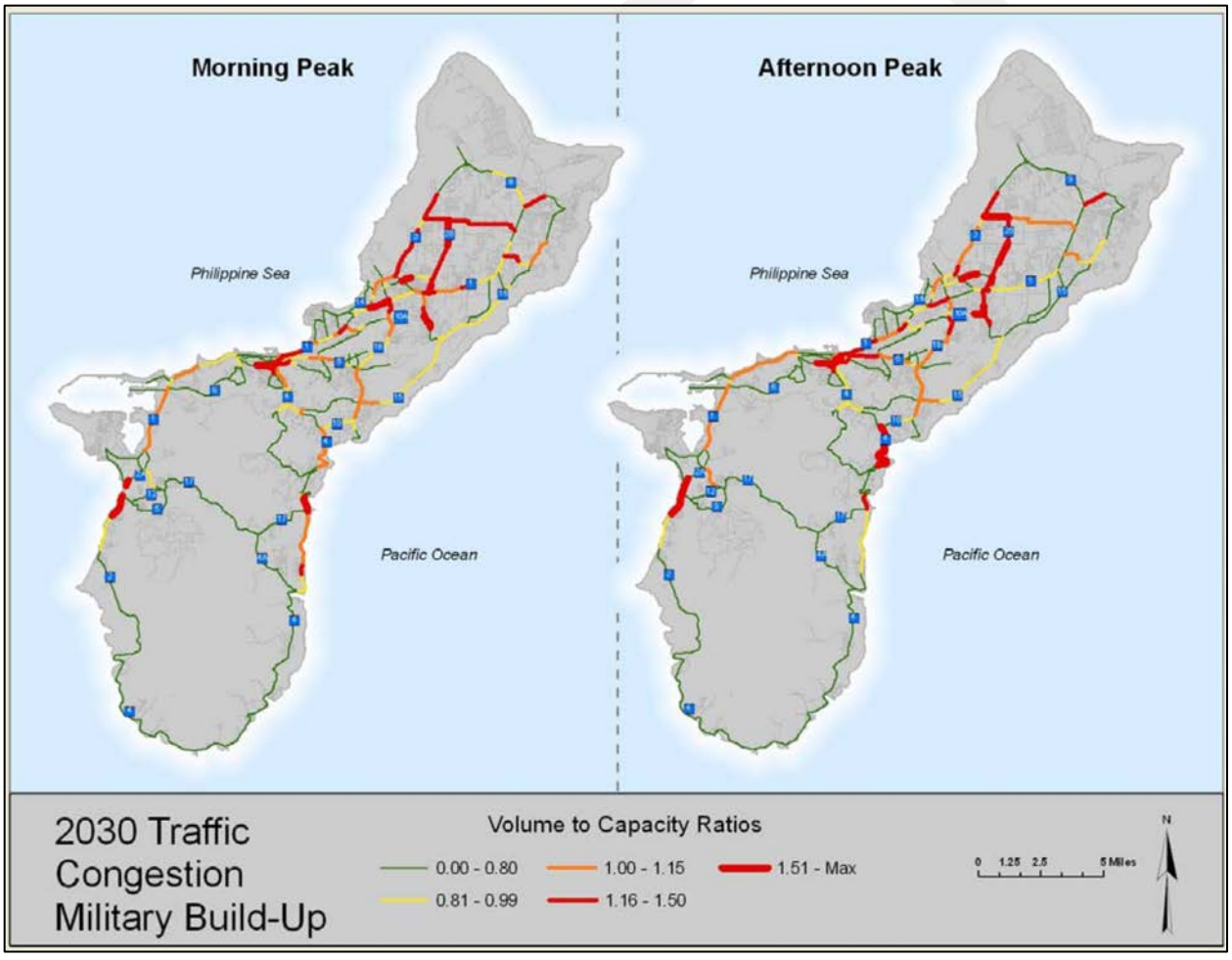

Figure 3-13. Projected Traffic Congestion with Military Build-Up (2030 Transportation Plan).

As part of the U.S. military build-up, Guam has developed a designated Haul Road Network (HRN) to support the transport of military personnel, equipment, and construction materials. The HRN identifies and strengthens specific routes to accommodate increased truck traffic

while minimizing island-wide disruption. Major corridors such as Route 8, Route 16, Route 27, and Route 3 are targeted for pavement strengthening, widening, intersection improvements, and bridge replacements to ensure structural integrity and traffic capacity. A key component of the network is a bypass around the congested Route 1 corridor near the Guam International Air Terminal, providing a critical cargo movement route between the Port of Guam, Andersen Air Force Base, and other military facilities.

DPW has launched multiple island wide pavement improvement projects since 2023, targeting deteriorated roads in Santa Rita, Mangilao, Mongmong-Toto-Maite, and Tamuning. These projects include milling, resurfacing, drainage repairs, and new striping to improve safety and visibility. Despite these efforts, many roads still require ongoing maintenance due to aging infrastructure and limited resources. Opinions collected from the G50SP Public Engagement Workshops align with the need for improved public transportation, road capacity, and better traffic planning. One resident highlighted the inefficiencies caused by heavy reliance on personal vehicles and inadequate traffic flow, stating, “I spend at least 10 hours a week driving to and from work in my personal car, which is very inefficient with only me in the car, and with how bad traffic is getting due to bad traffic planning.”

Insights from mayors’ interviews also identified road maintenance as an on-going concern. Offices have made efforts to “fill in potholes,” “stop small erosion,” and maintain village roads for their constituents, but main/routed roadways, such as Route 6, continue to raise concerns. Hence mayors indicated frustration in trying to address constituent concerns about roadway safety. Additionally, many mayors emphasized that widening roadways should be a priority in addition to repaving, resurfacing, and other repairs being done, especially in villages where there is evident erosion due to flooding and storms.

In villages where there are mainly two-lane roads mayors indicated, “...lots of tour vans and buses create traffic jams... We now have a compounded problem of trash trucks and tour buses. There was a perception that little planning for road widening had happened, raising concerns for public safety. Mayors also shared that, “whenever we have sick individuals here, ambulances have to work around all the traffic” conveying that if roadways were improved it would reduce the time it takes residents to obtain emergency services.

Concerns about road conditions were also echoed in responses from the G50SP Workshops. Participants highlighted challenges with “public roads,” noting that many access roads to private properties remain unpaved or entirely undeveloped due to the high cost of road improvements for individual property owners. Most workshop survey respondents also indicated dissatisfaction with the availability of roadways necessary to support sustainable growth (Figure 3-16).

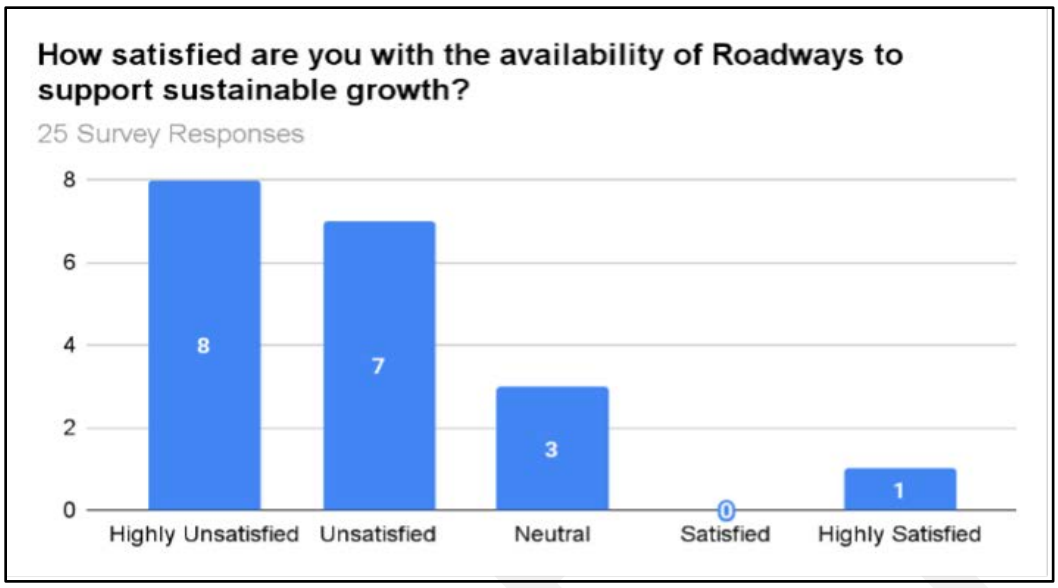

Figure 3-14. Public Satisfaction with Availability of Roadways to Support Sustainable Growth

This feedback highlights the critical need for strategic improvements in roadway design, traffic signal optimization, and enhanced public transportation options to alleviate congestion and improve overall mobility on the island.

Despite public perceptions, significant road investments are being made. The GTIP FY 2024–2027 includes a wide array of transportation projects categorized by function and purpose. Table xx summarizes estimated spending by project type, reflecting investments in reconstruction, drainage, transit, and more.

Table 3-4. Road Improvement Projects and Investments.

Ownership	Acres (acres)	Percent of Island
Bridge Replacements & Safety Upgrades	Replacing and retrofitting aging bridges, scour protection	~$300 million
Road Widening & Reconstruction	New lanes, medians, shoulders, drainage improvements	~$397 million
Intersection & Signal Improvements	New signals, optimized timing, reconfigured intersections	Included above
Storm Damage Repairs	Post-typhoon repairs to signs, lights, and roads	Included in grants
Drainage & Flood Control	Culvert upgrades, channel improvements, flood mitigation	Included above
ADA/Accessibility & Safety Enhancements	Sidewalks, curb ramps, safety medians	Included above

Ownership	Acres (acres)	Percent of Island
Transit Infrastructure	Buses, shelters, rural routes, maintenance	~$13 million (est.)
Program Management & Oversight	Engineering, legal services, ROW acquisition, inspections	~$116 million

As shown, Guam is benefiting from significant investments in bridge replacements and road widening and reconstruction. A major portion of funding—more than $280 million—comes through the Defense Access Roads (DAR) program, intended to expand and upgrade transportation corridors that serve both civilian and military needs. This includes major projects on Routes 1 and 3, and access improvements to the Marine Corps Base Guam. In parallel, over $294 million in federal grant funding has been secured for critical bridge replacements, traffic signal modernization, and ADA compliance improvements. These investments represent a decisive shift from patchwork repairs to more comprehensive corridor-level upgrades. Much of this funding was made possible through the Bipartisan Infrastructure Law (Infrastructure Investment and Jobs Act), which significantly expanded federal transportation programs such as the Bridge Formula Program, Surface Transportation Block Grants, and transit funding for rural and underserved communities.

3.3.5.2. Parking, Setbacks, and Road Signage

Guam's Zoning Law under Title 21 GCA, Chapter 61 provides clear minimum standards for parking and setbacks, though these are not always tailored to urban and more rural contexts. For urban and village core areas—such as Hagåtña's redevelopment corridors or Tamuning/ Tumon—standards should include reduced front yard setbacks of approximately 10 feet (versus typical 15–20 ft) and side setbacks of 5– 8 feet, to reinforce pedestrian continuity and mixed-use activation promoted by G50SP. Parking requirements could be relaxed to 0.75 stalls per dwelling unit or per 500 ft² of commercial space, utilizing shared or on-street loading, pursuant to an approved neighborhood parking management plan, aligning with walkable village strategies. One (1) off-street parking space per accessory dwelling unit must be provided. Currently, the code requires bicycle parking at a minimum of 1 bicycle rack per 20 auto stalls (§ 61531(l) GCA §61531(l)).

In rural and agricultural zones, standard setbacks currently range from 15–20 feet in front yards and 7–10 feet sides/rears, allowing flexibility for farm structures and buffers. Parking standards follow base statutory minimums: one auto space per dwelling unit (§ 61531(a)), or 1 per 100 ft² retail/commercial, 1 per 4 seats in assembly uses, etc. (§ 61531(b–f)). Standard stalls must measure at least 19 × 8.5 ft (compact: 16 × 7.5 ft) and aisle widths adjusted by angle: e.g. 13.5 ft aisle for 45° stalls. (§ 61532(d)).

While zoning and land use intensity influence how streets are designed and used, naming and numbering systems must maintain consistency and coherence across all contexts to ensure safety, mail delivery, disaster response, and utility service. The Government of Guam currently maintains a baseline street grid system, but gaps remain—especially in newer subdivisions, informal developments, and rural roads with multiple identifiers or inconsistent signage. The Guam Fire Department and Department of Public Works have reported navigation and dispatch difficulties, particularly during typhoon response and medical emergencies.

To modernize Guam's addressing system, the Guam 2050 Sustainability Plan recommends adoption of a unified addressing standard, supported by centralized GIS mapping and tied to parcel-level records. This allows for more responsive permitting, real-time infrastructure planning, and seamless integration of public services. Although implementation in rural areas may rely on simplified schemes, ensuring every structure has a mappable, unique identifier remains critical to equitable public service delivery.

3.3.5.3. Transit and Multimodal Transportation

Public transportation in Guam remains underdeveloped relative to demand, with low ridership and limited service coverage. Guam's transit system includes a core fixed-route service and demand-responsive options. While ridership remains modest, there is growing recognition of the need for high-capacity transit along Route 1 to support future growth and reduce reliance on private vehicles. Long-term plans include enhanced service frequency, improved bus stops, and integration with pedestrian and bike networks. The Guam Regional Transit Authority (GRTA) has made incremental progress through federal support programs such as Sections 5310 (mobility for seniors and persons with disabilities), 5311 (rural area service), and 5339 (capital projects). Recently, Guam received funding under the Federal Transit Administration's Accelerating Innovative Mobility (AIM) program, which supports service modernization, route optimization, and technology upgrades (FTA, 2022). This program may provide enhanced on-demand mobility options, especially for the southern villages. Despite these gains, GRTA continues to face challenges related to fleet size, scheduling frequency, and infrastructure such as bus stops and shelters.

The Guåhan 2050 Sustainability Plan can play a key role in establishing policy goals for expanding and improving public transit, particularly by prioritizing transit-oriented development (TOD) near employment centers, educational institutions, and key government services. Planning should integrate transit services with roadway projects to ensure accessibility, reduce vehicle dependency, and support equitable mobility for residents who lack access to private vehicles.

3.3.5.4. Pedestrian and Bicycle Infrastructure

Pedestrian and bicycle infrastructure is notably underdeveloped in Guam, with many corridors lacking safe sidewalks, crossings, or bike lanes. The GTIP and GTP mention ADA compliance and some safety improvements as part of broader road upgrades, but there is no dedicated

strategy or funding stream for active transportation. Routes with high pedestrian activity—such as along tourism zones in Tumon or near schools and public facilities—often lack safe, separated infrastructure.

To address this, Guam should develop a territory-wide pedestrian and bicycle master plan, identifying priority corridors, safety enhancements, and design standards. Integrating complete streets policies into the 2050 Sustainability Plan would ensure that future investments support walking and biking as viable modes, consistent with public health, climate, and equity goals. Programs should also target school zones and village centers where short trips could be easily shifted from cars to foot or bike with better infrastructure.

DPW policy continues to promote integrated bicycle and pedestrian facilities in all new and reconstructed roadways. In alignment with Public Law 29-98 all roadway redevelopment and new construction projects are required to consider the inclusion of bicycle lanes and pedestrian pathways. Improvements include:

- 4-foot-wide shoulders or marked bike lanes
- 14-foot-wide shared lanes
- 8-foot-wide shared-use paths in key corridors
- Sidewalks in urban areas and expanded shoulders in rural zones

While formal bike lanes remain limited, recent projects have begun incorporating these features, especially in areas with high tourist activity or near schools and parks.

Guam's pedestrian infrastructure varies significantly across the island, with the most integrated sidewalks located in Tumon Bay, the island's primary tourist district. This area includes continuous sidewalks along Routes 14 and 14A, mid-block crosswalks, and well-marked crossings at major intersections. However, even in these high-traffic zones, accessibility challenges persist.

For example, sidewalks adjacent to Outrigger, Dusit Thani, and DFS Galleria appear to not consistently meet accessibility standards. Obstacles such as utility poles, signage posts, and utility boxes often obstruct the pedestrian path, making navigation difficult for individuals using wheelchairs, mobility aids, or strollers. Similar issues are present in Hagåtña, where narrow sidewalks and inconsistent curb ramps limit safe and equitable access.

Outside of Tumon and Hagåtña, pedestrian infrastructure is fragmented. Sidewalks are present along portions of Routes 10A, 16, 27, and 27A, with intermittent coverage on Routes 4, 8, 11, 26, and 28. In rural and southern areas, unpaved shoulders often serve as informal pedestrian paths due to the absence of sidewalks.

Marked crosswalks are generally found at signalized intersections and near schools and churches. However, many crossings lack adequate lighting, visibility, or spacing, contributing to pedestrian-vehicle collisions, particularly at night.

3.3.5.5. Electric Vehicle Infrastructure and Sustainability

Guam is beginning to explore electric vehicle (EV) infrastructure, though current deployment is limited. As of 2024, the island has few public charging stations, and EV adoption remains modest due to cost, infrastructure, and awareness barriers. However, the GTIP includes administrative support and preliminary steps toward participating in the federal National Electric Vehicle Infrastructure (NEVI) program, which provides funding for designated charging corridors. The Guam Power Authority has also expressed interest in integrating EV charging with renewable energy resources, such as solar (Guam EPA, 2024).

As Guam advances toward a cleaner, more resilient future, the development of electric vehicle (EV) infrastructure stands as a cornerstone of the island's sustainable transportation strategy. Transitioning from fossil fuel-based vehicles to electric mobility will significantly reduce greenhouse gas emissions, improve air quality, and decrease Guam's dependence on imported petroleum products. Including robust EV infrastructure planning in the Guåhan 2050 Sustainability Plan can accelerate this transition. Strategies should include incentives for private sector investment, utility partnerships for grid management, and coordination with vehicle fleet replacement plans for government agencies. EV readiness should also be included in zoning and building codes for commercial and multifamily development.

Investing in EV infrastructure aligns directly with Guam's renewable energy targets and long-term sustainability goals. By expanding the network of EV charging stations across the island—particularly in high-traffic areas, government facilities, commercial centers, and underserved communities—Guam can support the growing adoption of electric vehicles while ensuring equitable access to clean transportation options.

3.3.5.6. Policy Implications

Guam's transportation system is undergoing a major transformation, fueled by federal investments, increased military activity, and the need for climate-resilient infrastructure. While recent plans and projects demonstrate clear progress in addressing critical road capacity and safety needs, future policies must more fully integrate multimodal access, land use coordination, and environmental sustainability.

For the Guam 2050 Sustainability Plan, this means adopting policies, including from the 2030 Transportation Plan, that accomplish the following:

- Promote compact and transit-accessible development near upgraded corridors.
- Establish complete streets standards and fund active transportation. For example, to ensure Guam's transportation network is inclusive and safe for all users, it would be

important to prioritize upgrades in high-use areas, including lighting, signage, curb ramps, and pedestrian refuge islands. It would also be useful to:
    - Conduct islandwide accessibility audits of sidewalks and crosswalks, with a focus on identifying barriers such as utility poles, signage, and uneven surfaces
    - Remove or relocate obstructions that impede access for people using wheelchairs, strollers, or mobility aids
    - Ensure all new and reconstructed pedestrian infrastructure complies with ADA standards

- Expand public transit service and infrastructure, with a focus on rural and transit-dependent communities.

- Accelerate EV infrastructure and align transportation planning with clean energy goals. This could include the following:
    - Develop supportive policies such as EV purchase incentives, reduced registration fees and preferential parking to encourage adoption. This includes:
        - Fleet Electrification: Transition government and public transportation fleets to electric vehicles, setting a leadership example and reducing operational emissions.
        - Workforce Development: Train local technicians and electricians in EV maintenance and charging station installation to build local capacity and create green jobs.
        - Deployment of Public Charging Stations: Prioritize Level 2 and DC fast chargers in strategic locations to support both daily commuting and long-distance travel.
    - Grid Integration and Renewable Energy Synergy: Design EV infrastructure to integrate with Guam's evolving renewable energy grid, including solar-powered charging stations and smart grid technologies.

- Require climate adaptation, hazard mitigation, and green infrastructure in all transportation projects.

A sustainable transportation future for Guam will depend not only on federal funding and engineering improvements, but also on bold, integrated policy that supports a resilient, equitable, and accessible transportation network for all island residents.

Transportation Policy Options

- Establish a Multi-Agency Infrastructure Coordination Committee composed of the Department of Public Works (DPW), Guam Waterworks Authority (GWA), Guam Power Authority (GPA), and GTA (Guam Telephone Authority). This committee will oversee the development of a centralized Geographic Information System (GIS) to map and manage utility and transportation assets. The system will support coordinated planning, reduce

project delays, and minimize redundant excavation, thereby lowering environmental and financial costs.

- Reform and relaunch the Guam Mass Transit Authority as an autonomous agency with the authority to:
    - Own and manage transit-related property and infrastructure
    - Receive and administer federal transportation funds
    - Enter into public-private partnerships and service contracts
    - Operate under the guidance of an independent, multi-sector board. This will enable the development of a more resilient, efficient, and equitable public transportation system aligned with long-term sustainability goals.
- Strengthen collaboration between the Guam Land Use Commission, non-governmental organizations (e.g., Guam Running Club, Guam Triathlon Federation), and DPW to ensure transportation planning is aligned with land use, environmental, and community development goals. Key actions include:
    - Coordinating right-of-way acquisition with land use planning to preserve corridors for future mobility needs
    - Encouraging mixed-use development and transit-oriented design
    - Promoting public-private partnerships for infrastructure investment

3.3.6. Stormwater Management

Guam experiences an average annual rainfall of approximately 100 inches, with typhoons capable of delivering 10–15 inches of rain in a single event. These intense storms, combined with strong winds and storm surges, pose significant risks to both the natural environment and built infrastructure. The island's unique geology—comprising porous limestone and volcanic formations—along with its sensitive water resources and ongoing land development, makes effective stormwater management a critical environmental and economic priority.

Historically, stormwater has been treated primarily as a drainage issue, with runoff directed to the nearest discharge point—often infiltrating untreated into the limestone aquifer or flowing directly into streams and coastal waters. This approach has led to increased flooding, erosion, and pollution of marine ecosystems.

Urban development has further intensified these challenges. The expansion of impervious surfaces such as roads, rooftops, and parking lots has disrupted the natural hydrologic cycle. During construction, vegetation that once absorbed rainfall is removed, and the land is compacted, reducing its ability to retain water. Post-construction, the lack of infiltration leads to higher volumes of stormwater runoff, overwhelming drainage systems and contributing to localized flooding. For example, a one-acre parking lot can generate up to 16 times more runoff annually than a one-acre meadow (Schueler, 1994). In Guam, this excess runoff may exceed the capacity of natural and built drainage systems, which are further compromised by inadequate maintenance. Sediment buildup and vegetation overgrowth in storm drains, swales, and basins reduce their effectiveness, exacerbating flood risks.

To address these issues, Guam must transition from conventional drainage practices to integrated stormwater management strategies that emphasize sustainability, resilience, and ecosystem protection. This includes implementing green infrastructure, enhancing maintenance programs, and aligning development practices with the island's hydrologic and ecological realities.

Public engagement for the G50SP included Mayors noting that the absence of proper sewer infrastructure in areas such as Malojloj often creates problems with stormwater runoff and flooding. In addition, they expressed that ponding basins in their villages need upgrades and cleaning which should be routine to prevent unnecessary stormwater runoff and flooding into main roadways such as Route 4. Residents' opinions gathered from the G50SP Workshops align with these sentiments stating that "flood control" was the most important infrastructure investment needed to support sustainable growth. Most respondents indicated dissatisfaction with the availability of storm drainage in the G50SP Workshop Survey (Figure 3-17).

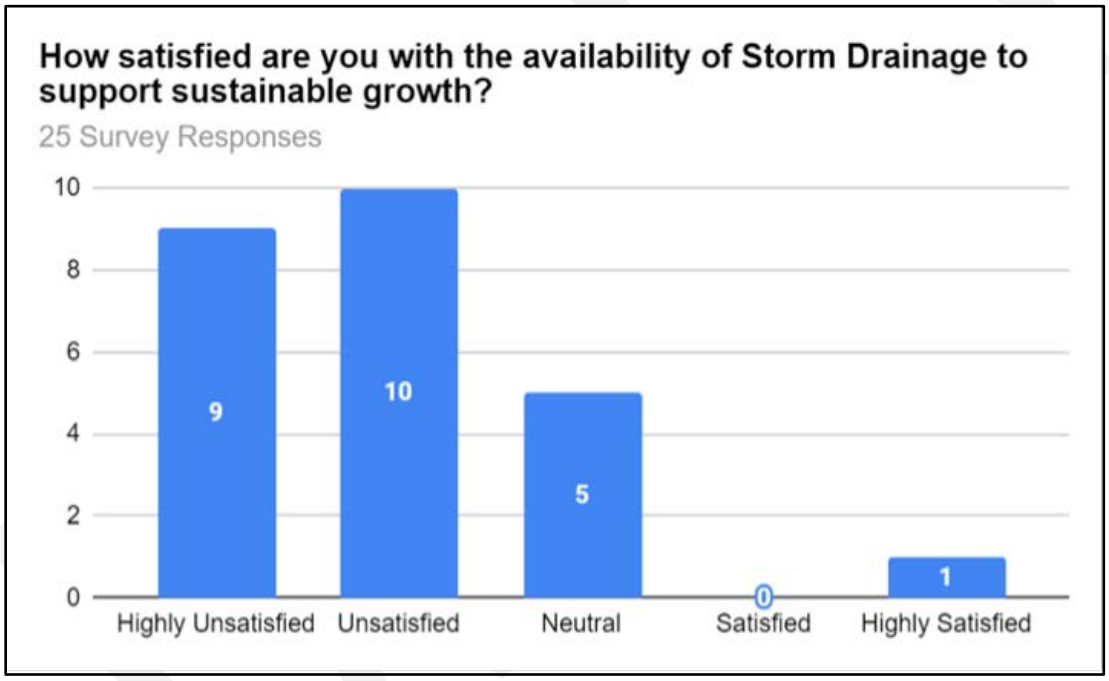

Figure 3-15. Public Satisfaction with Availability of Storm Drainage

3.3.6.2. Stormwater Policy Objectives

Stormwater management is an important infrastructure concern to address in the planning and development of roads, commercial, industrial, residential, and other development, hence its inclusion in this chapter about sustainable communities. The G50SP also addresses stormwater later in this chapter's discussion of flood hazards management, as well as Chapter Five's discussion of watershed management and Guam's comprehensive stormwater management plan. These other discussions highlight how stormwater is a multidimension

concern for Guam, and they establish the policy basis to address various stormwater management objectives, including:

- Providing integrated watershed and stormwater management such as regional detention basins and stormwater best management practices (BMPs) to manage runoff at the watershed scale. This will reduce peak flows, improve water quality, and support aquifer recharge. Regional detention basins will also alleviate flooding caused by existing structures that were permitted before the implementation of the CNMI/Guam Stormwater Management Manual (see Chapter 5).
- Require all new developments to incorporate integrated stormwater strategies that address quantity, quality, and downstream protection. This will minimize environmental impact and promote resilient site design (see Policies SC-23, SC-24).
- Prohibit development in flood-prone and coastal hazard zones unless comprehensive mitigation measures are implemented. This will reduce exposure to flood risks and protect sensitive ecosystems. (SC-84)
- Enforce flood prevention and stormwater control measures prior to subdivision approval, in accordance with GCA Title 21 Chapter 62. This requires relevant GovGuam agencies to review subdivision plans for adequate storm drainage and supporting infrastructure. Mandate that all subdivisions, including parental subdivisions, provide sufficient drainage to reasonably protect against flooding (SC-24).
- Pursue mitigation measures for private developments that contribute to flooding or stormwater pollution in key waterbodies such as Tumon Bay (see Policies TE-20 to TE-40)
- Require Low Impact Development (LID) practices and Green Infrastructure —such as bioswales, rain gardens, permeable pavements, and green roofs—in all new developments. This will enhance infiltration, reduces runoff, and supports biodiversity and urban cooling (see TE-17).

3.3.7. Solid Waste Management

Guam's history of solid waste management has been marked by long-standing challenges in infrastructure, regulation, and enforcement, culminating in significant legal and institutional reforms over the past two decades. For many years, the island's solid waste system was characterized by inadequate facilities, open dumping, limited recycling options, and insufficient government oversight. In 1986, the US Environmental Protection Agency (USEPA) cited that Guam was in violation of the Clean Water Act, since its only municipal solid waste disposal site was leaching contaminants into the groundwater. These deficiencies led to severe environmental and public health concerns, particularly related to the Ordot Dump—a large, unlined landfill site used for decades by both civilian and military entities. The Ordot Dump, which accepted waste without proper environmental controls, became emblematic of the island's waste management crisis.

In 2004, the U.S. Environmental Protection Agency (EPA) filed a lawsuit against the Government of Guam for violations of the Clean Water Act, citing leachate discharges from the Ordot Dump into the Lonfit River and failure to close the site in accordance with environmental regulations. The case resulted in a 2004 consent decree in which Guam agreed to close the Ordot Dump and build a new sanitary landfill (*United States v. Government of Guam*, Civil Case No. 02-00022 (D. Guam). However, the government struggled to meet the decree's requirements, facing delays, cost overruns, and management issues. As a result, the U.S. District Court appointed a federal receiver in 2008 to take control of the Guam Solid Waste Authority (GSWA), initiating a comprehensive overhaul of the island's waste system.

Under receivership, significant progress was made. The Layon Landfill—a modern, EPA-compliant facility—was completed in 2011 in Inarajan, replacing the Ordot Dump, which was formally closed. The receivership also implemented island-wide residential trash collection for single-family homes, established recycling programs, and improved operational efficiency. While these reforms addressed many critical deficiencies, they also highlighted the high costs of mismanagement and the need for sustained institutional capacity.

The role of the U.S. military in Guam's waste management history is also notable. During and after World War II, military operations contributed substantial quantities of waste to the Ordot Dump. In recent years, Guam has sought to hold the federal government accountable for part of the cleanup costs. In 2017, Guam sued the Navy for costs incurred as the Navy deposited munitions and chemicals at the Ordot Dump for decades. Guam sought compensation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), leading to a landmark U.S. Supreme Court ruling in 2021. The Court unanimously ruled in favor of Guam, allowing the territory to proceed with its claims to recover some of the costs of closing the Ordot Dump (*Guam v. United States,* 141 S. Ct. 1608 (2021)). In 2023, the US agreed to pay nearly $50M for costs associated with the dump's closure. The receivership has partially ended with GSWA collecting the island's solid waste and operating the Layon Landfill. The Receiver's remaining task is to finalize the Post-Closure Care Plan of Ordot Dump.

Guam's solid waste management also changed hands during the receivership. It was previously managed by the Department of Public Works (DPW). Now, Guam's solid waste is managed by the Guam Solid Waste Authority (GSWA), which was a government agency formed as part of the 2006 Integrated Solid Waste Management Plan (ISWP)(GEPA, 2006). Today, Guam continues to face solid waste challenges, including the need to expand diversion infrastructure, improve recycling rates, and manage construction and demolition debris. The Guam Zero Waste Master Plan (2023) reflects a strategic effort to address these issues by transitioning to a green circular economy (see below).

3.3.7.1. Landfills

Replacing Ordot Dump as the disposal site for the island's solid waste, Layon Landfill in Inarajan has been in operation since 2011. Given Guam's limited space, constructing multiple landfills to

manage the solid waste is not feasible. Therefore, the government of Guam has issued a comprehensive plan to tackle Guam's solid waste scenario. In 2023, Guam EPA released its Integrated Solid Waste Management Plan (ISWMP), setting a landfill diversion target goal of 50% by 2035. Guam's waste disposal and diversion pattern in 2022, are shown in Figure 3-18. GEPA and GSWA hope to accomplish this with the implementation of two zero waste programs for additional diversion: extended producer responsibility (EPR) for packaging and commercial food waste composting. In 2021, the diversion rate was 29% meaning Guam is more than halfway to reaching its goal of 50% by 2035.

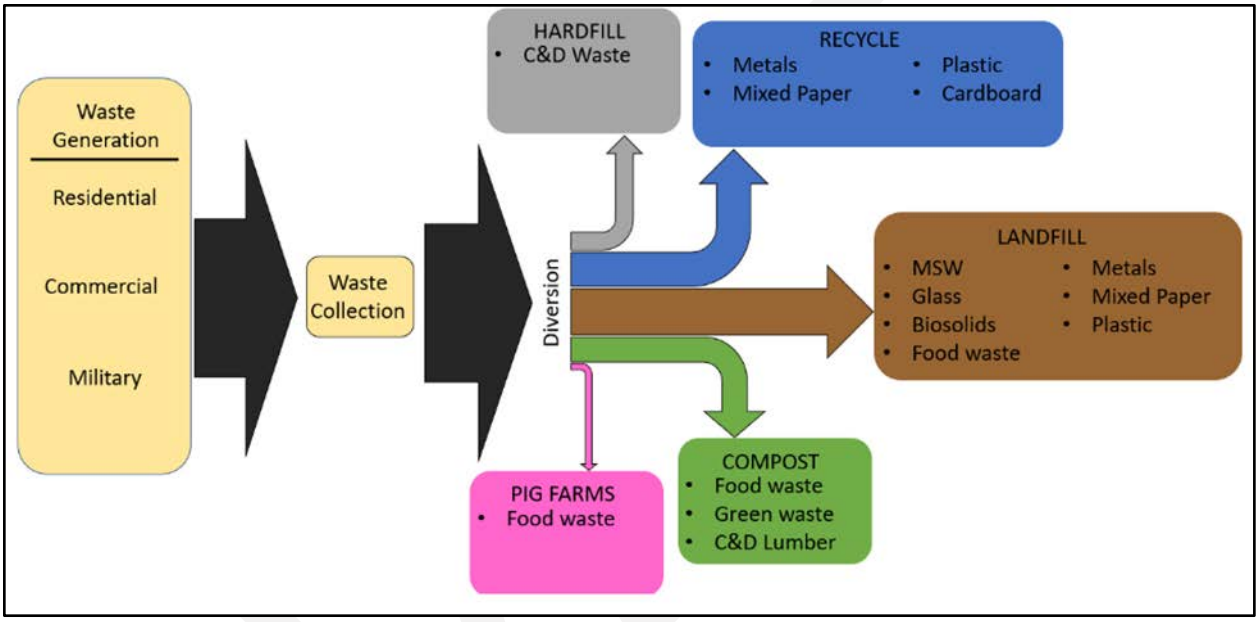

Figure 3-16. Guam's 2022 Waste Disposal and Diversion.

The ISWP projects a population increase to 183,580 by 2040, increasing the waste generation disposal to 105,700 tons (Figure 3-19). The waste diversion plan is key to managing the waste due to the increase in population.

Year	Population	Waste Disposal (tons)
2025	173,034	100,600
2030	179,932	103,600
2035	182,022	104,800
2040	183,580	105,700

Figure 3-17. Forecasted Population and Predicted Waste Disposal (ISWMP, 2023).

3.3.7.2. Guam Zero Waste Plan

The Guam Zero Waste Master Plan (GZWMP), released by the Guam Environmental Protection Agency (Guam EPA) in January 2023, provides a comprehensive and phased roadmap to transition Guam toward a green circular economy and achieve the aspirational goal of zero waste. Building on the foundation of the 2013 Zero Waste Plan, the updated 2023 Master Plan outlines strategic initiatives, implementation phases, and sustainability targets aligned with the Guam Green Growth (G3) Action Framework and the United Nations Sustainable Development Goals.

The 2023 GZWMP emphasizes the following strategic actions to guide Guam's zero waste transition:

- Strengthen Guam's Zero Waste Framework
- Establish Intergovernmental Partnerships
- Build Public-Private Partnerships
- Invest in Education and Green Workforce Development
- Focus on Equity and Environmental Justice

These strategies are supported by twelve priority zero waste initiatives, including mandatory island-wide residential collection, extended producer responsibility (EPR), commercial food waste composting, and construction and demolition (C&D) materials diversion.

Currently, Guam is in Phase III, which emphasizes increasing waste diversion and launching key regulatory and infrastructure initiatives. Key activities underway in Phase III include:

- Implementing a mandatory island-wide residential collection program
- Enacting legislation for an Extended Producer Responsibility (EPR) program for packaging
- Launching a mandatory commercial food waste and organics composting program
- Expanding recycling and reuse of waste tires and glass in construction applications
- Improving enforcement of illegal dumping and litter control laws
- Measuring and reporting progress toward Guam's 2035 goal of 50% waste diversion

While a Pay-As-You-Throw (PAYT) program has not yet been implemented, the other initiatives are on-going.

The Guam Zero Waste Master Plan also encompasses several strategies that have direct implications for land use planning and permitting, emphasizing the need for new infrastructure, regulatory reforms, and policy integration to support the island's transition to a circular economy. Key recommendations include establishing construction and demolition (C&D) materials processing and reuse facilities, mandating recycling and diversion policies within the permitting process, and adapting public infrastructure projects to incorporate recycled materials such as tire-derived aggregate and crushed glass. These initiatives may require zoning updates,

streamlined permitting processes, and proactive integration of zero waste goals into site planning and public works procurement. To align with these recommendations, the G50SP incorporates land use policies that enable siting and development of waste recovery infrastructure, support environmentally preferred purchasing in public projects, incentivize green industries, and ensure equitable distribution of zero waste services across the island.

3.3.7.3. Materials and Waste Management/Toxics

The Integrated Solid Waste Management Plan (ISWMP) does recognize that there are certain wastes that are safer to manage in a landfill. Those wastes are treated wood, nonhazardous contaminated soil, nonfriable asbestos, stabilized fats, oils, and grease (FOG), and shredded tires when recycling is not available. These are classified as “special wastes.” Since these “special wastes cannot be handled on-island, ISWMP presents a fee for the off-island disposal of these “special wastes.”

In a waste composition study conducted in 2019, 5% of the landfill waste was metals. Certain metals, household hazardous wastes, and old corrugated containers are banned from being disposed of in the landfill.

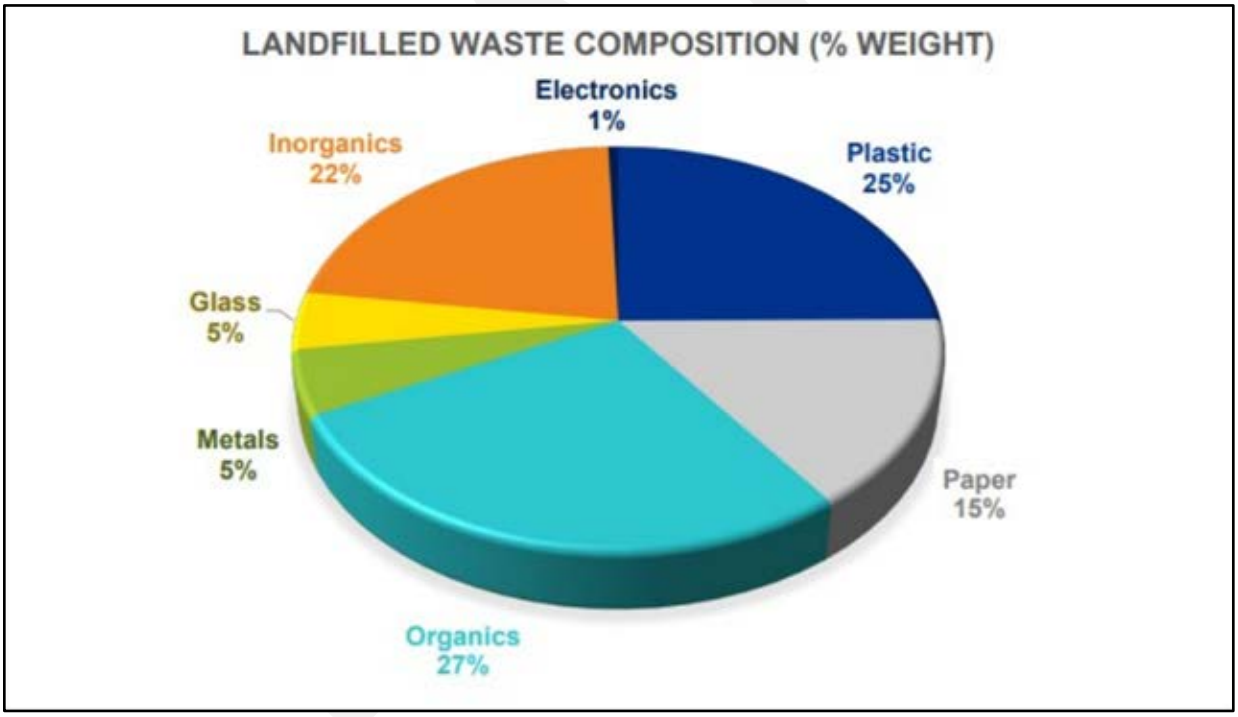

Figure 3-18. Results of Guam 2019 Waste Composition Study (Jacobs, 2023).

3.3.7.4. Recycling

Since October 2013, GSWA has offered recycling services for residential customers. Paper, aluminum and metal cans, and plastics were collected curbside twice a month. However,

Guahan Waste Control, the company responsible for sorting through the collected materials, reports that there is a contamination rate of 60% in the residential stream (Jacobs, 2023).

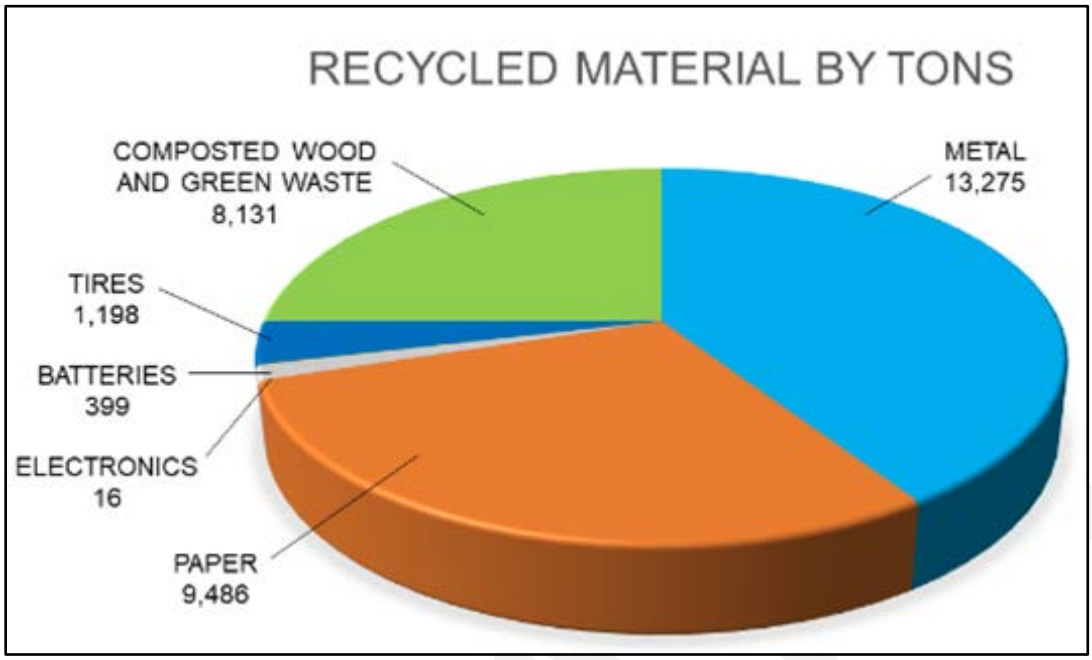

Figure 3-19. Recycled Material by Tons (Jacobs, 2023).

On-island recyclable materials processing are only for cardboard, glass bottles and jars, tires, and green waste. Plastics are collected, but are not being recycled. To facilitate Guam's recycling efforts, GEPA has proposed several zero waste initiatives in the GZWMP to include the biosolids composting initiative and the food waste initiative.

There were legislative actions to assist with the initiative. One was the Bottle Bill (Public Law 30-221) and Choose To Reuse: Mungna Ma Ayek I Plastek Act of 2018. The Bottle Bill is a bottle-redemption recycling program that was enacted in 2010. However, due to high start up costs, the program has not been implemented. The Plastek Act of 2018 banned the use of plastic carry out bags.

The Abandoned Vehicle Program was also established. This program provided free pickup and removal of priority recyclables such as abandoned cars, large white goods, and metals. Private recycling vendors (Pyramid Recycling) and programs (i*Recycle) also assists with recycling efforts on the island.

Although the ISWMP plans to divert 50% of the waste from landfill by 2035, the island land use plan should still consider the possibility of needing new land in case the need for a new landfill

arises. Guam's population is expected to grow in the coming decade. Initiatives such as the zero-waste and waste diversion programs are steps in the right direction, but the land use plan should still account for the scenario where a new landfill is needed as Layon Landfill is projected to reach its capacity around 2060 (GWSA, 2025).

3.3.7.6. Waste Management Policy and Program Direction

From the ISWMP, the recommended policies and programs are below:

- Islandwide Mandatory Residential Waste Collection - Launch a mandatory curbside waste and recycling collection service for all households across the island. All residents would be required to enroll and pay for the service. To ensure affordability, a subsidized "lifeline" rate would be offered to low-income households.
- Extended Producer Responsibility (EPR) for Packaging- Introduce an EPR program targeting plastic and paper packaging. This initiative would require producers to pay fees that cover the costs of collecting, sorting, and transporting recyclable packaging materials. The program would also include incentives to encourage producers to reduce the volume of packaging materials they introduce into the Guam market.
- Commercial Food Waste Collection and Composting - Establish a program to collect and compost food waste from commercial sources. This initiative would support local economic development by generating large quantities of compost for use in agriculture and landscaping. It would also create employment opportunities through the construction and operation of a private composting facility.

The recommended policies and programs from the Guam Zero Waste Plan are below:

Phase III (2023–2028): Increasing Diversion

- Mandatory Residential Island-Wide Collection. Expand curbside collection to all single and multifamily households, with subsidies for low-income residents.
- Mandatory Commercial Food Waste & Organics Composting. Require businesses to separate and compost food waste and compostable organics.
- Extended Producer Responsibility (EPR) for Packaging. Develop legislation requiring producers to fund recycling of packaging materials.
- Illegal Dumping & Litter Control Enforcement. Strengthen enforcement and public education to reduce illegal dumping.
- Recycle & Reuse Waste Tires. Promote use of tire-derived aggregate (TDA) in construction projects.
- Waste Glass Disposal Ban & Reuse. Ban landfill disposal of glass and promote its reuse in construction applications.
- Measure & Report Progress. Establish systems to track and report diversion and program performance.

Phase IV (2029–2033): Creating On-Island Markets

- Environmentally Preferable Purchasing (EPP). Strengthen compliance with existing laws (e.g., Public Laws 21-22 and 24-100) to prioritize procurement of recycled and sustainable materials.
- Mandatory Recycling in Government, Commercial Buildings & Public Spaces. Expand recycling mandates beyond government agencies to include commercial properties and public areas.
- Expansion of Existing Programs. Scale up EPR, tire and glass recycling, and public education initiatives.
- Measure & Report Progress. Continue performance tracking and public reporting.
- Five-Year Review of the Master Plan. Evaluate progress and update strategies as needed.

Phase V (2034–2038): Strengthening Resilience

- Construction & Demolition (C&D) Debris Processing Facility. Develop infrastructure to process and divert C&D materials.
- Used Building Materials Facility. Establish a facility to collect and resell salvaged construction materials.
- C&D Debris Diversion Policy. Enact policies requiring diversion of recyclable C&D materials.
- Optimize EPR & EPP Programs. Expand materials covered and improve program efficiency.
- Continue Public Education & Outreach. Annual Progress Reporting & Five-Year Review

Phase VI (2039+): Enhancing Sustainability

- Used Oil Recycling. Develop on-island micro-refinery capacity for waste oil reuse.
- Annual Reporting & Development of a New 20-Year Plan

3.3.8. Power

Guam's power system is a critical infrastructure sector that directly influences the island's sustainability, resilience, and economic prosperity. As a geographically isolated island territory with no indigenous fossil fuel resources, Guam is almost entirely dependent on imported fuel for electricity generation. The Guam Power Authority (GPA), a public utility governed by the Consolidated Commission on Utilities and regulated by the Public Utilities Commission, supplies electricity to all residential, commercial, and military customers on the island. As of 2022, approximately 89% of electricity generation came from fossil fuels, with the remaining 11% supplied by renewable sources (NREL, 2024). Electricity rates on Guam are among the highest in U.S. jurisdictions, averaging nearly $0.35/kWh, largely due to fuel costs and a Levelized Energy Adjustment Clause (LEAC) surcharge.

In recent years, Guam has taken steps to transition to a cleaner and more resilient energy system. Public Law 35-46 revised the Renewable Portfolio Standard (RPS) to require that 50% of net electricity sales come from renewable sources by 2035 and 100% by 2045. GPA's Clean Energy Master Plan, also known as the Integrated Resource Plan (IRP), outlines a phased approach to meet these goals, including 400 MW of new renewable energy capacity and $230 million in grid upgrades. Despite progress in adding utility-scale solar and battery storage, challenges remain in integrating intermittent resources, modernizing the grid, and addressing post-typhoon recovery and infrastructure vulnerabilities. As the island continues to rebuild from Typhoon Mawar and manage anticipated increases in military demand, a coordinated and equity-centered power sector transition is essential.

3.3.8.1. Clean and Renewable Power

Guam's commitment to renewable energy is anchored in both legislative mandates and community-driven planning processes. Public Law 35-46 codifies Guam's goal to achieve 100% renewable electricity by 2045. To support this target, GPA has partnered with the National Renewable Energy Laboratory (NREL) to develop "Guam100," a comprehensive roadmap to transition to 100% clean energy. The Guam100 approach prioritizes energy justice through three pillars: recognition justice (acknowledging past and present inequities), procedural justice (ensuring inclusive and fair decision-making), and distributional justice (ensuring equitable sharing of benefits and burdens).

As of 2023, GPA's operational renewable energy portfolio includes the 25 MW Dandan Solar Farm, the 60 MW KEPCO Mangilao Solar Project with integrated battery storage, and over 22 MW of distributed customer-sited solar. New procurements have been underway, including perhaps more than 330 MW of solar and solar-plus-storage capacity. All new utility-scale renewable projects are required to include Battery Energy Storage Systems (BESS) to support grid stability. GPA is also planning a Virtual Power Plant (VPP) program and upgrading its grid controllers, smart meters, and control systems to accommodate higher levels of inverter-based generation.

3.3.8.2. Reliability

System reliability is a pressing concern for Guam, especially in the wake of recent typhoon-related disruptions. GPA's generation assets are aging, and recent storm damage has underscored the fragility of key infrastructure. The GPA 2021 Integrated Resource Plan emphasized the importance of maintaining adequate reserve margins and modernizing generating assets to ensure grid reliability. GPA's current reliability strategy includes the deployment of Energy Shifting Battery Energy Storage Systems (ES BESS) to provide load balancing, voltage and frequency regulation, spinning reserves, and additional peak load carrying capacity.

The completion of the 198 MW Ukudu Power Plant is expected to provide critical new base load capacity, replacing older fossil-based units and enabling the retirement of the Cabras 1 & 2 steam plants. However, construction delays from Typhoon Mawar have postponed full operational status until at least 2025. In the interim, GPA continues to rely on its interruptible load program, smart grid technology, and rotating outages during peak periods to maintain grid stability. Long-term reliability will require resilient infrastructure, grid automation, and diversified generation sources.

3.3.8.3. Affordability

Affordability remains one of the most significant challenges for Guam's energy system. The cost of electricity—driven by global fuel prices, shipping constraints, and operational inefficiencies—places a heavy burden on residents and businesses. In 2022, Guam's average retail electricity cost was nearly double the U.S. national average. GPA's LEAC surcharge fluctuates with international fuel markets and can constitute over half the customer rate. GPA anticipates that the Ukudu plant will improve cost efficiency by reducing annual oil imports by nearly 900,000 barrels and enabling more stable, efficient generation.

To mitigate the energy burden on consumers, GPA offers demand-side management programs, net metering for distributed solar, and energy efficiency rebates through the Energy Sense Rebate Program. Low-income households can also benefit from federal Weatherization Assistance Programs. Strategic energy planning must consider land use needs for future renewable energy installations and battery storage, and address lifecycle issues such as battery disposal. Guam's sustainability and land use planning must integrate long-term energy

affordability with clean energy deployment, equitable access, and system-wide efficiency improvements.

3.3.8.4. Policy and Implementation Priorities

To support an equitable and sustainable energy future aligned with Guam's land use energy policies below (SC-26 through SC-31), the following actions are important to consider:

- Guam should fully implement and regularly update the Clean Energy Master Plan to ensure consistency with the 2045 renewable energy goal under GCA §8311.
- Integrate Guam100's energy justice principles into all planning, permitting, and investment decisions.
- The Bureau of Statistics and Plans (BSP), Department of Land Management (DLM), GPA, and other agencies should coordinate to identify and secure sites for renewable energy facilities that avoid impacts to sensitive natural resources, prime agricultural lands, hazard zones, and residential communities.
- Prioritize rooftop solar and solar over developed areas such as parking lots and commercial buildings, consistent with SC-28 and SC-29, to reduce land use conflicts and support distributed energy resilience.
- Prior to development, it is essential to analyze whether the power system can accommodate the additional load required.
- Require new residential subdivisions (5+ lots) and commercial developments (>10,000 sq ft) to include solar systems or contribute in-lieu fees for public solar investments.
- Complete a coordinated siting and feasibility study for large-scale solar facilities, per SC-28, ensuring optimization of grid connectivity and avoidance of scenic or ecological impacts.
- Ensure all new energy infrastructure, including power lines, is undergrounded to the extent feasible to enhance storm resilience (SC-30).
- Ensure long-term safety and security of energy facilities while minimizing impacts to public access and recreational use areas (SC-31).
- Advance GPA's Virtual Power Plant (VPP), smart grid, and DER integration strategies to support efficient, decentralized, and responsive power systems.
- Strengthen interagency collaboration among GPA, CCU, PUC, GWA, GEPA, DoD, and community stakeholders to ensure energy planning is comprehensive, transparent, and inclusive.

With the requirements of PL 35-46, the land use plan should also address the need for land for wind turbine or solar power generation. Moreover, the land use plan should consider the storage required for the disposal or storage of the future spent solar batteries. Figure 3-22 shows GPA's proposed island wide power system by 2028 as reflected in the NREL 2023 Energy Baseline Report. Together, these integrated policies and actions will enable Guam to transition to a 100% renewable, affordable, and resilient power system by 2045 while supporting smart land use, environmental protection, and community well-being.

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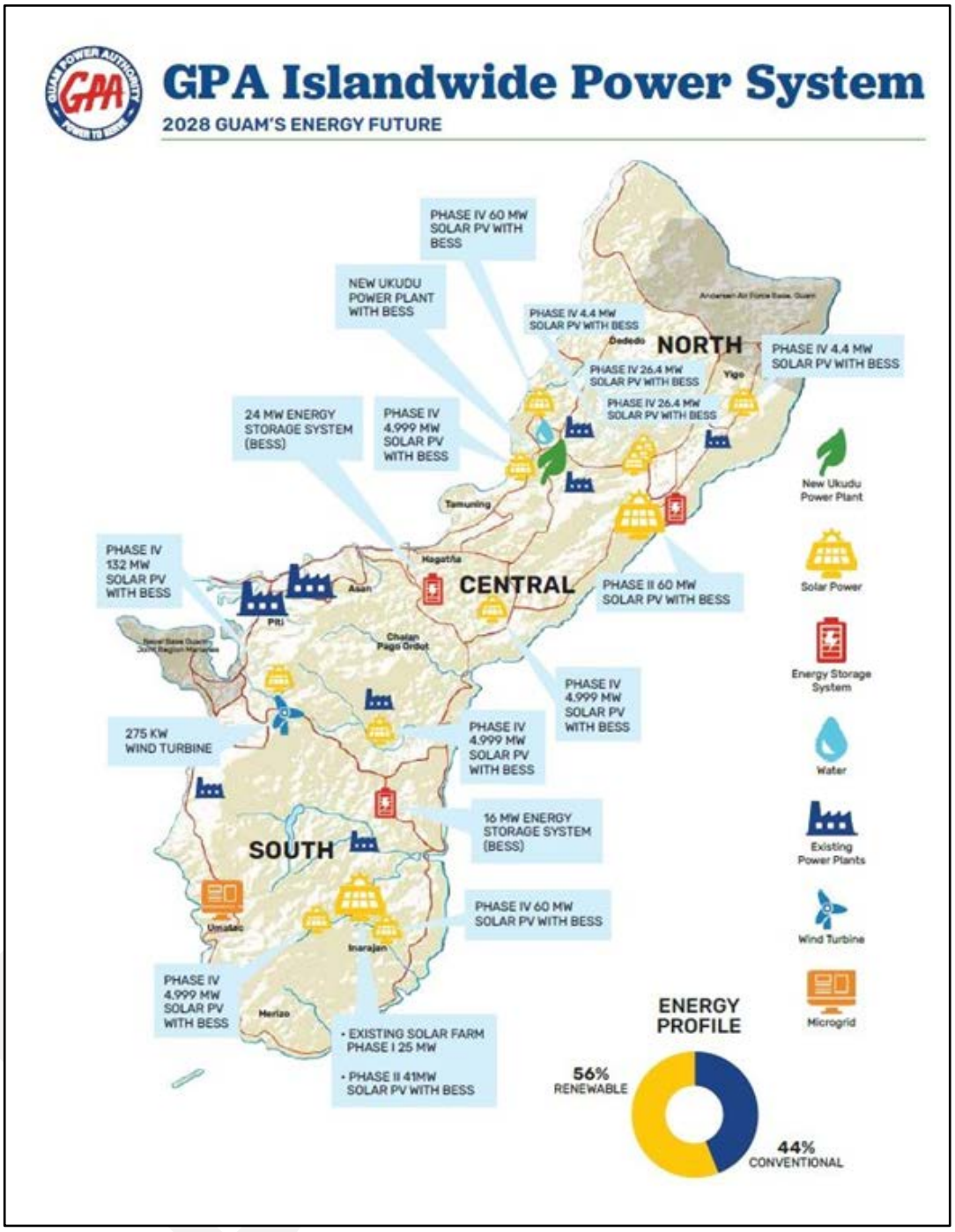


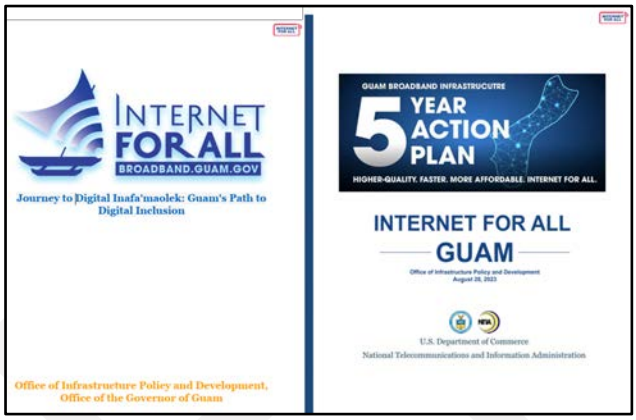
Figure 3-20. GPA Islandwide Power System: 2028 Guam's Energy Future.

3.3.9. Communications

Several communication companies provide internet service throughout the island. Docomo Pacific, GTA, and IT&E are the three major communication companies on the island. Additionally, Starlink is present on the island and provides high-speed services on the island for approximately 4,000 subscribers. With the advancement in technology, an internet connection

has become a necessity. The internet allows residents of Guam to connect through messaging and social media networks. Society has gotten to a point where a lack of connectivity to the internet can really become a disadvantage for those who cannot afford it.

3.3.9.1. Five-Year Action Plan



A five-year action plan, "Internet for All – Guam" was established on August 28, 2023 by the Guam Office of Infrastructure Policy and Development. The five-year action plan has set a tangible goal to ensure that "every islander, no matter their location or income, has access to free high-speed public internet or an affordable private broadband service" (Office of Infrastructure Policy and Development, 2023). The program would utilize Broadband Equity, Access, and Deployment (BEAD) funding from the US Department of Commerce. The program defines a population as 'Served' with affordable internet access greater than 100 Mbps download, 20 Mbps upload, and latency below 100 ms. Unfortunately, these speeds are currently inaccessible for most Guamanians.

The five-year plan has established the following goals and objectives:

- Develop a self-sufficient broadband infrastructure
- Deliver affordable, high-speed internet
- Offer Free Public Island-Wide Service
- Elevate the Internet Speeds Across Guam
- Nurture a Skilled Workforce
- Facilitate Participation in the Digital Economy
- Navigate Regulatory Challenges
- Champion Equitable Access
- Adhere to Federal BEAD Program Requirements

One of the key components of the five-year action plan is the construction of Tier 4 Data Center 4 which include the IXP, CDNs, Hosting Services, and other technologies to address latency. The action plan believes that the data center would position Guam as a "hub for global content providers, addressing latency and boosting the economy" (Office of Infrastructure Policy and Development, 2023).

3.3.9.2. Digital Equity Plan

As a result of the five-year action plan, the Office of Infrastructure Policy and Development released "Internet For All: Journey to Digital Inafa'maolek: Guam's Path to Digital Inclusion," also

known as the Digital Equity Plan (DEP), in April 2024. The DEP's vision for digital equity is a "future where every individual, from each of the covered populations, enjoys equal access to the opportunities and benefits of the digital world" (Office of Infrastructure Policy and Development, 2024). The DEP believes that digital equity is "not merely a technological goal but a moral imperative for Guam" (Office of Infrastructure Policy and Development, 2024). The DEP strives for equitable access to broadband data for the island.

3.3.9.3. Affordability

Figure 3-23 shows that, in comparison to Hawaii and Idaho, Guam pays significantly more than residents of Hawaii and Idaho. The five-year action plan strives to address this issue and to make high-speed internet affordable at a standard of 100 mbps download and 20 mbps upload for a rate of $75 a month.

ISP Name	Download Mbps	Upload Mbps	Price	Per Mbps
Guam / ITE	25	5	$50.00	$2.00
Guam / ITE	75	5	$75.00	$1.00
DOCOMO Pacific Premium	60	3	$110.00	$1.83
DOCOMO Pacific Extreme	120	8	$175.00	$1.46
Guam / GTA minimum	25	1	$92.00	$3.68
Guam / GTA maximum	150	30	$172.00	$1.15
Hawaii / Oahu / Hawaiian Telcom	1000	500	$75.00	$0.08
Ziply Fiber Idaho	50	50	$20.00	$0.40

Figure 3-21. Guam Internet Prices (Office of Infrastructure Policy and Development, 2023).

To address the affordability issue, the five-year plan aims to provide free island-wide wireless internet access. To avoid undermining carriers, the free wireless internet would offer speeds below what's considered as "served," so that carriers would still be able to provide service for customers who want faster speeds.

3.3.9.4. Land Use Policy Implications

The Guam Digital Equity Plan and Five-Year Broadband Action Plan carry significant land use policy implications as they propose extensive deployment of broadband infrastructure across the island. These include the construction of a Tier 4 data center, expansion of middle- and last-mile fiber networks, and installation of wireless towers—all of which require coordinated land use planning, zoning, and streamlined permitting. To enable rapid and equitable deployment, land use policies must accommodate "Dig Once" strategies (to ensure that conduits for internet cables are installed when there's construction work on roads and public spaces), co-location rights, and infrastructure siting near community anchor institutions such as schools and clinics. Village-level engagement is emphasized, meaning land use decisions must reflect localized

needs while balancing infrastructure growth with environmental protection and cultural preservation.

Moreover, the plans treat broadband as essential infrastructure, comparable to water and electricity, suggesting a shift in land use priorities to support digital access as a public utility. This elevates the need for land use regulations to support publicly owned digital infrastructure, designate easements and access corridors, and ensure siting avoids hazard zones and sensitive cultural or ecological areas. As Guam adapts to climate risks and a growing digital economy, land use planning will also need to integrate digital infrastructure into broader resilience, workforce housing, and economic development strategies. In short, digital equity goals necessitate a proactive, inclusive, and adaptive land use framework to ensure equitable and sustainable infrastructure deployment across the island.

3.3.10. Airport Land Use and Infrastructure Planning Considerations

This analysis draws primarily from the 2023 Antonio B. Won Pat International Airport Master Plan Update, which provides a comprehensive roadmap for the airport's growth over the next 20 years. The Master Plan identifies land use, infrastructure, and sustainability challenges that must be addressed to accommodate projected increases in passenger and cargo demand while ensuring continued safety, resilience, and compatibility with surrounding land uses. As the island's only commercial service airport, the Antonio B. Won Pat International Airport plays a substantial role in Guam's economy, public services, and emergency response system, making thoughtful integration with regional land use and transportation planning essential.

A key issue highlighted in the Master Plan is the need to protect Runway Protection Zones (RPZs)[8] and other critical safety areas from encroachment by incompatible uses (Figure 3-24). Although the airport has sufficient airfield capacity to meet projected demand, the master plan notes several safety-related land use issues—including fencing, terrain obstructions, and development within RPZs—that require mitigation to maintain compliance with FAA standards (Master Plan, Executive Summary, p. ES-7). Future development must reinforce land use compatibility by aligning zoning, permitting, and enforcement practices with the Airport Layout Plan and FAA design criteria.

[8] Runway protection zones are a trapezoidal area "off the end of the runway end that serves to enhance the protection of people and property on the ground" in the event an aircraft lands or crashes beyond the runway end. Runway Protection Zones underlie a portion of the approach closest to the airport. Compatible land use within the RPZ is generally restricted to such land uses as agricultural, golf course, and similar uses that do not involve congregations of people or construction of buildings or other improvements that may be obstructions.

Figure 3-22. Runway Protection Zone and Existing Development.

The Master Plan also underscores the importance of preserving adjacent lands for airport-compatible industrial and logistics functions. The northern, northeastern, and southern areas of the airport are home to key air cargo, general aviation, and support facilities—including the Guam Integrated Air Cargo Facility and Airport Industrial Park (p. ES-8). These areas are essential to sustaining aviation services and accommodating projected cargo tonnage growth, which is forecast to more than double by 2039 (p. ES-2). Land use planning must therefore resist pressures to convert these areas to residential or incompatible commercial uses that could undermine long-term airport operations and employment-generating opportunities. Access to the airport is another priority addressed in the Master Plan, particularly the impact of planned improvements to Route 10A and Tiyan Parkway (p. ES-8). These upgrades will improve connectivity and capacity but are expected to affect airport parking and circulation systems, including employee and rental car lots. The Plan recommends a two-story parking structure and revised traffic circulation to manage these changes. These investments should be coordinated with regional transportation and land use plans to ensure multimodal accessibility, support

efficient freight and passenger movement, and prevent new conflicts between airport operations and adjacent communities.

Sustainability and stormwater management also feature prominently in the Master Plan. The airport's physical expansion—through new cargo aprons, terminal enhancements, and parking structures—will increase impervious surfaces and runoff. The Master Plan recommends integrating sustainability strategies such as energy-efficient infrastructure, water conservation, and green stormwater systems (pp. ES-16–17). These strategies are essential given Guam's vulnerability to extreme rainfall and coastal flooding. Climate resilience must also guide the siting and design of critical infrastructure, especially facilities like the fuel farm and air traffic control tower located in low-lying areas.

Finally, the Master Plan raises concerns about noise compatibility and environmental justice. As nearby communities in Barrigada and Harmon grow, updated airport noise contour mapping and land use policies may be needed to prevent new residential or sensitive developments in high-exposure areas (Figure 3-25). Coordination with federal, territorial, and military agencies will also be critical to maintain joint-use airspace, emergency access, and continuity of operations across Guam's civil and defense infrastructure. Land use planning around the airport must therefore reflect a systems-level understanding of risk, access, and interagency responsibilities.

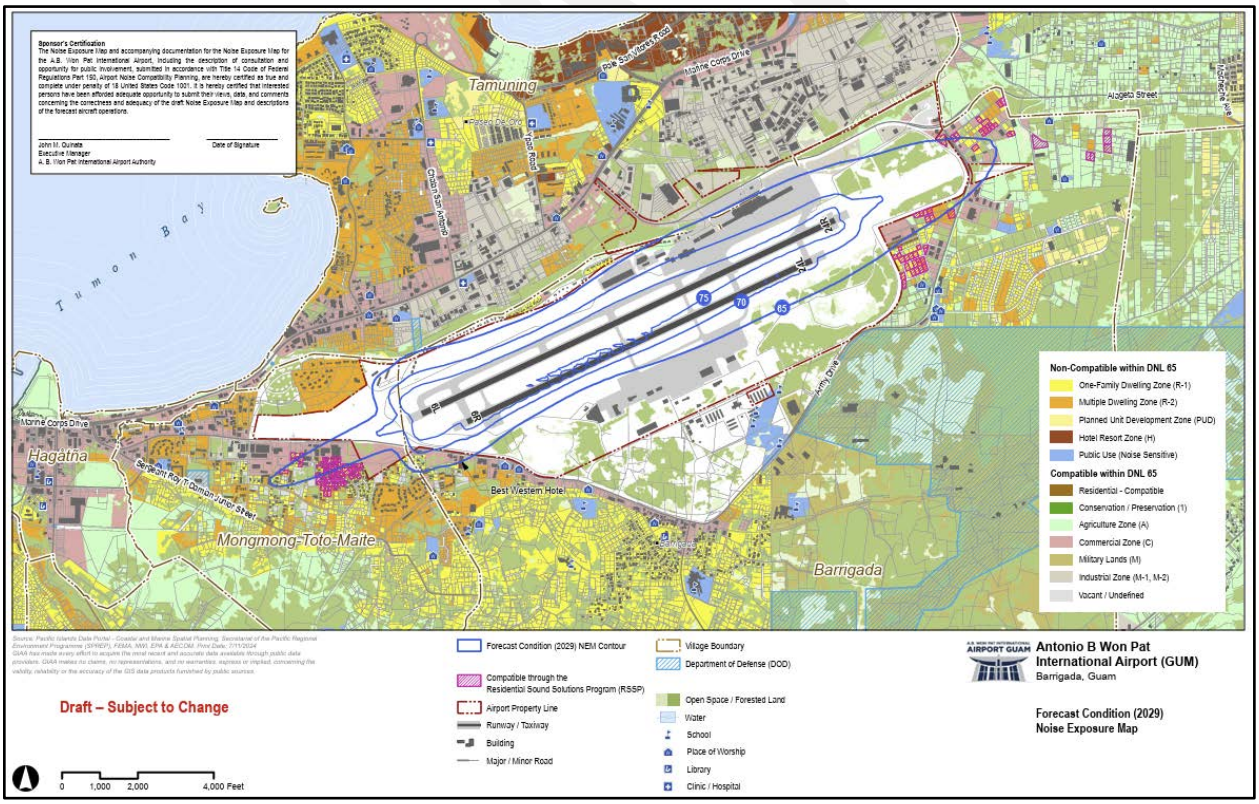


Figure 3-23. Forecasted 2029 Noise Exposure Map for Antonio B. Won Pat International Airport (Antonio B. Won Pat International Airport Master Plan Update).

3.3.11. Port of Guam Land Use and Sustainability

This discussion draws from the 2023 *Port Authority of Guam Sustainability and Resiliency Plan*, which provides the most current evaluation of port infrastructure, operational challenges, and environmental vulnerabilities. The Port of Guam, located in Apra Harbor, is Guam's primary maritime cargo facility and a lifeline for over 90% of the island's imported goods, including food, fuel, building materials, and critical supplies. The port's continued functionality is vital to public safety, economic stability, and disaster resilience. As such, planning for the port's land use, infrastructure, and surrounding development must be closely aligned with Guam's broader sustainability and climate adaptation goals.

The Port Sustainability Plan identifies major physical vulnerabilities to climate change and natural hazards. These include aging and corroded infrastructure, limited drainage capacity, exposure to coastal inundation and sea level rise, and lack of redundancy in critical systems (PAG, 2023, p. 12–13). Key assets such as the main wharves, container yards, power and water systems, and access roads lie within areas highly exposed to storm surge and flooding. The plan recommends elevating and hardening critical infrastructure, relocating vulnerable systems, and planning for eventual sea level rise inundation over the long term. These physical vulnerabilities have direct implications for land use, requiring not just on-site upgrades but broader coordination of coastal management and upland development.

Land use compatibility is another core issue. The port occupies constrained land adjacent to industrial and commercial development in Cabras Island and Piti, but faces pressure from adjacent land uses that may be incompatible with its high-volume, high-impact operations. Heavy truck traffic, noise, and emissions from port activities require careful buffer zoning and

separation from residential or recreational uses. The Port's plan notes that some existing land uses—such as fuel tank farms, utility facilities, and shoreline access points—may conflict with long-term resilience objectives or create hazards in the event of natural disasters (*Id*., p. 34–36). Land use planning should preserve essential working waterfront functions while improving compatibility and access management.

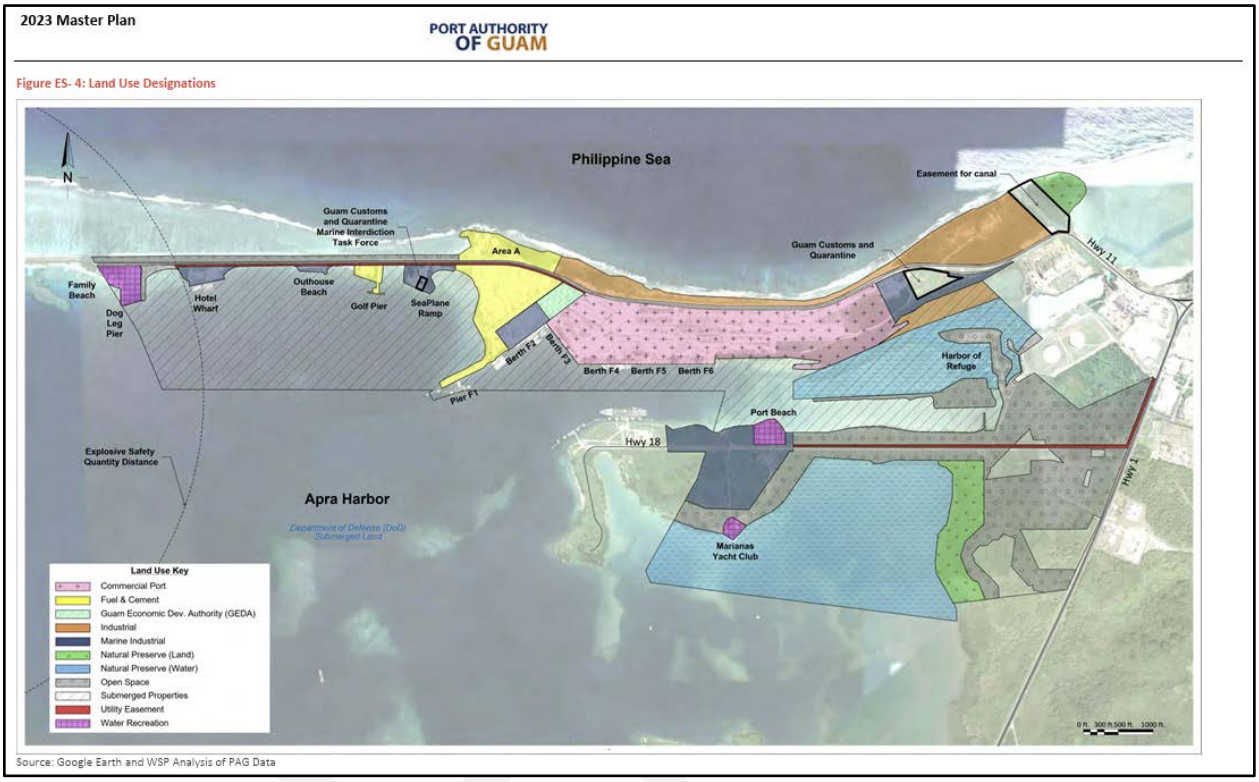


Figure 3-24. Port Authority of Guam Land Use Designations

The port's role as a multimodal freight hub requires robust surface transportation infrastructure and integrated planning with the island's road system (Figure 3-26). Access to and from the port depends heavily on Marine Corps Drive (Route 1), which also serves as a primary corridor for the civilian population. The Port Plan recommends investments in access roads, staging areas, and traffic management systems to reduce congestion, facilitate emergency response, and maintain cargo flow in the event of disruptions. From a land use perspective, this means identifying and preserving corridors for freight mobility and ensuring new development near the port does not constrain operations or emergency access routes.

Sustainability and environmental compliance are also major concerns. The port contributes to air and water quality impacts due to diesel emissions, stormwater runoff, and aging bulk handling infrastructure. The Port Plan calls for implementation of environmental best management practices (BMPs), such as upgrading fueling stations, improving stormwater treatment, and developing green infrastructure where feasible (*Id*., p. 20–21). These actions must be supported through land use policies that enable space for such infrastructure, limit runoff from adjacent uplands, and guide future development toward more sustainable practices.

The port also plays a central role in Guam's climate adaptation and emergency preparedness framework. It must remain functional during typhoons and earthquakes and be positioned to support recovery after disasters. This necessitates regional coordination in hazard mitigation planning, pre-positioning of emergency resources, and cross-sector continuity planning. Land use planning should support this function by enabling redundancies, providing upland staging areas, and maintaining open logistics corridors. The Port Plan specifically calls for a "whole community" approach that includes not just the port, but surrounding businesses, utilities, and public agencies in building resilience (*Id*., p. 39–40).

In addition to infrastructure and operational priorities, the Port's Sustainability and Resiliency Plan identifies the need to protect surrounding coastal and marine ecosystems, including wetlands, mangroves, and nearshore habitats in and around Apra Harbor. These resources provide critical ecological functions—such as shoreline stabilization, fish nursery habitat, and water quality filtration—while also contributing to the port's climate resilience by buffering against erosion and storm surge. Mangrove areas along the harbor's edge and remnants of wetland systems near fuel storage and staging areas are particularly vulnerable to the effects of sea level rise, port expansion, and pollutant runoff. Ensuring compatibility between port operations and these natural systems will require integrated planning and adherence to both local and federal environmental safeguards (see Chapter Five also).

The Port Plan calls for environmental best management practices (BMPs) and nature-based solutions to reduce impacts from stormwater and industrial activity. These include improving drainage infrastructure, installing vegetated swales, and potentially restoring mangrove fringes or tidal wetland buffers where space allows. Such approaches serve dual purposes: they help the port meet Clean Water Act and Coastal Zone Management Program requirements, and they contribute to broader resilience objectives by enhancing natural defenses. Incorporating habitat protection into land use and infrastructure decisions will strengthen the port's sustainability profile and ensure that Guam's working waterfront supports both economic and environmental security.

3.3.12. Public Services Policies and Sustainability

Ensuring that new development in Guam is supported by adequate public services aligns closely with the United Nations Sustainable Development Goals (SDGs), particularly SDG 11: Sustainable Cities and Communities. The Guåhan 2050 Sustainability Plan reinforces key SDG principles by requiring that urban development is strategically planned, infrastructure-supported, and environmentally sustainable. SDG 11.1 advocates for safe and affordable housing, which necessitates proper public services such as water, power, wastewater systems, and transportation networks. Similarly, SDG 11.3 emphasizes inclusive and sustainable urbanization,

which is reflected in Guam's commitment to concentrating development in areas with established infrastructure, preventing urban sprawl, and protecting rural and sensitive lands.

Beyond urban planning, these policies also align with SDG 6: Clean Water and Sanitation by ensuring that groundwater withdrawals remain within sustainable limits, wastewater infrastructure supports public health, and stormwater systems mitigate environmental risks. Furthermore, the emphasis on renewable energy and resilient power supply directly supports SDG 7: Affordable and Clean Energy, aiming for a transition to 100% renewable energy by 2045 in accordance with Guam's energy policies. Investments in multi-modal transportation and public transit systems also advance SDG 9: Industry, Innovation, and Infrastructure, improving mobility while reducing traffic congestion and emissions. By integrating these SDG-aligned principles into Guam's land use policies, the island is fostering a future that balances economic growth, environmental protection, and social well-being, ensuring long-term resilience and sustainability for its communities.

PUBLIC SERVICES POLICIES

Urban Development

SC-7. Adequate Public Services.

New development in designated Urban Areas must be served, prior to occupancy, by adequate and sustainable public services, including water supply, wastewater connection, primary and secondary access roads, power, and communications. The Bureau of Statistics and Plans, Department of Land Management, and the CHamoru Land Trust (CLT) shall coordinate about the adequacy of public services and other relevant land use matters prior to any disposition, transfer, subdivision, or development proposal of CLT lands that may lead to an increase in water, wastewater, or other public services demand.

SC-8. Capacity and Growth Inducement.

New public services infrastructure shall be adequately sized to support planned development and to not induce growth inconsistent with other provisions of the Guåhan 2050 Sustainability Plan.

SC-9. Development Over the Aquifer.

New development over the aquifer must be served by public sewer or meet Guam EPA septic discharge requirements pursuant to P.L. 37-105.

SC-10. Subdivision Over the Aquifer.

Subdivision of parcels over the Northern Guam Lens Aquifer not served by public wastewater or able to comply with Guam EPA septic discharge requirements pursuant to P.L. 37-105 is prohibited.

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Water Supply

SC-11. Sustainable Water Supply.
Groundwater withdrawals shall not exceed the aquifer's sustainable yield.

SC-12. Adequate Water Supply.
New development must be served by adequate, safe public water supply, including source waters, storage (water tanks) and distribution systems, or in rural areas by sustainable and safe private water, where applicable.

SC-13. Private Water Supply.
Private water supply systems shall be designed, operated, and function consistent with the protection of public health.

SC-14. Water Capacity and Sizing.
Public and private water systems, including wells, storage, and distribution infrastructure, shall be provided and designed to serve planned, sustainable growth, support minimum fire safety flows, and not induce growth inconsistent with the Guåhan Sustainable Development Plan.

Wastewater Infrastructure

SC-15. Wastewater Capacity.
The capacity of public and private wastewater systems shall be sized to serve planned, sustainable growth and not induce growth inconsistent with the Guåhan Sustainable Development Plan.

SC-16. Wastewater Public Health.
Wastewater systems shall be designed, operated and maintained in support of the public health and public groundwater supplies.

SC-17. Adequate Wastewater Systems.
New development must be served by adequate public wastewater service, consistent with GCA Title 10 and implementing regulations, or in rural areas by a private system authorized by Guam EPA. The adequacy of wastewater systems for existing development shall be evaluated and connected to public wastewater service if feasible and as otherwise required by law. Expansions or redevelopment of existing development shall comply with this policy.

Transportation and Mobility System

SC-18. Adequate Roads, Circulation, and EV Infrastructure.
New development shall be served by adequate public roadways and circulation capacity, including bicycle, pedestrian, and transit options and supporting infrastructure (e.g., bike

racks, lighting, benches), consistent with applicable federal standards. EV charging infrastructure shall be supported to meet EV demand.

SC-19. Multi-modal Transportation.

Public roads shall be designed and operated for safe, multi-modal transportation, including automobile, bicycle, and pedestrian use. Existing roads shall be regularly assessed and those not in compliance with required safety standards shall be upgraded as soon as possible. Existing transportation facilities shall be enhanced with bicycle and pedestrian infrastructure, including bike lanes, sidewalks, and crosswalks.

SC-20. Public Transportation.

Public transit systems, rideshare, bike lanes, on-demand transit, and other non single-occupancy vehicle transportation programs shall be facilitated and provided for in new development and infrastructure improvements where applicable.

SC-21. Parking.

New development, including redevelopment of existing structures and land uses, shall be served by adequate parking facilities. Parking requirements may be reduced if supported by offsetting transit options.

SC-22. Road Capacity and Transportation Planning.

New roads and parking facilities shall be sized to serve planned, sustainable growth and not induce growth inconsistent with the Guåhan Sustainable Development Plan. Update the Guam Transportation Management Plan for 2030-2050. Establish Level of Service (LOS) standards to maintain a sustainable road system.

SC-23. Context-Sensitive Setback and Parking Standards.

Establish updated, context-sensitive setback and parking standards, including through approved neighborhood parking management plans, that support multimodal mobility, pedestrian safety, and stormwater management objectives, consistent with site conditions, land use intensity, and village design principles.

SC-24. Urban/Village Setbacks & Parking Ratios.

Implement the following setbacks and parking ratios in Urban and Village centers as appropriate:

- **Setbacks:** Front yard setback may be reduced to 10 ft; side setbacks 5–8 ft, to support active street frontage without compromising safety or stormwater buffers.
- **Parking Ratios:** Allow reduction to ~0.75 auto stalls per residential unit; 1 per 500 ft² commercial, pursuant to an approved neighborhood parking management plan; allow compact/angled configurations, shared on-street facilities, and integrate required bicycle parking per § 61531(l).

SC-25. Rural/Agricultural Setbacks & Parking Standards.

Implement the following setbacks and parking ratios in Rural and Agricultural Areas as appropriate:

- **Setbacks:** Maintain existing minimums (15–20 ft front; 7–10 ft side/rear) to support open space, operations, and emergency access. Allow limited modular variances (±3 ft) per § 61616(l) for practical hardship cases.
- **Parking:** Comply with base statutory standards—1 auto stall per dwelling; 1 per 100 ft² retail; maintain standard stall dimensions and aisle widths as defined in § 61531 and § 61532.

SC-26. Flexible Loading and Shared Parking in Denser Zones.

Urban mixed-use zones may allow angled parking (up to 45°) with 13.5 ft aisle widths to economize space. Promote shared parking between complementary uses (e.g. retail/night & residential/day) to reduce overall parking footprint, supported by zoning flexibility.

SC-27. Emerging Resilience Standards via Setback Design.

Encourage setbacks to incorporate bioretention strips or native landscaping zones, especially where stormwater drainage is constrained. Parking layouts should be designed for dual use—e.g. as temporary staging or emergency surge space during disasters—while still complying with dimensions and aisle standards.

SC-28. Islandwide Standardization of Street Naming and Address Systems.

- **Uniform Guidelines:** Establish and enforce a consistent, islandwide protocol for street naming and building numbering, aligned with National Emergency Number Association (NENA) standards and compatible with public safety systems (e.g. 911 response, disaster evacuation).
- **Urban Areas and Village Cores:** Prioritize block-by-block precision, GIS tagging, and integration with parcel databases, especially in growth areas (e.g. Dededo, Tamuning, Mangilao). Ensure names are unique, culturally appropriate, and usable by emergency responders and logistics.
- **Rural and Agricultural Areas:** Implement simplified linear addressing or distance-based numbering (e.g., house number = distance from road origin), allowing lower density areas to be included in the grid while minimizing maintenance burden.
- **Technology Integration:** Invest in an up-to-date, centralized digital platform integrating naming, numbering, and GIS location data across all government departments (DPW, Land Management, GFD, etc.) for permit processing, infrastructure planning, and emergency access.

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Stormwater Capacity

SC-23. Stormwater Facilities.

New development, including redevelopment, shall include or be served by adequate stormwater detention, treatment, conveyance capacity, and maintenance, including on and offsite best management practices as specified in the CNMI and Guam Stormwater Management Manual and Supplement.

SC-24. Stormwater Capacity.

Stormwater facilities shall be designed and sized to serve planned, sustainable growth and not induce growth inconsistent with the Guåhan Sustainable Development Plan.

SC-25. Peak Storm Events System Assessment.

Assess island drainage systems to identify priority improvements to address significant risks from peak storm events.

Waste Management

SC-26. Zero-waste Infrastructure.

Designate and protect land for zero waste infrastructure (e.g., reuse centers, C&D recovery, composting). Streamline permitting for facilities aligned with zero waste goals. Allow accessory recovery and recycling uses in commercial and light industrial zones.

SC-27. Construction and Demolition Waste Diversion.

Require waste diversion plans for construction and demolition permits.

SC-28. Recycled Materials in Public Infrastructure.

Maximize use of recycled materials as feasible in public infrastructure projects.

SC-30. Incentives for Green Industry and Circular Economy.

Consider land use incentives, including density bonuses and permit streamlining for projects incorporating site recycling, material reuse, or green job creation. Support eco-industrial parks consistent with G50SP land use designations and policies.

SC-31. Infrastructure Siting Coordination.

Use land use planning to reduce illegal dumping by ensuring accessible, conveniently located drop-off and processing facilities.

SC-32. Distribution of Waste Management Infrastructure.

Ensure that zero waste infrastructure and services are equitably distributed without disproportionately impacts across the villages. Engage village residents in site selection and planning of reuse and recycling facilities.

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Power Supply

SC-33. Sustainable Power.

New development shall be served by adequate and sustainable power.

SC-34. Renewable Energy.

Non-fossil fuel energy developments and infrastructure should be prioritized and provided for through appropriate siting and design to achieve 100% affordable, technically sound, resilient, and equitable renewable energy for Guam by 2045 consistent with GCA §8311, in coordination with community interests and the National Renewable Energy Lab (NREL).

SC-35. Locating and Planning for New Energy Facilities.

a. Energy facility development shall be located to avoid adverse impacts to natural resources, parks, and communities to the maximum extent feasible. This includes utilizing distributed and diverse energy sources using developed locations, such as solar facilities over public parking areas and larger industrial and commercial buildings.

b. **Large Solar Arrays.** BSP shall complete, in coordination with GPA, DLM, and other relevant agencies, a siting and feasibility study to identify appropriate locations for large solar arrays that (1) avoid to the maximum extent feasible lands designated as resource conservation or prime agricultural land, sensitive habitats, wetlands, or streams, and land located in a hazard zone, including coastal setback areas, flood zones, and steep slopes or unstable lands; (2) consider and minimize potential impacts to residential areas; (3) minimize impacts to scenic landscapes or public views; and (4) optimize proximity to the power grid and other energy system infrastructure.

SC-36. Rooftop Solar Energy.

Rooftop residential, government, commercial, and industrial solar energy siting shall be supported to minimize impacts to undeveloped areas and support energy grid resilience and maximum affordability, consistent with the Guam Clean Energy Master Plan. Where appropriate, residential subdivisions of 5 or more lots, and commercial developments greater than 10,000 square feet shall include solar energy systems or provide equivalent in lieu fees to the GPA for purposes of public solar energy or other renewable energy facility development.

SC-37. Undergrounding.

Power lines shall be installed underground to the maximum extent feasible.

SC-38. Facility Security.

Power and energy facilities shall be sited and designed for long-term safety and security without unnecessary impacts to public recreational access or other public purposes.

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Communications

SC-39. Universal Telecommunications.
New development shall be served by adequate telecommunications, including state-of-the-art transmission technologies equitably distributed.

SC-40. Undergrounding and Wireless.
Communication infrastructure shall be installed underground or rely on wireless technologies to the maximum extent feasible.

SC-41. Co-location, Consolidation, and Visual Mitigation Required.
Telecommunication transmission infrastructure shall be co-located and consolidated, outside of the roadway pavement, to the maximum extent feasible. Communication towers and other facilities shall be designed with visual mitigations and screening to reduce impacts on Guam's scenic character.

SC-42. Facility Security.
Communication facilities and infrastructure shall be sited and designed for long-term safety and security without unnecessary impacts to public recreational access or other public purposes.

Airport Land Use and Infrastructure

SC-43. Ensure Compatible Land Use in Airport Safety Zones.
Preserve the safety and operational integrity of the airport by maintaining land use compatibility in Runway Protection Zones (RPZs), safety areas, and airspace clearance zones. Prohibit new incompatible development in these zones and coordinate zoning and permitting with FAA guidelines and the Airport Layout Plan.

SC-44. Preserve Strategic Lands for Airport-Compatible Development.
Protect and reserve adjacent lands, including those in the Airport Industrial Park and former NAS property, for logistics, cargo, aviation maintenance, and other airport-compatible industrial uses. Avoid rezoning or redevelopment for residential or incompatible commercial use that may constrain long-term airport operations.

SC-45. Coordinate Airport Access Improvements with Regional Mobility Planning.
Support the integration of Route 10A and Tiyan Parkway improvements into broader transportation planning. Ensure safe and efficient access for airport users—passengers, workers, freight, and emergency vehicles—while minimizing local congestion and land use conflicts.

SC-46. Integrate Sustainable Stormwater Management into Airport Development.
Require all new and redeveloped airport and adjacent facilities to implement sustainable stormwater management practices consistent with other policies of this plan, including

green infrastructure, detention systems, and runoff quality treatment to manage flood risks and protect water quality.

SC-47. Mitigate Airport Noise and Air Quality Impacts.
Discourage new sensitive land uses, such as housing and schools, in areas affected by aircraft noise and emissions. Use noise contour maps, air quality data, and flight path analyses to inform planning, zoning, and development review decisions.

SC-48. Build Resilient and Sustainable Airport Infrastructure.
Support investments in infrastructure hardening and decarbonization at the airport, including energy-efficient building design, renewable energy, electrification of support systems, and storm hazard protection. Coordinate with the Guam Coastal Management Program to ensure consistency with climate resilience and coastal zone policies.

Port of Guam Land Use and Sustainability

SC-49. Protect and Reinforce Port Infrastructure and Lifeline Systems.
Support investments to harden, elevate, and modernize critical port infrastructure to reduce exposure to climate hazards, including sea level rise, coastal flooding, and typhoon damage. Coordinate hazard mitigation planning with port operations and adjacent land uses to ensure system-wide resilience.

SC-50. Ensure Land Use Compatibility and Buffer Zones around the Port.
Maintain zoning and land use designations that preserve industrial and maritime functions within the port district and prevent encroachment of incompatible uses. Encourage land use buffers and mitigation strategies (e.g., traffic controls, vegetation, setbacks) to reduce conflicts with adjacent communities.

SC-51. Integrate Port Access Planning into Regional Transportation Systems.
Coordinate freight and cargo access routes to the port with regional transportation planning. Preserve and enhance road capacity and staging areas along Marine Corps Drive and related corridors to support efficient and resilient movement of goods, including during emergencies.

SC-52. Advance Stormwater and Environmental Management at the Port.
Support implementation of green infrastructure, stormwater BMPs, and environmental upgrades at the port and surrounding industrial areas. Require adjacent developments to manage runoff and minimize pollution loads that may affect harbor and marine ecosystems.

SC-53. Support the Port's Emergency and Disaster Preparedness Role.
Plan for redundant systems, upland logistics zones, and continuity of operations to ensure the port's functionality during and after disasters. Designate compatible upland areas to serve as contingency logistics hubs or emergency support facilities as part of Guam's broader adaptation framework.

SC-54. Protect Coastal Wetlands, Mangroves, and Marine Resources at the Port. Ensure that all port operations, infrastructure upgrades, and adjacent land development avoid or minimize adverse impacts to coastal wetlands, mangrove forests, and nearshore marine ecosystems. Require compliance with environmental regulations and support enhancement measures such as shoreline buffers, habitat restoration, and green infrastructure that provide ecological and protective benefits. Coordinate with resource agencies to integrate habitat considerations into all phases of port planning, permitting, and construction.

3.4. Housing

Guam faces significant challenges in providing adequate and sustainable housing for its growing population. These challenges include a shortage of affordable housing, exposure to climate change-related hazards, and aging infrastructure that limits new development. At the same time, the island must balance the demand for new residential land while ensuring that existing communities remain resilient to climate change impacts such as sea level rise, increasing storm intensities, extreme flooding, and other environmental risks. This section summarizes the recent history of housing issues in Guam and the basis for policies that aim to create a diverse and sustainable housing market that meets the needs of Guam's residents while promoting climate resilience and infrastructure efficiency.

3.4.1. Contemporary Housing Trends and Issues

Over the past four decades, Guam has experienced significant shifts in housing trends and land use, influenced by economic fluctuations, military activities, and policy decisions. In the 1980s, the federal government maintained control over approximately one-third of Guam's land, primarily for military purposes, a situation unchanged since the end of World War II. This extensive federal land ownership limited the availability of property for civilian housing and development, contributing to a constrained real estate market (Government of Guam, 1988).

The early 1990s saw a concerted effort to analyze and address housing needs. A 1994 report highlighted challenges such as infrastructure deficiencies, a lack of affordable housing, and environmental degradation resulting from rapid, unplanned growth. These issues underscored the necessity for comprehensive land use planning to balance development with environmental preservation (BSP, 1994).

In recent years, Guam's housing market has faced renewed pressures. The military buildup, particularly the relocation of U.S. Marines from Okinawa, has intensified demand for housing, leading to rising property values and rental rates. This surge has exacerbated the existing shortage of affordable housing, including on-base, making it increasingly difficult for local residents to secure homes within their financial means (GAO, 2025; GAO, 2024; Reuters, 2024). As summarized by the GAO:

> *In the absence of identified personnel requirements, DOD faces challenges to ensuring an adequate support infrastructure at installations in Guam to accommodate both Marine Corps personnel relocating from Okinawa and future GDS personnel.[] Guam has limited space and capacity to support the expected growth in personnel and related installations and services. DOD faces significant challenges to ensuring GDS personnel and their families have sufficient housing, schools, medical care facilities, and commissaries.* (GAO, 2025, p. 22)

3.4.2. Affordable Housing and Housing Diversity

The affordability crisis in Guam has been exacerbated by rising construction costs, land scarcity, and a mismatch between housing supply and income levels. Many low- and moderate-income households struggle to find suitable housing within their means, while higher-density and mixed-use developments remain limited. To address this, it is necessary to maintain adequate land availability and zoning for a range of housing types, including single-family, multi-family, and mixed-use developments, ensuring that all income levels have access to affordable, safe and sustainable housing options. Inclusionary housing requirements and density bonuses will help increase the availability of affordable units while promoting efficient land use.

Guam is currently grappling with a multifaceted housing crisis characterized by a shortage of affordable units, vulnerability to climate-induced hazards, rising construction costs, and infrastructure challenges. The 2019 Guam Housing Study and Needs Assessment projected a demand for nearly 10,000 additional housing units between 2020 and 2025 to accommodate population growth and address existing shortages (GHURA, 2020). Notably, the island's housing stock increased by only 988 units between 2010 and 2020, highlighting a significant shortfall in meeting housing needs (BSP, 2025).

The affordability crisis has been exacerbated by rising construction costs and limited land availability. In 2021, the median price for a single-family home reached $375,000, a 12% increase from the previous year, making homeownership increasingly unattainable for many residents. Most recently, the median home price was around $400,000. When plotted against median household income, the dramatic decrease in affordability is apparent, with the ratio of income to home price falling by more than half (Figure 3-27). This situation is further strained by the influx of military personnel and associated temporary workers, which has led to increased demand and competition in the housing market (MBJ, 2023).

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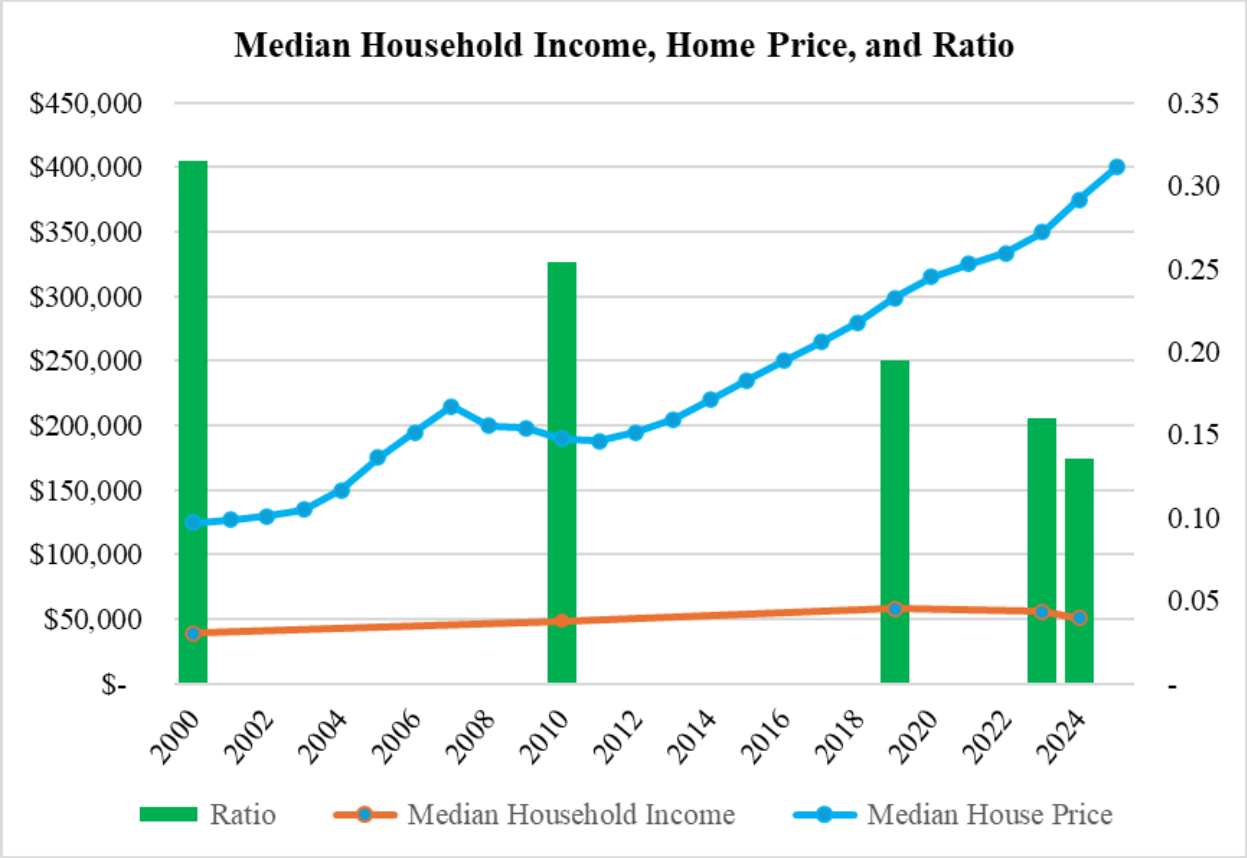

Figure 3-25. Median Household Income, Home Price and Ratio

According to some village mayors, there are concerns about the adequacy of the housing stock: "Our village seems to have an adequate number of livable spaces in general, as there are many apartment-type units. However, many of those units house more than one household." And, despite some high-quality affordable housing, some felt that "many homes are costly considering the quick development in the more recent past." Mayors also emphasized the need to explore new or redeveloped housing opportunities, including development of supporting infrastructure, particularly along Route 15, where many residents apparently use Chamorro Land Trust properties. "Perhaps new housing can be possible for our people if these large properties have infrastructure needed to build."

Survey responses from the G50SP Workshop (Figure 3-28) highlight community concerns and priorities for sustainable growth with respondents emphasizing the importance of and need for:

- "Affordable housing, repairing education facilities,"
- "Affordable, multiuse housing, protection of our water sources, renewable energy: solar panels on roofs (not clearing land)."

When asked how affordable housing could be provided, responses suggested that Guam should "subsidize affordable housing construction and training for construction workers/architects in

Guam," as well as "provide more options in housing choices and accommodations to income." Others called for "good and stronger policy and laws for businesses to provide affordable housing to the local people," while pointing out that the government should evaluate whether Chamorro Land Trust land was being used for farming as was originally intended, and whether there were opportunities to leverage this land for affordable housing development for all.

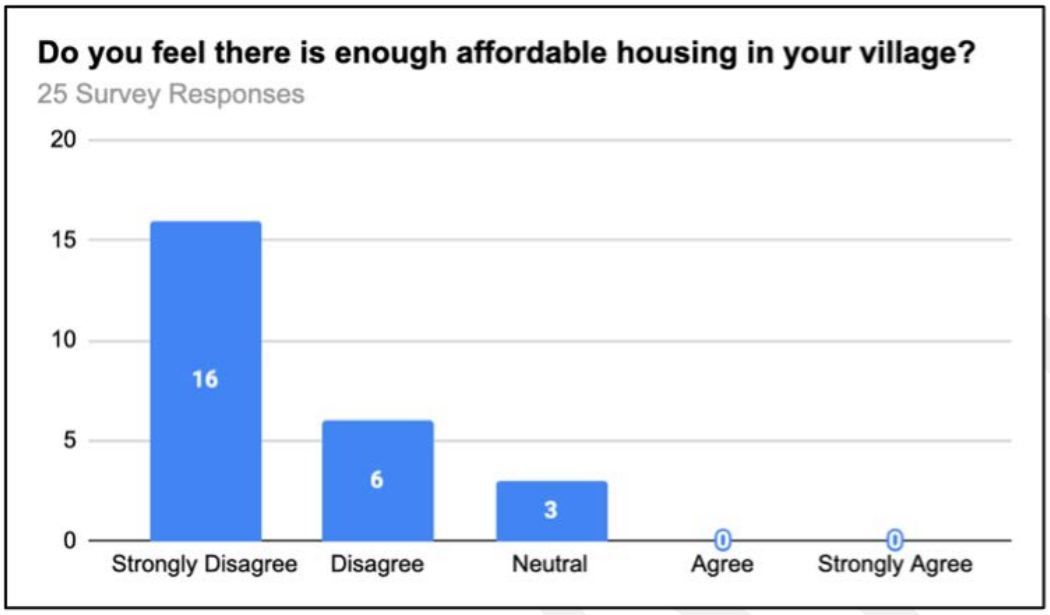

Figure 3-26. Public Response to Available Affordable Housing.

As seen in *Figure 3-29*, further community engagement through the G50SP Island Wide survey revealed that 82% of respondents believed a combination of both multi-family and single-family housing was the best approach to addressing Guam's housing needs. A strong majority (87%) supported the construction of affordable housing in their village, while 12% opposed it. Similarly, 79% supported the construction of more multi-family housing units in their village, with only 19% opposed.

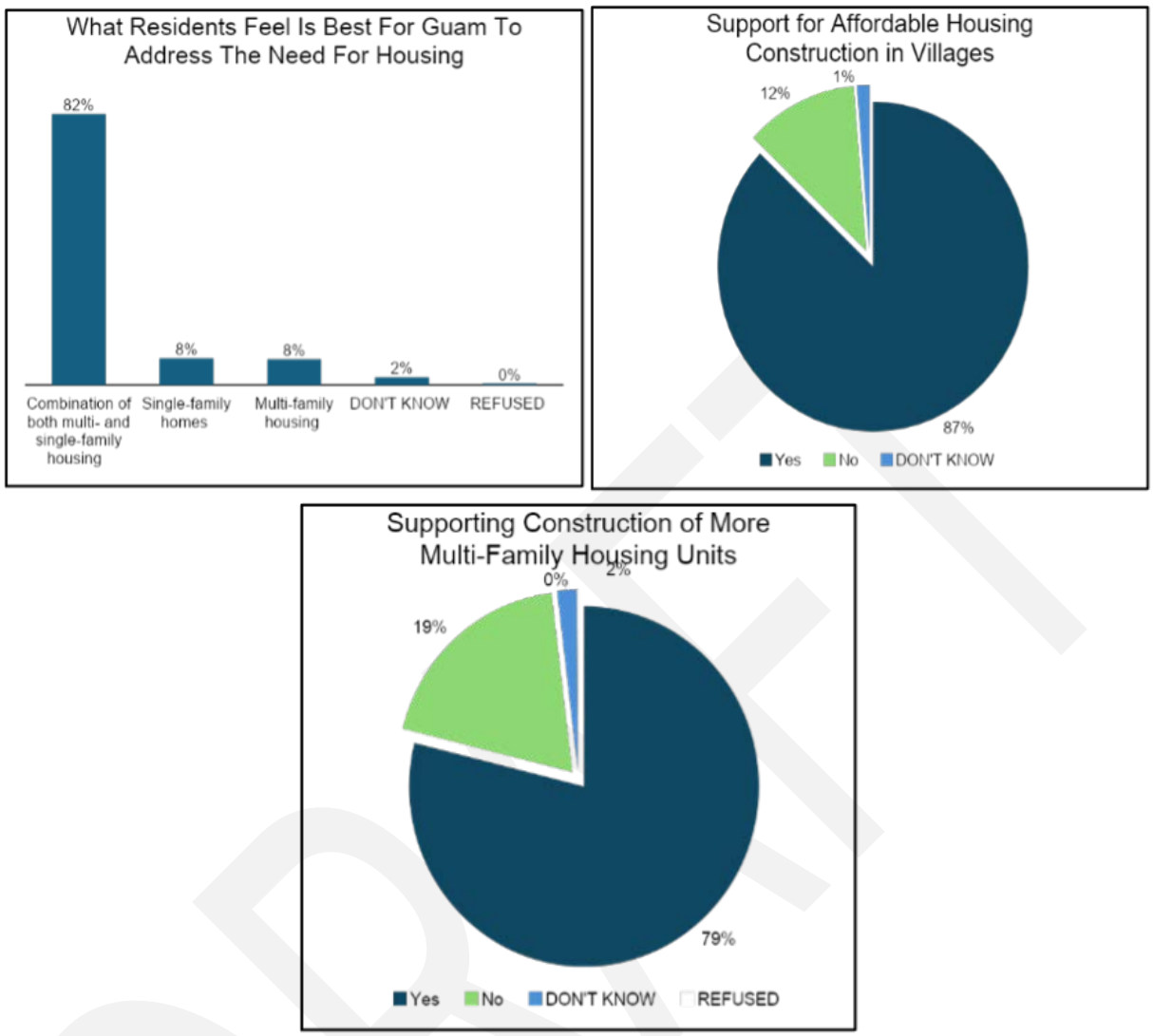

Figure 3-27. Public Response to Housing Needs

Accessory Dwelling Units (ADUs) is another viable solution for increasing affordable housing options. Also known as "granny flats" or "in-law suites," these units can serve multiple purposes, such as housing family members or generating rental income, thereby addressing the pressing need for affordable housing on the island. Many communities have been updating their land use plans and zoning codes to allow ADUs, including specific requirements to ensure compliance with existing building codes, such as minimum lot sizes, unit dimensions, and utility hookup requirements. For instance, in one proposal for Guam, lots measuring 3,500 square feet could accommodate a 400-square-foot unit, while those of 5,500 square feet or larger could support up to 900 square feet. However, any increase in housing density should be closely coordinated with other elements of the G50SP that seek to protect Guam's drinking water supply by minimizing septic demand over the aquifer.

Enabling the construction of ADUs could provide practical and immediate solutions to the affordable housing crisis, allowing families to care for their members—particularly the elderly—

and offering more affordable rental opportunities for the community. Implementing ADUs could be a strategic approach to alleviating Guam's housing shortage. By maximizing existing residential spaces, ADUs can increase housing density without the need for extensive new developments. This approach not only addresses the immediate demand for affordable housing but also supports multigenerational living arrangements and provides homeowners with additional income streams, contributing to the economic resilience of Guam's communities.

3.4.3. Mixed-Use and Compact Development

Traditional settlement patterns in Guam have favored village centers with a mix of residential, commercial, and community uses. Encouraging mixed-use development and compact urban design will help revitalize village cores, reduce transportation costs, and enhance access to essential services. Higher residential densities near employment centers, public services, and transit corridors will maximize land efficiency and minimize the need for costly infrastructure expansion, which is consistent with the growth management and public services policies of G50SP.

Planned Unit Developments (PUDs) and innovative housing models, such as small-lot developments and mid-rise buildings, can provide additional flexibility and creativity in residential planning. This approach aligns with the 2009 North and Central Land Use Plan, which included mixed use land use designations along major developed road corridors in Yigo, Dededo, Tamuning, and Barrigada-Mangilao, which are largely incorporated into the land use map of the G50SP (Figure 3-30).

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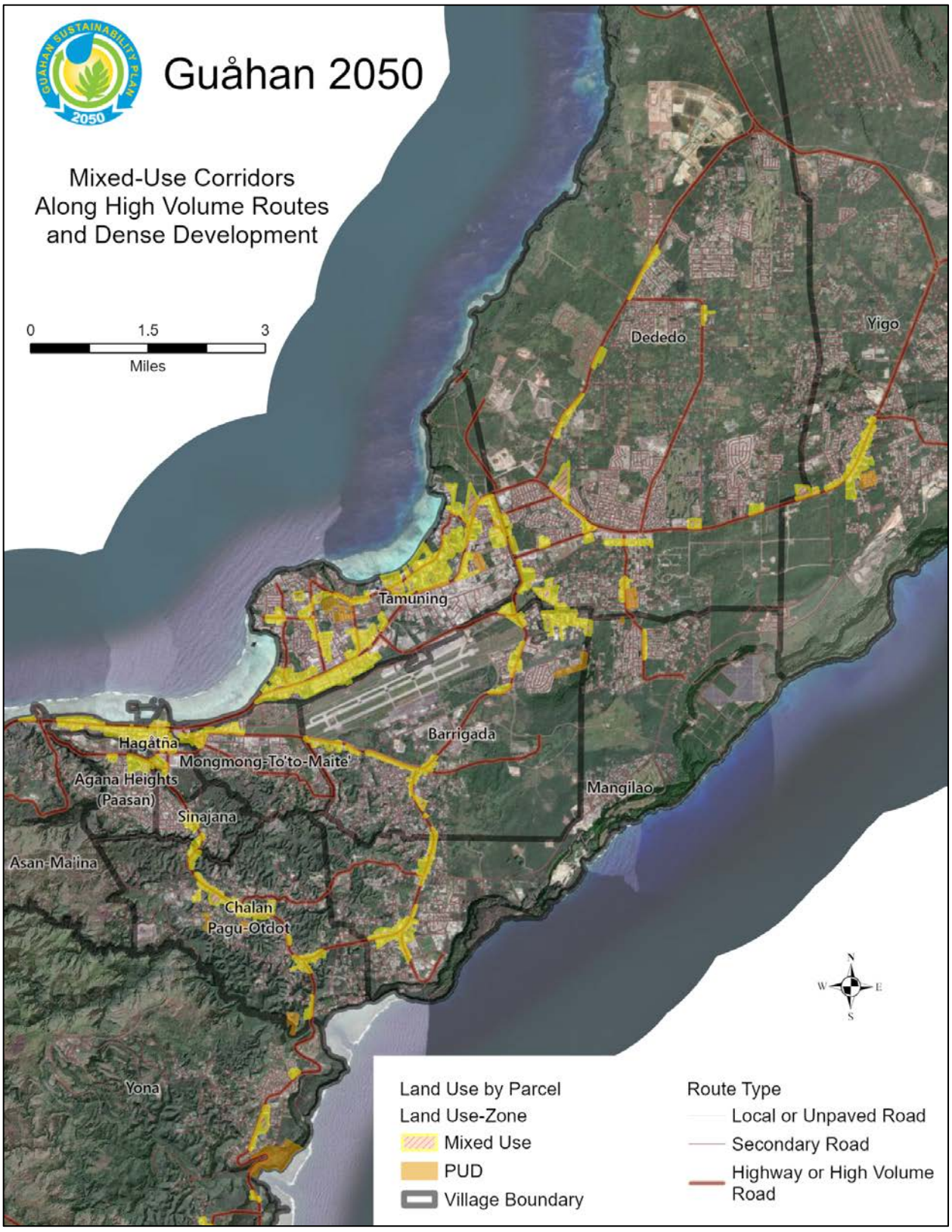

Figure 3-28. Mixed-use corridors (yellow) in North and Central Guam.

3.4.4. Temporary Workforce Housing

The demand for temporary workforce housing, particularly related to military construction and economic growth, requires strategic planning to prevent excessive strain on existing communities and resources. Ensuring that such housing is located in designated urban zones and designed for potential conversion into permanent residential use will help mitigate long-term land use challenges.

The Challenge: Housing for Temporary Workers

Guam faces a severe housing shortage driven by an influx of temporary foreign workers—primarily construction laborers under the H-2B visa program—who are critical to ongoing military and infrastructure projects. With thousands of temporary workers arriving to support the $8 billion military buildup and civilian development, the island's limited housing stock is under strain. Many contractors struggle to find suitable accommodations, which in turn affects project timelines, increases rental costs, and contributes to the broader affordability crisis for local residents.

The key issues raised by this challenge include:

- **Housing Market Pressure:** Increased demand for rental properties has driven up housing costs, making it harder for local families to find affordable homes.
- **Zoning and Land Use Restrictions and Concerns:** Temporary worker housing is largely restricted to industrial (M-1) zones, limiting opportunities for new worker accommodations. At the same time, temporary worker housing may not be compatible with more established residential neighborhoods, tourist districts, school and park locations and other competing land uses.
- **Infrastructure Limitations:** Many areas lack sufficient sewer, water, and transportation infrastructure to support large-scale workforce housing developments.
- **Project Delays:** Without adequate housing, contractors struggle to bring in enough skilled labor, slowing down major construction projects and increasing costs.

LAND USE APPROACHES AND POLICY SOLUTIONS

The need for temporary workforce housing can be addressed through multiple strategies, including land use policy:

1. **Expand Workforce Housing Zones:** Modify zoning laws to allow temporary worker dormitories in select commercial and mixed-use zones rather than restricting them to industrial areas.
2. **Fast-Track Approvals for Workforce Housing:** Streamline the permitting process for dedicated worker housing facilities to reduce bureaucratic delays and encourage private investment.

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3. **Leverage Underutilized Federal and Public Lands:** Repurpose unused government-owned (military) land for worker housing projects, particularly near job sites to reduce transportation burdens.
4. **Encourage On-Site Housing for Large-Scale Developments:** Provide incentives for developers to include on-site dormitory housing as part of major construction projects.
5. **Public-Private Partnerships for Housing Villages:** Support the development of centralized, high-capacity workforce housing projects that can serve multiple employers, ensuring safe, sanitary, and cost-effective accommodations.
6. **Increase Local Skilled Workforce:** Reduce long-term reliance on foreign labor by investing in training programs to develop a skilled local workforce, mitigating future housing shortages.

These strategies may help Guam balance the need for temporary worker housing with sustainable land use policies that protect local residents from market disruptions while ensuring the continued success of critical infrastructure and military projects.

3.4.5. The Need for Specialized Community Housing.

Guam's changing demographics and social needs highlight an urgent demand for specialized community housing, including senior living facilities, supportive housing for persons with disabilities, transitional housing for the unhoused, and group homes for foster care and other vulnerable populations. As discussed in Chapter 2, the island's aging population is a growing concern. By 2030, it is projected that over 20% of Guam's residents will be 65 years or older. This shift requires expanded senior housing options, from independent living communities to assisted living and skilled nursing facilities. Currently, Guam lacks sufficient licensed assisted living centers, forcing many elderly residents to seek care from family members or relocate off-island for specialized medical and eldercare services.

Additionally, supportive and transitional housing is essential for individuals experiencing homelessness, survivors of domestic violence, and persons with disabilities. Guam's housing market is highly competitive and expensive, making it difficult for low-income or vulnerable populations to secure stable housing. A coordinated land use strategy is necessary to integrate these facilities into the broader community, ensuring that transitional and supportive housing programs are not isolated but rather co-located near essential services, parks, community centers, and commercial areas. Such planning would improve accessibility to healthcare, public transportation, employment opportunities, and social services, fostering long-term stability for residents.

The Need for Specialized Housing Services

- The **Guam Four Year State Plan on Aging (2024-2027)** highlights that, despite discussions on establishing assisted living facilities, there remains a need to implement regulations and attract businesses to provide such services. Consequently, families often resort to off-island healthcare due to limited local options (DPHSS, 2023).
- A recent study published in **Alzheimer's & Dementia** notes that Guam currently has no nursing homes or assisted living facilities specializing in care for individuals with Alzheimer's disease and related dementias, placing a significant burden on families (Twaddle, et al., 2025).
- An article from **NeighborWorks America** discusses the severe lack of nonprofit housing and community development capacity in Guam, exacerbating the housing shortage and impacting the availability of specialized facilities for seniors (Barbier, 2024).

From a land use perspective, Guam's planning policies should designate areas for specialized housing developments that align with existing infrastructure and community assets. Strategic zoning modifications could expand the availability of land for group homes and care facilities while incentivizing mixed-use developments that incorporate residential, commercial, and recreational spaces. Land use strategies include:

- Updating zoning codes where necessary to permit senior housing, group homes, and transitional housing in more commercial and residential districts.
- Providing incentives (such as density bonuses or tax credits) to encourage private sector investment in specialized housing.
- Encouraging co-location of facilities near parks, health clinics, and transit hubs to improve accessibility and enhance quality of life.
- Streamlining permitting processes for non-profits and developers to fast-track the construction of community support housing.

The G50SP includes policy to support increased specialized community housing, including co-location of facilities in optimum areas and to initiate a focused planning assessment to determine the need and best locations for such housing.

3.4.6. Housing Land Use Policy and Sustainability

The G50SP's land use plan housing policies directly support multiple United Nations SDGs by promoting affordable, inclusive, and sustainable housing for a diverse population. Overall, the policies ensure residential land availability, density planning, mixed-use development, and

housing affordability, aligning with key SDGs such as Sustainable Cities and Communities (SDG 11), No Poverty (SDG 1), Climate Action (SDG 13), and Reduced Inequalities (SDG 10).

The policy to maintain adequate residential land for a diversity of housing needs supports SDG 1 (No Poverty) and SDG 11 (Sustainable Cities and Communities) by ensuring that land use planning prioritizes equitable access to safe and sustainable housing. By providing zoning and public services to accommodate single-family and multi-family housing across income levels, the plan fosters inclusive urban development, addressing SDG Target 11.1, which calls for adequate, safe, and affordable housing for all.

The Affordable Housing policy—which mandates that at least 20% of new subdivisions and multi-unit developments be allocated for affordable housing or provide an equivalent contribution to Guam Housing and Urban Renewal Authority (GHURA)—ensures that lower-income households are not excluded from new housing opportunities. Density bonuses for developers who provide affordable units create economic incentives to expand the housing supply, contributing to SDG Target 10.2, which focuses on empowering and promoting social, economic, and political inclusion. Allowing Accessory Dwelling Units (ADUs) in appropriate zones supports SDG 9 by promoting innovative housing solutions that optimize existing land use. ADUs enable multi-generational housing, providing additional income for homeowners while increasing the supply of affordable rental units, directly addressing SDG Target 11.1.

The plan's emphasis on mixed-use development and compact urban design directly supports SDG 11.3, which promotes inclusive and sustainable urbanization by integrating housing, public services, and transportation infrastructure. By encouraging high-density housing (30 units per acre in R-2 zones) near commercial centers, transit hubs, and employment areas, the policy reduces urban sprawl, supports public transit, and enhances walkability, aligning with SDG 13 (Climate Action) by lowering carbon emissions from transportation. Additionally, the Planned Unit Development (PUD) policy encourages innovative housing solutions, such as small-lot development, flexible setbacks, and mid-rise buildings, which optimize land use efficiency and promote energy-efficient housing designs. These strategies align with SDG Target 9.4, which calls for upgrading infrastructure to be sustainable, with increased resource efficiency and adoption of clean technologies, and they foster resource-efficient and low-waste housing development, contributing to SDG 12 (Responsible Consumption and Production) by minimizing land consumption and reducing construction waste.

The Land Use Compatibility policy ensures that residential areas are protected from environmental hazards and conflicting adjacent uses, such as intensive industrial or agricultural activity. This aligns with SDG 3 (Good Health and Well-Being) by mitigating exposure to pollution, hazardous waste, and environmental degradation, directly supporting SDG Target 3.9, which seeks to reduce illnesses caused by air, water, and soil pollution. By establishing minimum lot sizes (5,000 sq. ft. for R-1, 1 acre for rural lands), the plan also protects open space, preserves natural resources, and balances urban expansion with conservation goals, contributing to SDG 15 (Life on Land) and Target 15.1, which calls for the sustainable management of land and natural ecosystems.

Guam's commitment to housing accessibility and inclusivity is evident in policy supporting senior housing, assisted living, supportive housing for persons with disabilities, group homes, and transitional housing for unhoused individuals. Co-locating these facilities near community centers, parks, and commercial areas ensures that residents have access to healthcare, employment, and essential services. This supports SDG Target 3.8, which aims for universal access to healthcare and essential services. Additionally, the Temporary Worker Housing policy, which encourages worker housing in urban zones (R-2, MU, and PUD) and near transit corridors, ensures that migrant and contract workers have safe and accessible housing options, aligning with SDG Target 10.7, which calls for safe, orderly, and responsible migration and mobility of people. Requiring that temporary worker housing be designed for future conversion into permanent housing ensures long-term sustainability and maximizes land use efficiency.

HOUSING LAND USE POLICIES

Residential Land Use

SC-55. Residential Land.

Maintain adequate land area suitable for a wide range of safe and sustainable housing for a diversity of incomes and household and community needs.

SC-56. Single and Multi-family Housing.

Provide sufficient land area, zoning, and public services to support single and multi-family housing and mixed-use developments for a wide range of incomes.

SC-57. Residential Densities.

Minimum parcel sizes in the R-1 zone shall be 5,000 square feet and one acre in the Rural Lands zone. Maximum densities in the R-2 zone shall be 30 units/acre.

SC-58. Land Use Compatibility.

Assure that residential areas are, where necessary, protected from and do not conflict with adjacent uses, such as intensive industrial, commercial, and agricultural land use activities.

SC-59. Mixed Use Development and Compact Urban Design.

Implement mixed-use development patterns where appropriate. Provide for a variety of densities, based on compact traditional patterns, with highest densities located near village centers, public facilities and services, commercial services, major transportation corridors, and within easy walking distance of employment centers and transit stops.

SC-60. Planned Unit and Other Innovative Housing.

Where appropriate, promote innovation in housing, such as small lot development, flexible setbacks, attached single family residential development, mid-rise development, mixed-use buildings, clustering and other measures that support design creativity. Use Planned Unit Development (PUD) designations where appropriate.

Community Housing

SC-61. Affordable Housing.

Subdivision creating four or more lots or developments proposing 5 or more units shall provide at least 20% affordable inclusionary housing (households earning up to 80% of local income) or pay an equivalent in lieu of the affordable housing fee to the Guam Housing and Urban Renewal Authority solely for purposes of constructing affordable housing units on Guam.

SC-62. Density Bonuses.

Provide density increases and other zoning flexibility for projects providing at least 20% affordable housing.

SC-63. Accessory Dwelling Units.

Allow accessory dwelling units on single-family residential lots, and in rural areas where appropriate.

SC-64. Temporary Worker Housing.

Locate temporary worker housing in urban development zones, including R2, MU, and PUD zones, and near existing and planned transit facilities to the maximum extent feasible. Design and construct housing for eventual conversion to permanent housing.

SC-65. Senior and Community Facilities.

Support new housing for seniors, assisted living, foster care, persons with disabilities, transitional and supportive housing for unhoused persons, group homes, and other community support facilities. Where feasible co-locate facilities near community centers, parks, commercial areas, and other community facilities.

SC-66. Planning for Specialized Housing.

BSP should initiate a focused planning assessment of the need and best locations for specialized community housing, including housing for seniors, assisted living, foster care, persons with disabilities, transitional and supportive housing for unhoused persons, and group homes.

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3.5. Commercial, Industrial, and Priority Development

A well-planned approach to commercial, industrial, and priority coastal-related land uses is essential for Guam's long-term economic resilience, environmental sustainability, and community well-being. Thoughtful land use planning ensures that commercial and industrial developments are strategically located to maximize economic benefits while minimizing negative environmental and social impacts. Similarly, coastal-related industries such as boating facilities, aquaculture, and marine tourism play a critical role in Guam's economy, providing jobs and supporting local food production while requiring careful management to preserve the island's fragile coastal ecosystems. By aligning land use policies with sustainable development principles, Guam can promote economic diversification, protect natural resources, and enhance climate resilience while fostering vibrant, livable communities.

3.5.1. Commercial Development and Mixed-Use Areas

Incorporating well-planned commercial areas and adopting mixed-use land use strategies are pivotal components of the Guam 2050 Sustainability Plan, aiming to foster sustainable economic growth and enhance community well-being. By promoting diverse commercial developments in proximity to residential zones, directing intensive commercial activities to designated urban and tourist areas, and encouraging mixed-use corridors, Guam can create vibrant, resilient communities that align with contemporary urban planning principles.

3.5.1.1. Planned, Appropriate Commercial Land Uses

Strategically locating a variety of commercial developments near residential and village centers not only stimulates local economies but also enhances the quality of life for residents. This approach reduces travel times, encourages local spending, and fosters a sense of community. Recent studies have shown that mixed-use developments can lead to increased economic opportunities and household wealth by integrating residential, commercial, and recreational spaces, thereby creating dynamic neighborhoods that cater to diverse needs (County Health Rankings, 2025).

Concentrating intensive commercial activities within designated urban and tourist areas also ensures that such developments are supported by adequate infrastructure and services, minimizing potential disruptions in less developed regions. This strategy not only preserves the character of rural and village settings but also maximizes the efficiency of resource utilization in urban centers. As discussed previously, the North and Central Guam Land Use Plan emphasizes

the importance of directing high-density commercial projects to appropriate areas, thereby maintaining a balance between development and community integrity (BSP, 2009).

3.5.1.2. Commercial/Mixed-Use Corridors

Developing concentrated commercial and mixed-use corridors within urban zones promotes walkability, reduces reliance on personal vehicles, and enhances accessibility to essential services. This approach aligns with the concept of "20-Minute Neighborhoods," where residents can access most of their daily needs within a short walk or bike ride.[9] Implementing such corridors in Guam's urban planning can lead to more sustainable and connected communities, as evidenced by successful mixed-use projects in other regions that have revitalized local economies and improved quality of life (Gensler, 2022).

[9] The concept of a “20-minute neighborhood” refers to a planning model in which most daily needs—such as groceries, schools, parks, healthcare, and transit—can be met within a 20-minute walk, bike ride, or transit trip from home. This approach promotes walkability, local living, and reduced car dependency, contributing to sustainability, public health, and social cohesion. The model has been adopted or explored in various cities, including Melbourne, Australia, which formalized the concept in its Plan Melbourne 2017–2050; Paris, France, where Mayor Anne Hidalgo’s “15-minute city” initiative has restructured urban life around local accessibility; and Portland, Oregon, which integrated the concept into its Climate Action Plan and comprehensive planning framework. See: City of Melbourne (2017). Plan Melbourne 2017–2050; Ville de Paris (2020). La Ville du quart d’heure; City of Portland (2009). Portland Climate Action Plan; Moreno, C. et al. (2021). Introducing the “15-minute city”: Sustainability, resilience and place identity in future post-pandemic cities, Smart Cities, 4(1), 93–111. See also: https://www.eugene-or.gov/1216/What-is-a-20-Minute-Neighborhood.

3.5.2. Industrial Land Uses on Guam

Over the past 25 years, Guam's industrial development has grown modestly, driven largely by construction, public infrastructure projects, and support industries for tourism and the U.S. military presence after a slump in the 1990s and early 2000s, the economy began to improve; however, heavy manufacturing remains limited due to Guam's remote location and focus on service sectors. Industrial land use has gradually expanded in designated areas (e.g. Harmon, Tamuning near the airport, and around the Port of Guam) to support activities like warehousing, logistics, and utilities. Key economic drivers – tourism, defense, and real estate – have shaped these land use patterns, with new industrial facilities primarily related to infrastructure (power generation, waste management) and construction material production. Throughout this period, land use planning initiatives (such as the North and Central Guam Land Use Plan of 2009) emphasized accommodating growth through a "sustainable pattern of development" that provides for industrial and commercial expansion while maintaining Guam's character (BSP, 2009).

Land use challenges. Historically, Guam faced fragmented, haphazard development with residential and industrial uses in close proximity due to past lax zoning enforcement. In response, government agencies have worked to strengthen zoning laws and enforcement to prevent incompatible uses. For example, older industrial activities (auto shops, scrap yards, and small manufacturing) that once popped up in rural or residential zones have been gradually brought into compliance or relocated. Over time, public awareness of environmental and community impacts has grown, leading to stricter review of industrial projects by the Guam Land Use Commission (GLUC) and regulatory agencies.

3.5.2.1. Siting of Intensive Industry and Zoning Policies

Guam's current policy framework strictly controls the siting of "intensive" industries (those with significant noise, pollution, or hazard potential) by limiting them to designated industrial zones (M-1 and M-2). The island's zoning law provides two industrial designations: "M-1" Light Industrial and "M-2" Heavy Industrial. Light Industrial (M-1) zones allow manufacturing, warehousing, and other uses that are not objectionable or hazardous, including many small to mid-scale industries compatible with commercial uses. Heavy Industrial (M-2) zones, by contrast, are the only zones where uses considered "objectionable, obnoxious, or offensive by reason of odor, dust, smoke, noise, [etc.]" are permitted (21 GCA 61). In practice, this means any truly intensive industry – such as power plants, waste processing facilities, quarries, heavy manufacturing plants, or chemical storage – must be located in an M-2 (or in some cases M-1) zone and cannot be established in residential, commercial, or agricultural zones.

Within the island's sustainable planning framework, spot zoning or one-off exceptions for heavy industry are strongly discouraged. Industrial rezoning applications are scrutinized for consistency with the Comprehensive Land Use Plan and the Guam Coastal Management Program. Over the last two decades, proposals to rezone rural or residential land to industrial

have been approved only when clearly serving the public interest and when buffering measures are in place. High-impact uses (e.g. an asphalt or concrete batching plant) that sought rezoning were conditioned to operate strictly within the industrial-zoned footprint and adhere to all performance standards (For example, Zone Change Application 2012-48). In essence, intensive industries are kept within the bounds of M-1/M-2 zones, and these zones themselves tend to be located in certain parts of Guam (such as along Route 3, around Cabras/Piti, Harmon, and Tiyan) identified for economic development. This concentrated approach not only simplifies the provision of infrastructure to industrial areas but also preserves the integrity of residential and conservation areas.

3.5.2.2. Minimizing Offsite Impacts of New Industrial Development

A cornerstone of the G50SP approach to sustainable industrial growth is the requirement that new industrial developments minimize and mitigate offsite impacts to the maximum extent feasible. Any proposed industry must undergo environmental assessments and meet regulatory standards designed to protect neighboring communities and ecosystems. The zoning regulations themselves embed this principle: M-1 zone uses must not produce nuisance-level impacts beyond their site (excessive noise, noxious odors, air or water pollution), and any use that does is classified as heavy industrial and tightly controlled (Title 21 GCA 61).

Typical requirements for new industrial facilities include:

- **Emission and pollution controls:** Facilities must install appropriate pollution control technology (e.g. scrubbers, filters, wastewater treatment) and obtain permits (air, water) from Guam EPA to ensure emissions meet standards and do not degrade ambient environment quality beyond the property line. For example, the new Ukudu power plant's air permit application details advanced controls to minimize sulfur dioxide and particulate emissions offsite (Guam Ukudu Power, 2021).
- **Buffering and site design:** Industrial sites are usually required to maintain buffer zones (setbacks, landscaping belts or greenbelts) between their operations and adjacent non-industrial properties. These buffers help dampen noise and trap dust. Height and lighting restrictions may be imposed to reduce visual and light pollution impacts on surrounding areas, aligning with the GLUC's mandate to control nuisances (Title 21 GCA 61).
- **Traffic and infrastructure mitigation:** Projects that generate heavy truck traffic must implement traffic management plans to avoid congestion or unsafe conditions on public roads. Often, improvements (widening access roads, adding turn lanes) are required as a

condition of approval. Similarly, any large water or power demands are coordinated with utilities to prevent strain on local service for other users.

- **Operational best practices:** Conditions may be placed on hours of operation (to limit nighttime noise), dust suppression (e.g. wetting of roads and stockpiles at quarry or construction material sites), and spill containment. Guam EPA and Public Works inspectors conduct follow-up checks; compliance with these measures is needed before an occupancy permit is granted.
- **Community engagement:** For major projects, public hearings are held, and community concerns (health, safety, cultural resource protection) are considered. Mitigation measures often directly respond to these concerns – for instance, relocating an access point away from a village or funding environmental monitoring in neighboring areas.

Through these measures, Guam may ensure that even as industrial activities expand, their external footprint is limited. The phrase "to the maximum extent feasible" is contained in policy to push developers to use the best available technology or practices to avoid impacts that could otherwise be "externalized" to the public. For example, if a manufacturing facility can feasibly recycle its wastewater or capture waste heat, it would be expected to do so, thereby reducing pollution and resource use offsite. Additionally, environmental impact studies for significant projects detail potential effects on air quality, water resources, coral reefs, and community well-being, and they propose mitigation that must be implemented as enforceable permit conditions. This process reflects the broader goal of Guam's sustainable land use planning: to allow economic and industrial development without sacrificing environmental quality or public health.

3.5.2.3. Sustainable Land Use Planning Context

All of the above practices are framed within Guam's push toward sustainable land use and development, looking ahead to 2050 and beyond. The Guåhan2050 Sustainability Plan (building on efforts like the Guam Green Growth initiative) treats land use as a holistic system where industrial zones, residential villages, commercial centers, and natural areas each have a role in a sustainable island ecosystem. The policies on industrial siting and impact mitigation align with several core principles of sustainable land use planning:

- **Smart growth and compact development:** Guam aims to direct growth (including industry) to appropriate areas and already-developed districts, rather than sprawl into greenfield sites. By confining industry to existing M-1/M-2 zones, the island prevents uncontrolled expansion into agricultural or conservation lands, preserving open space and critical habitats. This approach mirrors "smart growth" strategies that concentrate development where infrastructure exists and protect undeveloped land
- **Economic diversification with environmental stewardship:** Encouraging light industrial and tech industries in designated parks contributes to a more diverse economy (reducing over-reliance on tourism and military) At the same time, strict environmental safeguards ensure this economic growth does not degrade natural resources. The land

use plan explicitly calls for a “diverse economic base” while preserving quality of life and natural heritage.

- **Community health and safety:** Keeping intensive industries away from residential zones and groundwater recharge areas supports cleaner air and water for communities (for example, ensuring that a landfill or fuel storage is not near a village’s drinking water source). Guam’s sustainability vision includes “safe, crime-free, clean, organized communities” and a natural environment that is “clean and well managed.” The industrial land use policies contribute to this vision by preventing land use conflicts that could lead to pollution or hazards in neighborhoods.
- **Resilience and climate adaptation:** By planning industrial facilities in appropriate locations, Guam also accounts for natural hazard exposure and climate resilience. Industrial zones are evaluated for risks like flooding, typhoons, and proximity to the coast. New facilities are often built to higher standards (e.g. wind-resistant structures, setbacks from shorelines) to withstand climate impacts, in line with the sustainability plan’s resilience goals. Furthermore, consolidating industry can make it easier to implement island-wide improvements such as renewable energy integration or emergency response for chemical incidents.
- **Coastal Hazards Management:** As discussed later in this Chapter and Chapter 5, there is a need to reevaluate and strengthen seashore reserve policies by potentially extending the mandatory setbacks from the mean high water mark (MHWM), which is currently 33 feet, perhaps to a minimum of 100 feet. This adjustment aims to provide enhanced protection against a range of coastal hazards, including the increasing risks posed by storm surges, sea level rise, and coastal erosion. Establishing a wider setback will not only safeguard infrastructure and human activities, but also help preserve natural coastal ecosystems that play a vital role in mitigating such hazards. Moreover, adopting updated setbacks is essential for long-term resilience, allowing coastal communities to better adapt to the evolving impacts of climate change while maintaining the ecological integrity of coastal areas.

3.5.3. Coastal-Dependent and Priority Land Uses

Coastal-dependent and other priority land uses need to be planned and accommodated relative to other land uses. This requires a plan that prioritizes such uses and identifies appropriate locations that can be preserved for potential use.

3.5.3.1. Aquaculture

Aquaculture in Guam has experienced significant developments, particularly in recent years, as the island seeks to enhance food security, economic diversification, and cultural preservation. Historically, aquaculture activities on Guam have fluctuated, with the highest number of fish farms recorded in 1974 at 13, and the lowest in 1993 with only two farms (UOG, 2016).

Recognizing the potential of aquaculture, the government and various stakeholders have initiated several programs and plans to revitalize and expand this sector. In 2024, Governor Lou Leon Guerrero signed Executive Order 2024-01, establishing a Division of Aquaculture within the Department of Agriculture. This division aims to support the development of a sustainable aquaculture industry by providing technical assistance, regulatory oversight, and promoting research and development. The creation of this division underscores the government's commitment to prioritizing aquaculture as a key component of Guam's economic and food security strategies.

Community-based projects have also gained momentum. A notable example is the NOAA-funded initiative focused on giant clam (hima) aquaculture in the southern villages of Inalåhan and Malesso' (NOAA, 2022). The project not only aims to provide a sustainable source of food and employment, but also seeks to preserve cultural practices associated with the hima, while also observing appropriate concerns about the status of specific hima species. The initiative involves training community members in aquaculture techniques, thereby fostering local expertise and stewardship. Also, the University of Guam (UOG) has been instrumental in exploring innovative solutions to support aquaculture. In November 2024, UOG hosted a town hall meeting to discuss the potential of ocean thermal energy conversion (OTEC) and wave energy conversion (WEC) technologies to power a proposed Guam Aquaculture Innovation Center. This initiative aims to harness renewable energy sources to support aquaculture operations, reducing reliance on imported energy and promoting environmental sustainability. (guamepscor.uog.edu)

LAND USE CONSIDERATIONS AND PLANNING OBJECTIVES

The expansion of aquaculture in Guam necessitates careful consideration of land use to balance development with environmental conservation and cultural preservation. Historically, land use plans, such as the 1966 Territorial Planning Commission's master plan, emphasized the protection of prime agricultural areas. As discussed in later sections, urbanization and other developments have encroached upon these areas, leading to a decline in agricultural lands. Hence, the Guam Department of Agriculture's Strategic Plan advocates for the preservation of agricultural lands and the promotion of sustainable practices, policies also included in the G50SP (DOAG, 2024). The plan recommends measures such as zoning regulations that restrict non-agricultural uses in designated farming areas, including CHamoru Land Trust properties. By safeguarding these lands, the government aims to provide adequate space for aquaculture and other agricultural activities, ensuring their viability for future generations.

Additionally, the Guam REPI Habitat Conservation Initiative Implementation Plan highlights the importance of mitigating environmental threats, such as land-based sources of pollution and sedimentation, which can adversely affect marine ecosystems (NFWF, 2022). Implementing best management practices in land use can help reduce these impacts, creating a more conducive environment for aquaculture.

3.5.3.2. Fishing and Boating

Recreational fishing and boating are integral components of Guam's cultural heritage, economy, and community life. These activities not only provide leisure and subsistence opportunities but also significantly contribute to the island's tourism sector. However, the increasing demand for marine recreation necessitates strategic land use planning and infrastructure development to ensure sustainable growth and environmental conservation.

Guam's small-boat fisheries have experienced fluctuations over the years. A 2019 report by the National Oceanic and Atmospheric Administration (NOAA) highlighted trends in economic performance indicators for small boat fisheries in Guam from 2009 to 2017. The data revealed variability in catch rates and economic returns, influenced by factors such as weather patterns, fish stock health, and market demand. Notably, pelagic species like tuna have shown strong gains in certain years, while non-tuna species such as mahimahi have seen declines. These trends underscore the dynamic nature of Guam's marine ecosystems and the need for adaptive management strategies (NOAA, 2019).

The recreational boating sector, encompassing activities like sportfishing, sailing, and diving excursions, has also seen growth, particularly driven by tourism. Charter operations cater to both residents and visitors, offering access to Guam's rich marine biodiversity and scenic coastal waters. However, the expansion of this sector brings challenges, including the need for adequate docking facilities, maintenance services, and environmental safeguards to prevent habitat degradation.

LAND USE ISSUES AND PLANNING OBJECTIVES

The development of boating infrastructure in Guam is closely tied to land use planning, as coastal areas serve as the interface between terrestrial and marine environments. Key considerations include:

- **Coastal Development:** Balancing the construction of marinas, docks, and related facilities with the preservation of natural habitats is crucial. Unregulated development can lead to shoreline erosion, water pollution, and loss of biodiversity.
- **Public Access:** Ensuring that local communities have access to coastal areas for recreational and subsistence fishing is a priority. This involves designating public access points and preventing the privatization of critical shoreline segments. In addition, the public's right of unrestricted access must be ensured to all non federally-owned beach areas and all Territorial recreation areas, parks, scenic overlooks, designated conservation areas and other public lands; and agreements shall be encouraged with the

owners of private and federal property for the provision of reasonable access to, and use of, resources of public nature located on such land.

- **Environmental Protection:** Implementing measures to mitigate the environmental impact of increased boating activity, such as controlling fuel spills, managing waste disposal, and protecting coral reefs from anchor damage. Monitoring the status of moorings and removing unpermitted buoys is one mechanism for addressing boating impacts.

The Guam Coastal Management Program (GCMP) plays a pivotal role in addressing these issues. The GCMP aims to create a responsible and balanced use of Guam's coastal resources by integrating policy-making efforts with public and private interests. This includes planning for the preservation of natural charm and character within the framework of a growing population and modern technology. The program emphasizes the importance of establishing specified areas of use within urban, suburban, rural, agricultural, conservation, industrial, and resort contexts.

ENHANCING BOATING OPPORTUNITIES AND INFRASTRUCTURE

To support the growth of recreational fishing and boating, several initiatives can be considered:

- **Infrastructure Development:** Investing in the construction and maintenance of marinas, boat ramps, and docking facilities to accommodate increasing numbers of recreational vessels. This includes ensuring facilities are equipped with amenities such as fuel stations, waste disposal systems, and restrooms.
- **Funding Opportunities:** Leveraging federal programs like the Boating Infrastructure Grant (BIG) Program, which provides funds for tie-up facilities and support amenities for transient vessels. These grants can assist in expanding and enhancing Guam's boating infrastructure.
- **Community Engagement:** Involving local communities in the planning and decision-making processes to ensure that developments align with public interests and cultural values. This includes conducting public consultations and workshops to gather input and foster stewardship.
- **Environmental Education:** Promoting awareness among boaters and fishers about sustainable practices, such as catch-and-release fishing, proper waste disposal, and adherence to marine protected area (MPA) regulations. Educational programs can help preserve marine ecosystems for future generations.

3.5.3.3. Fiber Optic Cables

Guam serves as a critical hub in the Pacific for submarine fiber-optic cables, sometimes referred to as "The Big Switch in the Pacific." As of 2024, the island hosts 11 operational subsea cables, with plans for at least four additional cables in the coming years. Notable projects include the APRICOT cable system, connecting Guam to Indonesia, Taiwan, Japan, the Philippines, and Singapore, and the MYUS cable, linking Oregon, Guam, Indonesia, and the Philippines. These developments underscore Guam's strategic importance in global telecommunications (cite).

In 2023, for example, GTA TeleGuam received approval to construct a new cable landing station in Inalåhan, located on the southeastern coast of Guam. This facility aims to provide an alternative landing site to the existing ones on the western side of the island, enhancing the resilience and capacity of Guam's telecommunications infrastructure (cite). These types of projects, sometimes require a rezoning, and should be carefully planned in consideration of other competing land uses.

The expansion of submarine cable infrastructure on Guam brings several land use considerations. Environmental concerns are paramount, as cable installation can disrupt marine ecosystems. Additionally, the leasing of submerged lands for cable infrastructure has prompted discussions about fair compensation for the use of public lands, as well as regulatory oversight (P.L. 36-108). To address these challenges, Guam's Bureau of Statistics and Plans developed guidelines for identifying optimal locations for submerged cable landings.

Suitability Guidelines for Submerged Cable Landings on Guam (2023)

In accordance with Public Law 36-108, the Bureau of Statistics and Plans (BSP), through the Guam Coastal Management Program (GCMP), developed comprehensive *Suitability Guidelines for Determining Optimal Locations for Submerged Cable Landings on Guam*. The guidelines aim to ensure that new telecommunications infrastructure is sited with minimal environmental, cultural, and recreational impacts to Guam's submerged lands and coastal waters. The framework is based on a four-tier classification system that evaluates site compatibility based on benthic habitat sensitivity, public use, ecosystem services, and water quality standards:

- Highly Suitable (S1)
- Moderately Suitable (S2)
- Marginally Suitable (S3)
- Not Suitable (NS)

Land Use Policy Implications

This guidance is as a decision-support tool for permitting agencies and planners during the early stages of infrastructure planning. It complements, but does not replace, existing local and federal permitting requirements. From a land use policy perspective, it encourages:

- Co-location at existing cable landing sites.
- Early inter-agency coordination.
- Discourages development in ecologically and culturally sensitive areas (S3 and NS classes).

It provides technical grounding for the Cham01rn Land Trust Commission and other land managers to incorporate marine spatial planning and environmental constraints into lease, zoning, and development decisions.

3.5.4. Commercial, Industrial, and Priority Uses Policy and Sustainability

The alignment of commercial, industrial, and priority development land use policies with the UN SDGs reflects a commitment to sustainable economic growth, environmental stewardship, and community well-being. The promotion of Planned Commercial Land Uses aligns with SDG 8 (Decent Work and Economic Growth) by fostering economic diversification and proximity to residential areas, reducing commuting distances and promoting local entrepreneurship. Appropriate Commercial Development and Commercial/Mixed-Use Corridors support SDG 11 (Sustainable Cities and Communities) by ensuring that commercial growth is well-integrated into urban and rural environments, reducing sprawl and promoting walkable, mixed-use communities.

Industrial Development policies align closely with SDG 9 (Industry, Innovation, and Infrastructure) and SDG 12 (Responsible Consumption and Production). The Siting of Intensive Industry within designated M-1 zones helps control environmental and social impacts, contributing to Target 9.4, which emphasizes sustainable industrialization and improved resource efficiency. Additionally, policies requiring industrial development to minimize offsite impacts reinforce Target 12.4, which calls for the environmentally sound management of chemicals and waste, reducing pollution and negative effects on communities.

Priority Island Development policies advance SDG 7 (Affordable and Clean Energy) and SDG 14 (Life Below Water) by ensuring well-planned infrastructure and facilities that support renewable energy and protect coastal-dependent industries such as fishing and boating. Providing Critical Infrastructure and Community Facilities ensures resilience in island communities, in line with Target 11.B, which focuses on disaster risk reduction and sustainable urban planning. Similarly, the Priority Island and Coastal Developments policy safeguards economic and environmental sustainability by ensuring the responsible allocation of coastal resources, supporting Target 14.7, which promotes sustainable marine-based economies, particularly for small island communities. Overall, these land use policies demonstrate a strategic alignment with the UN SDGs by fostering sustainable economic activity while preserving environmental integrity and community resilience.

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COMMERCIAL, INDUSTRIAL, AND PRIORITY LAND USE POLICY

Commercial Development and Mixed-Use Areas

SC-66. Planned Commercial Land Uses.
Promote the location and design of a diversity of commercial development types in proximity to residential and village life and to promote sustainable economic growth.

SC-67. Appropriate Commercial Development.
Direct intensive commercial development to designated urban and tourist areas. Appropriately scale new commercial land uses in rural and less intensively developed village settings.

SC-68. Commercial/Mixed-Use Corridors.
Promote concentrated commercial development and mixed-use in designated urban corridors and zones.

Industrial Development

SC-69. Siting of Intensive Industry.
Limit intensive industrial development to M-1 zones without exception.

SC-70. Offsite Impacts.
New industrial development shall minimize and mitigate offsite impacts to the maximum extent feasible.

Priority Island Development

SC-71. Critical Infrastructure and Community Facilities.
Provide well-planned and adequate locations for important infrastructure and community uses, such as renewable energy facilities and civic buildings.

SC-72. Priority Island and Coastal Developments.
Assure adequate land and locations for important coastal-dependent and related development, such as boating and fishing facilities. Evaluate the status of existing moorings and buoys and impacts to the nearshore environment.

SC-73. Siting of Submerged Cable Landings.
Proposed cable landings shall follow the Government of Guam's Guidelines, Standards, and Suitability Orders for Submerged Cable Landing Sites on Guam.

3.6. Rural and Agricultural Lands

Guam's agricultural and rural lands play a crucial role in ensuring local food security, protecting natural resources, and maintaining cultural traditions. However, these lands face significant challenges, including encroaching development, declining agricultural activity, and the need for

more sustainable farming practices. The Guåhan 2050 Sustainability Plan establishes a framework to address these issues by balancing growth with the preservation of agricultural and rural lands. The policies outlined in the plan emphasize maintaining minimum lot sizes, ensuring adequate public services for new developments, and protecting prime agricultural soils from conversion to non-agricultural uses. The long-term sustainability of these lands depends on comprehensive land use planning, improved infrastructure, and incentives for farmers to engage in productive and sustainable agriculture.

3.6.1. Status of Agriculture on Guam: Sustainability and Land Use Planning Issues

Agriculture on Guam has undergone significant changes over the decades, evolving from a subsistence-based system to a more market-oriented but highly import-dependent sector. The historical shift has been shaped by factors such as land use policies, military expansion, economic shifts, and climate change. Despite a renewed focus on food security and sustainability, Guam's agricultural sector continues to face challenges related to land availability, market access, and environmental constraints. Guam's agricultural sector faces several land use challenges that impact its sustainability and growth. Significant issues include:

- Limited availability of arable land. The island's total land area is approximately 212 square miles, and much of this is allocated for urban development, military installations, and conservation areas, leaving limited space for agriculture. This scarcity of suitable farmland restricts the expansion of agricultural activities and affects the island's ability to achieve greater self-sufficiency in food production.
- Land tenure and ownership complexities further complicate agricultural land use. A considerable portion of land on Guam is under federal or government control, and private land often has fragmented ownership or unresolved title issues. These factors can deter investment in agriculture, as farmers may face uncertainties regarding long-term access to land, making it challenging to plan and implement sustainable farming practices.
- Urbanization, competing land uses, and demographic change present additional challenges. As Guam's population grows and tourism-related development expands, agricultural lands are increasingly under pressure for conversion to residential, commercial, or industrial uses. This trend not only reduces the land available for farming but also leads to potential conflicts between agricultural and non-agricultural land uses, such as issues related to water rights, pesticide use, and infrastructure development. Another major challenge is the aging farmer population, with decreasing interest among younger generations in continuing farming traditions.
- Environmental factors also play a role in agricultural land use issues. Soil erosion, particularly in areas with steep topography, and the prevalence of invasive species can degrade the quality of agricultural lands. Additionally, the island's susceptibility to

typhoons and climate change impacts poses risks to both land and crop viability, necessitating the implementation of resilient and adaptive farming practices.

3.6.2. Rural Lands Development and Agricultural Land Protection

Current land use planning efforts, particularly those outlined in the Guam Agriculture Master Plan, emphasize the need for comprehensive land use planning that integrates agricultural considerations. Strategies in the Master Plan include identifying and protecting prime agricultural lands through zoning regulations, resolving land tenure issues to provide farmers with secure land access, and promoting sustainable farming practices that mitigate environmental impacts. The plan also advocates for balancing development with the preservation of agricultural spaces to ensure the long-term viability of Guam's agricultural sector.

Community perspectives, as reflected in the G50SP Community Engagement Survey, highlight the importance of conservation and agriculture. As seen in Figure 3-31, while 57% of respondents prioritized conservation, 34% believed that conservation areas should also be used for agricultural purposes. The strong support (85%) for agricultural initiatives reflect general concerns about food security in Guam because it is a remote island, but it also may reflect nostalgia for Guam’s rural agricultural heritage.

Rural Lands Protection

The Policies of G50SP align closely with the Agricultural Master Plan. One of the key policies aimed at strengthening agriculture on Guam is the Rural Lands Development policy, which establishes a minimum lot size of one acre for rural lands and requires adequate public services for subdivisions unless otherwise required by local law governing protection of the Northern Guam Lens Aquifer. This policy is designed to prevent excessive land fragmentation and maintain the rural character of the island while allowing for appropriate levels of development that support small-scale and subsistence farming.

Development on rural lands also must be sited and designed to be compatible with small-scale or subsistence agricultural uses, ensuring that new projects do not conflict with existing farming activities. This may preserve opportunities to support local food production and preserve Guam’s agricultural heritage. Subdivision of rural lands is also restricted, and requires the availability of essential public services, ensuring that new developments do not convert potential agricultural lands without appropriate infrastructure. These policies align with the 2009 North and Central Guam Land Use Plan, which emphasizes the importance of maintaining the rural character of these areas while accommodating limited residential and agricultural development.

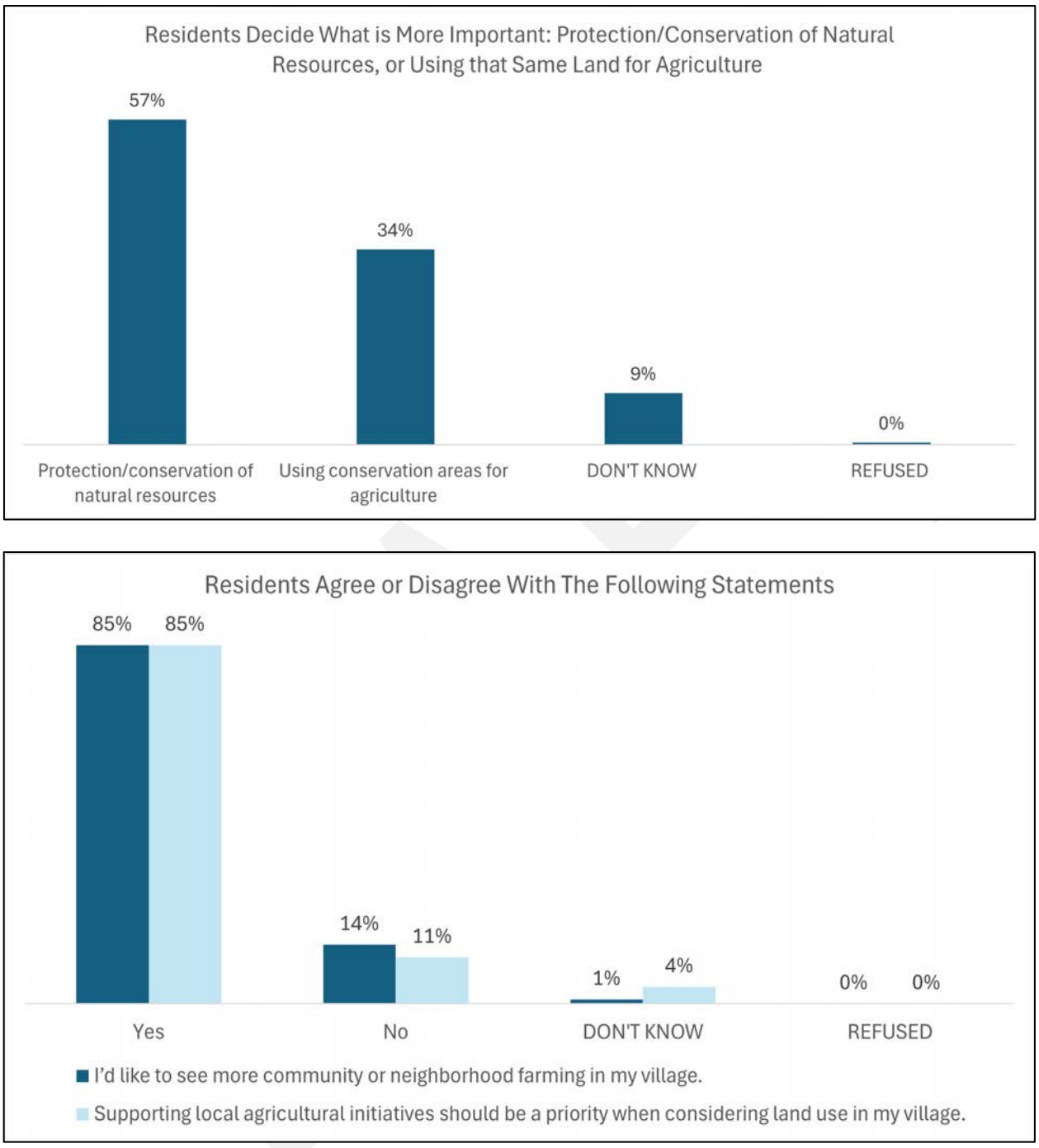
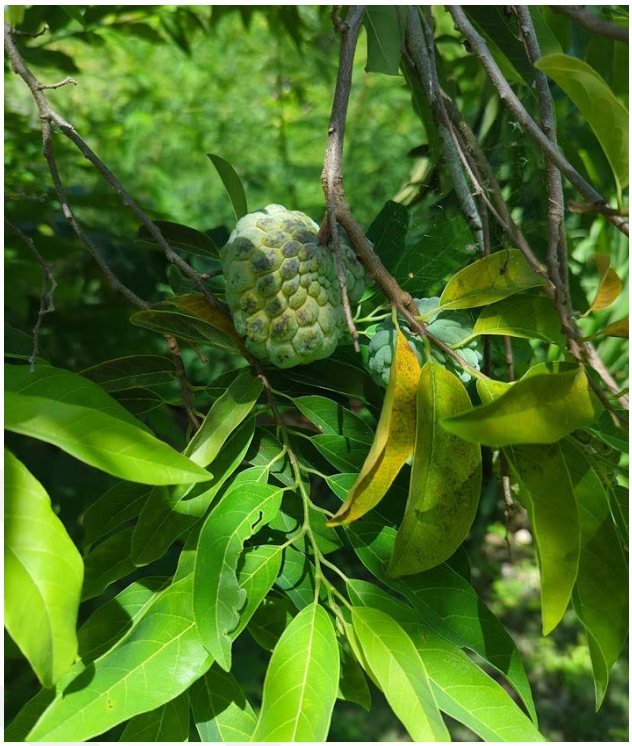


Figure 3-29. Attitudes towards agriculture and land conservation.

Agricultural Lands Protection

The G50SP Agricultural Lands policies seek to preserve critical agricultural lands, as first called out in the 1978 Comprehensive Development Plan for Guam developed under the Coastal Zone Management program. The policy ensures that agricultural zones remain intact, where feasible to enhance local food security and support the economic viability of the agricultural sector. The decline in Guam's agricultural land over the decades—dropping from over 32,000 acres in the 1960s to only 1,000 acres in 2007 and 2,441 acres today—demonstrates the urgency of this effort (Figure 3-32). The plan also sets a minimum lot size of 10 acres for agricultural lands, or 5 acres with appropriate restrictions, preventing the conversion of viable farmland into smaller parcels unsuitable for commercial or subsistence farming.



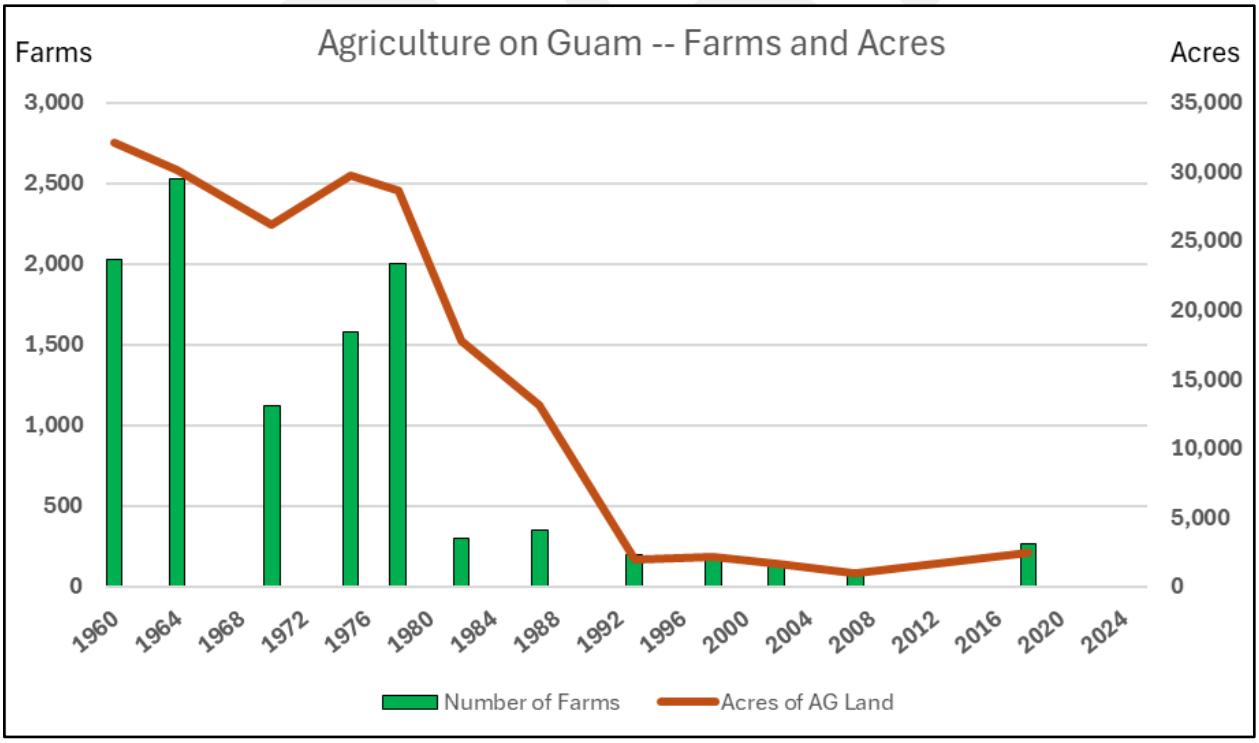


Figure 3-30. Decline in Guam's Agricultural Land Over the Decades

Though limited in occurrence and availability (see Figure 3-33), protecting prime agricultural soils (AG-1 lands) is a cornerstone of the policy, prohibiting their conversion to non-agricultural uses unless an agricultural land viability analysis determines they are no longer productive. This approach mirrors global best practices in agricultural land conservation, ensuring that Guam retains its capacity to produce local food. Furthermore, subdivision of AG-1 land is only permitted for agricultural purposes, with enforceable restrictions such as recorded deed requirements or agricultural conservation easements. Other agricultural lands (AG-2) will also be protected to the maximum extent feasible, discouraging their subdivision unless accompanied by an agricultural sustainability plan that demonstrates long-term farming viability.

Unlocking Guam's Agricultural Potential

Guam holds significant promise for sustainable and productive agriculture, particularly when soil limitations such as moisture availability are addressed through irrigation. The USDA Soil Survey identifies four soil types that become prime farmland when irrigated, greatly expanding the island's agricultural productivity potential. These soils include:

- **Akina soils (AkB, AkC)** – Classified as *Ultisols*, these deep and moderately permeable soils offer a strong foundation for diversified crop production when supplemented with consistent irrigation.
- **Guam soils (GuB, GuC)** – Classified as *Mollisols*, these soils are typically found in gently sloping areas and are productive and responsive to good water management practices.
- **Pulantat soils (PuC, PuD)** – Classified as *Alfisols*, these fertile, well-drained soils are ideal for various crops and significantly enhance agricultural output under irrigation.
- **Yigo soils (YgC, YgD)** – Classified as *Oxisols*, these soils have moderate depth and good natural drainage, becoming highly productive agricultural land when adequately irrigated.

Investing in irrigation infrastructure, may transform these soil types into highly productive farmland, enhancing food security, economic resilience, and sustainability on the island.

USDA, Soil Conservation Service, 1988. Soil Survey of Territory of Guam.

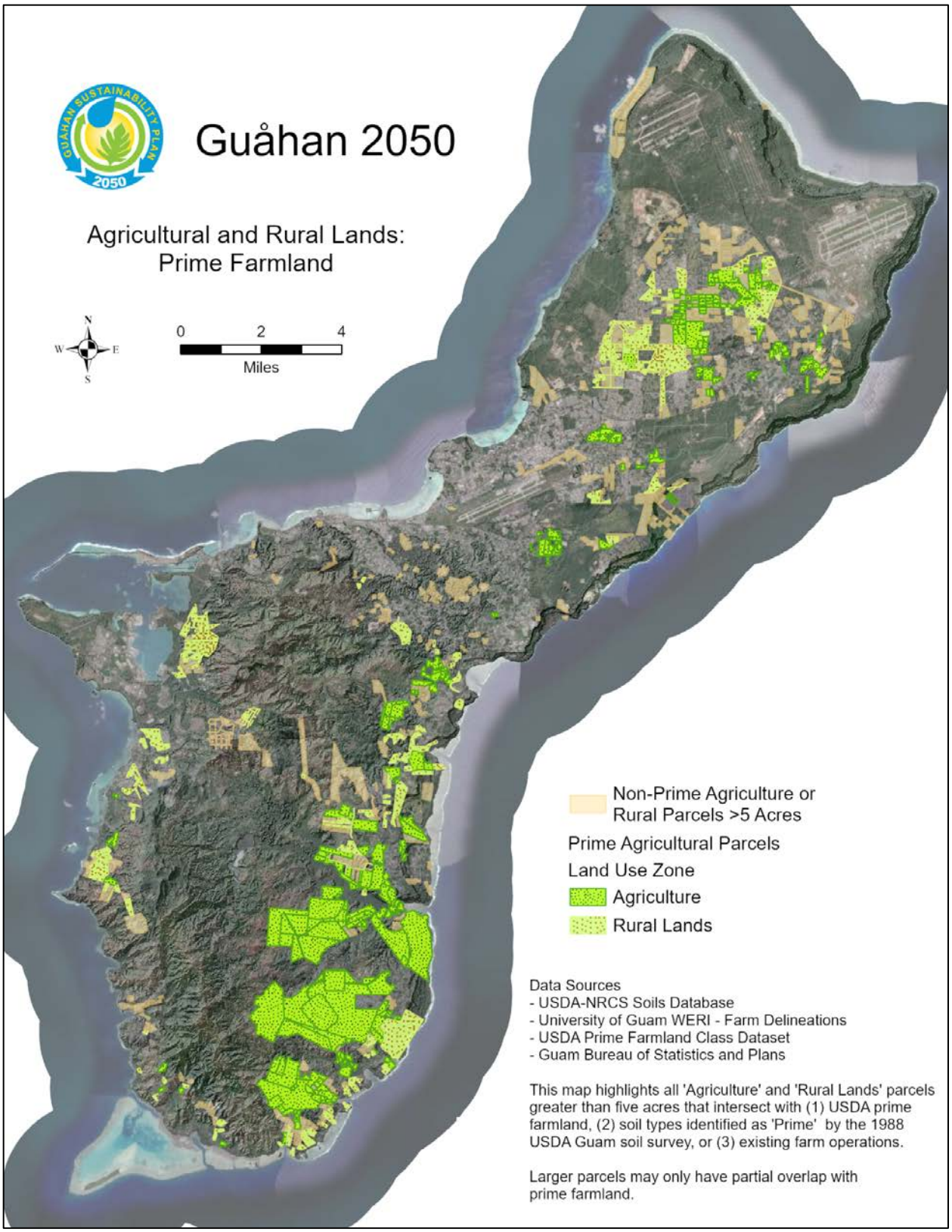


Figure 3-31. Agricultural and Rural Lands: Prime Farm Land

To balance growth with agricultural sustainability, the plan limits the conversion of agricultural land to non-agricultural purposes. Exceptions include parks and recreation, critical public infrastructure, and residential uses within a Planned Unit Development (PUD) that meets stringent public service requirements. Additionally, Transfer of Development Rights (TDRs) are proposed for consideration to incentivize the permanent protection of agricultural lands, providing landowners with financial compensation or development credits while preserving farming areas. The Guam Department of Agriculture (DOAG) and the Bureau of Statistics and Plans (BSP) will collaborate on monitoring and enforcement mechanisms to ensure compliance with these policies.

Another critical component of implementing agricultural land use protection policies is enhancing agricultural infrastructure, including water supply, road access, and market facilities. According to the Guam Agriculture Master Plan, improved water storage, irrigation systems, and soil conservation measures are essential for supporting long-term agricultural productivity. Additionally, Guam's government is working on incentives for sustainable farming, such as grants for organic farming, agritourism opportunities, and financial support for farmers adopting climate-resilient practices.

3.6.3. Agriculture Land Use Policies and Sustainability

The Guam 2050 Sustainability Plan presents a proactive approach to agricultural and rural land use planning, balancing development needs with environmental and economic sustainability. By implementing policies that protect farmland, support agricultural livelihoods, and ensure responsible rural development, Guam can safeguard its agricultural heritage and food security for future generations.

The discussion of agriculture and rural land use in Guam also aligns closely with the United Nations Sustainable Development Goals (SDGs), particularly SDG 2 (Zero Hunger), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), SDG 13 (Climate Action), and SDG 15 (Life on Land). By prioritizing the protection of agricultural lands, ensuring food security, and promoting sustainable farming practices, the Guam 2050 Sustainability Plan contributes to SDG 2 by reducing reliance on imported food and fostering a resilient local food system. The plan's emphasis on minimum lot sizes, land use protections, and incentives for sustainable agriculture also supports SDG 15, as it helps prevent land degradation and protects Guam's soil and biodiversity from urban encroachment and unsustainable development.

Additionally, the emphasis on rural economic development and local food systems aligns with SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production). By ensuring that agricultural lands remain productive and sustainable, Guam is taking critical steps toward reducing import dependency, improving food sovereignty, and fostering economic resilience in rural communities.

Also, the plan's focus on planned rural development and infrastructure improvements aligns with SDG 11, ensuring that Guam's rural communities have access to adequate public services while maintaining their agricultural productivity. The restrictions on converting prime farmland and the promotion of climate-resilient farming techniques contribute to SDG 13, helping the island mitigate and adapt to climate change impacts, such as rising temperatures and more extreme weather events. Moreover, the encouragement of local food production and responsible land use management under the plan supports SDG 12, ensuring that natural resources are used efficiently and equitably. By integrating land use planning with sustainability goals, Guam is taking significant steps toward a future where agriculture, rural livelihoods, and environmental protection are harmonized, reinforcing global commitments to a more sustainable and resilient world.

Finally, the proposed agriculture policies in the Guåhan 2050 Sustainability Plan align closely with the recently drafted Guam Agriculture Master Plan (2024), which emphasizes food security, economic diversification, and sustainable land management. Both plans advocate for the protection of agricultural lands, ensuring that critical AG-1 and AG-2 lands remain dedicated to farming and preventing their conversion to non-agricultural uses without thorough viability assessments. The Master Plan highlights the need for infrastructure improvements, including water storage, irrigation systems, and road access, which are also reinforced in the Sustainability Plan's requirement for adequate public services in rural land subdivisions. Additionally, the Agriculture Master Plan underscores the importance of incentivizing local food production through policy support, financial assistance, and agritourism development, directly aligning with the Sustainability Plan's commitment to offering incentives for sustainable farming practices. Moreover, both plans recognize the threats posed by climate change and invasive species, advocating for stronger conservation efforts, biosecurity measures, and integrated land-use strategies to protect Guam's agricultural sector from environmental degradation. By reinforcing the principles outlined in the Agriculture Master Plan, the Guåhan 2050 Sustainability Plan ensures a cohesive, long-term strategy that supports farmers, strengthens local food systems, and promotes sustainable rural development.

Agricultural Master Plan – Land Use Strategies

Strategy 19 – Land Use Inventory. DOAG in collaboration with other Guam agencies, should develop an inventory of government, CHamoru Trust Land, and private land that is currently in agriculture land use. The inventory should determine the agricultural potential of that land. The inventory should rate that land based on productivity and should take into account the current agriculture use in the inventory.

Strategy 20 – Preserving Agriculture Land Use. DOAG and other government agencies responsible for land use and zoning, should preserve agriculture land and make it difficult to change the land use to non-agriculture uses. This should apply to all lands, including the CHamoru Trust Lands.

Strategy 21 – Development of Farm Lots for Small Farms. One of the challenges for new farmers or starting small farms is the lack of inexpensive agriculture land(s) or the high cost of buying or leasing land. DOAG should develop small farm lots in a subdivision for a low lease rent with a lease period of 20 to 30 years. The long lease period is to allow them to obtain traditional funding for the development of the farm.

Strategy 22 Agri-Tourism and Energy Production on Agriculture Land. The use of Agriculture land for other uses such as agri-tourism and energy production is an ongoing debate. The double purpose of the land may have financial benefit to the landowner. The opponents cite the loss of good agriculture land from production. To address these issues and to ensure long-term agriculture production, DOAG should develop policies, rules and regulations for agri-tourism and energy production on agriculture lands.

AGRICULTURE AND RURAL LANDS POLICY

Rural Lands Development

SC-74 Minimum Lot Size.

Rural Lands shall have a minimum lot size of 1 acre.

SC-75. Services Required for Subdivision.

Subdivision of Rural Lands shall require adequate public services except as may be provided by P.L. 37-105.

SC-76. Development Siting on Rural Lands.

Development on Rural Lands shall be sited and designed to be compatible with small-scale or subsistence agricultural uses.

Agricultural Lands Protection

SC-77. Critical Land (CZM).

Critical agricultural lands shall be preserved and maintained for agricultural use.

SC-78. Preservation of Agricultural Land.

Protect agricultural zones to ensure local food security and support the agricultural sector. Offer incentives for sustainable farming practices and local food production.

SC-79. Minimum Lot Size.

Agricultural Lands shall have a minimum lot size of 10 acres except that lot sizes may be reduced to no less than 5 acres if restricted to agricultural use by deed restriction or easement.

SC-80. Protection of Prime Soils.

Lands designated AG-1 (Prime) shall not be converted or redesignated to non-agricultural land uses unless the lands are shown to be no longer viable for agricultural production, as determined by an agricultural land viability analysis.

SC-81. Subdivision of Prime Land.

Subdivision of AG-1 land is prohibited except for agricultural purposes, which shall be memorialized through appropriate land use restrictions, such as recorded deed requirements or agricultural conservation easements.

SC-82. Other Suitable Agricultural Lands.

Other lands suitable for agricultural land uses (AG-2) shall be protected for such purposes to the maximum extent feasible.

SC-83. Subdivision of Lands Suitable for Agriculture.

Subdivision of lands suitable for agriculture is discouraged. Any subdivision lands shall be supported by an agricultural sustainability plan identifying how agricultural uses will be promoted and supported.

SC-84. Conversion of Agricultural Land.

Redesignation of agricultural land for non-agricultural purposes shall be limited to conversions to parks and recreational and resource conservation purposes, critical public services and community infrastructure, or residential uses pursuant to a Planned Unit Development with adequate public services, including wastewater capacity, roads and circulation, and water supply.

SC-85. Transfer of Development.

Consider development transfer mechanisms to incentivize the permanent protection of agricultural lands. Coordinate with the CHamoru Land Trust concerning the agricultural and other potential of CLTC lands to meet the needs of Guam's cultural heritage.

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SC-86. Right to Farm.

Evaluate the current right to farm

SC-87. Land Use Inventory.

DOAG in collaboration with other Guam agencies, should develop an inventory of government, CHamoru Trust Land, and private land that is currently in agriculture land use. The inventory should determine the agricultural potential of that land. The inventory should rate that land based on productivity and should take into account the current agriculture use in the inventory.

SC- 88. Development of Farm Lots for Small Farms.

Where appropriate, DOAG should support development of small farm lots in a subdivision for a low lease rent with a lease period of 20 to 30 years.

SC-89. Agri-Tourism and Energy Production on Agriculture Land.

BSP, in collaboration with DOAG, GPA, and other agencies should develop policies, rules and regulations for agri-tourism and energy production on agriculture lands.

3.7 Natural Hazards

Guam faces a variety of natural hazards, including typhoons, flooding, shoreline erosion, earthquakes, landslides, and wildfires. These hazards pose significant threats to public safety, development, and infrastructure, and require a robust land use planning and sustainability framework to mitigate risks while ensuring responsible development.

3.7.1. General Hazard Policies and Sustainable Land Use

The 2024 Guam Hazard Mitigation Plan (GHMP) provides an island-wide risk assessment and mitigation framework, identifying hazards, mapping vulnerable assets, and outlining goals and actions for resilience (GHS, 2024; GHS, 2025). The GHMP provides important guidance for the G50SP land use policies addressing natural hazards.

Best Available Hazard Information. Guam's sustainability plan must leverage the GHMP to maintain up-to-date hazard mapping and risk assessment. The latest findings indicate that coastal and inland flood risks, seismic vulnerabilities, and wildfire exposure have intensified due to climate change and increased urbanization. Continued investments in GIS-based hazard mapping and data collection, including updates to FEMA's Flood Insurance Rate Maps (FIRMs) and the Guam Shoreline Atlas, will improve planning and resilience efforts.

Hazard Risk Reduction & Disaster Safety. Development policies also should integrate risk assessments for critical infrastructure such as power grids, transportation networks, and emergency facilities. The GHMP highlights coastal infrastructure risks, particularly in Apra Harbor, Talofofo Bay, and Inalåhan, where typhoon-driven storm surges and sea-level rise exacerbate vulnerabilities. To mitigate these risks, zoning regulations should prohibit new

development in high-risk zones unless climate-adaptive measures—such as elevated structures, breakaway walls, and storm-resistant materials—are implemented.

Health and Safety. Public health considerations include ensuring safe water supplies and sanitation, especially in flood-prone areas. The GHMP underscores the impact of flooding on Guam's water systems, advocating for upgrades in wastewater treatment and drinking water infrastructure to withstand extreme weather events.

Key Insights from the 2024 Hazard Mitigation Plan (HMP)

MAJOR NATURAL HAZARDS IMPACTING GUAM

- **Tropical Cyclones & Typhoons** – With wind speeds exceeding 150 mph, typhoons pose the greatest immediate threat. Storm surges, flooding, and wind damage from events like Typhoon Mawar (2023) have caused massive destruction.
- **Sea Level Rise & Coastal Erosion** – Rising ocean levels threaten homes, infrastructure, and ecosystems, exacerbated by coral reef degradation.
- **Earthquakes & Tsunamis** – Guam's location in the Pacific's seismic zone makes it susceptible to earthquakes and tsunamis.
- **Drought & Wildfires** – Climate change is intensifying dry conditions, leading to water shortages and increased wildfire risks.
- **Flooding & Landslides** – Heavy rainfall, particularly during typhoons and El Niño events, increases the likelihood of inland flooding and slope failures.

LAND USE AND DEVELOPMENT CHALLENGES

- **Military Expansion & Civilian Development** – Guam's military buildup and urban expansion require careful hazard mitigation planning to ensure resilience.
- **Infrastructure Vulnerabilities** – The power grid, water supply, and critical facilities remain exposed to storm damage and flooding.
- **Tourism & Economic Impacts** – With much of Guam's economy tied to coastal areas, hazards such as typhoons and sea level rise pose a risk to hotels, businesses, and transportation systems.

MITIGATION STRATEGIES

The 2024 HMP outlines a whole-community, multi-pronged approach to hazard mitigation, including:

- Strengthening building codes and enforcing zoning laws to minimize risk exposure.
- Investing in resilient infrastructure, such as flood-resistant roads and energy systems.
- Expanding coral reef and coastal protection projects to reduce storm surge impacts.
- Enhancing emergency preparedness and early warning systems.
- Integrating climate adaptation strategies into long-term land use planning.

conditions are favorable for cyclone development. However, Guam remains at risk of typhoons year-round, making preparedness and mitigation efforts crucial (Figure 3-34).

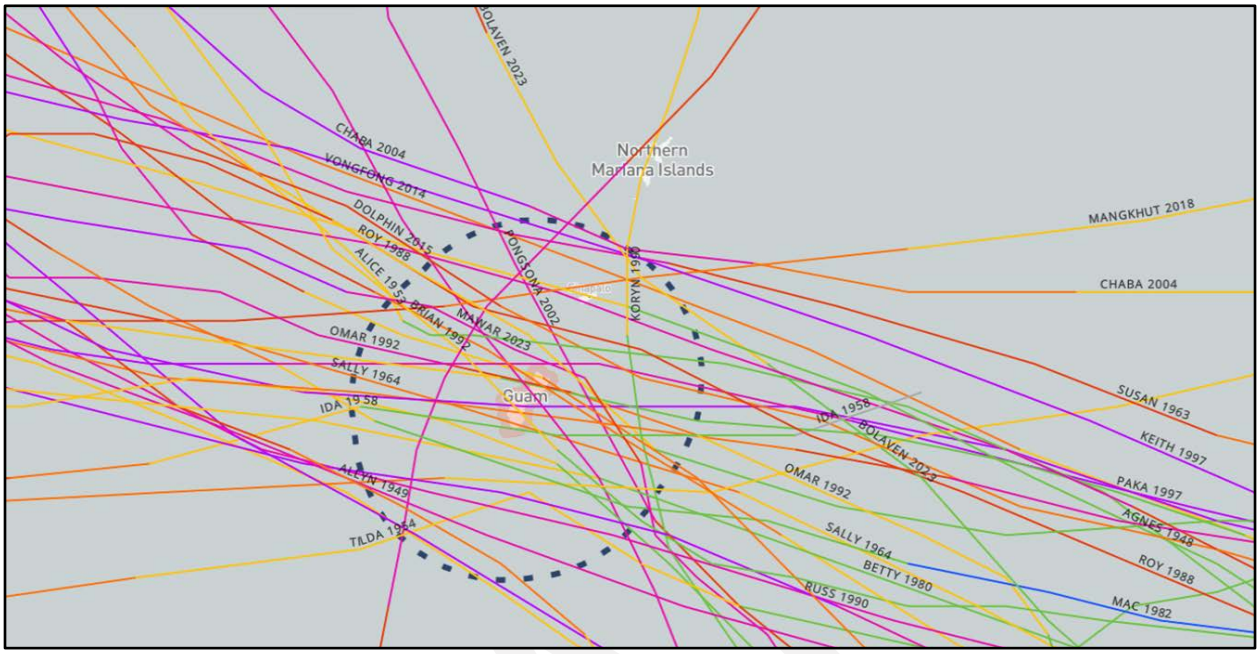

Figure 3-32. Typhoon tracks near Guam, 1948-present (NOAA, 2025).

Climate change is expected to increase typhoon intensity in the future, with stronger winds and more extreme rainfall rates posing an even greater threat to the island (EPA, 2016). The 2024 HMP notes that while the frequency of tropical cyclones may decline, those that do form are projected to be more intense, leading to higher storm surges and greater flood risks. Historical events like Typhoon Mawar (2023), which caused an estimated $300 million in damages, and Typhoon Pongsona (2002), which left Guam without power for weeks, underscore the island's vulnerability. The loss of coral reefs due to climate change further exacerbates coastal flooding and erosion, as reefs provide a natural buffer against powerful waves. Recognizing these threats, the 2024 HMP emphasizes the need for stronger building codes, improved disaster preparedness, and climate adaptation strategies to reduce the long-term risks posed by typhoons.

Guam's land use planning deeply incorporates resilience to typhoons and extreme storms, which are a persistent threat in the Western Pacific. Lessons from past storms have significantly shaped policy. For example, Super Typhoon Paka (1997) pummeled Guam with sustained winds of 115–144 mph for 8–10 hours. In its aftermath, assessments noted no loss of life on Guam – a result credited to the island's experienced populace, timely warnings, and a superior building code that produced sturdy concrete homes (PDN, 1997). Newer concrete-roofed houses and reinforced power poles withstood Paka's onslaught well, whereas older tin-roofed structures and wooden utility poles were destroyed, leaving several thousand people homeless (Weather.gov, 1997). These outcomes reinforced the crucial importance of adhering to modern building standards and replacing aging, vulnerable infrastructure. Each major

typhoon, from Karen (1962) to Pongsona (2002) to Mawar (2023), has underscored the need for robust construction and continuous improvement in storm preparedness.

Building resilience against typhoons is a top land use priority. Guam's development regulations require that structures meet stringent wind load and flood standards. Most homes and buildings are constructed of reinforced concrete or masonry, often with typhoon shutters or impact-resistant windows, to endure extreme winds. Power and communications infrastructure are steadily being upgraded to reduce storm vulnerability. Nearly all of Guam's older wooden power poles have been replaced with steel or concrete, and about a quarter of power lines have been undergrounded to prevent wind damage and accelerate post-storm recovery. The G50SP incorporates these mitigation policies to support future natural hazard and climate change resilience.

Critical facilities like hospitals, shelters, and water/power plants are built to higher design standards and include backup systems, recognizing their importance during disasters. Development in hazardous coastal areas is managed via setback requirements and elevation standards to mitigate storm surge impacts. For instance, new construction along low-lying shorelines often must be elevated on reinforced concrete piers or placed further inland. Land use plans also designate certain public buildings (e.g. concrete school structures or community centers) as typhoon shelters, ensuring that residents of flood-prone or weak structures have a safe refuge during storms. At the same time, mayors and residents are concerned about the adequacy and availability of typhoon shelters. Some village Mayors have reported that residents are directed to seek shelter in locations that may be inaccessible due to road conditions during severe weather events and typhoons. In certain areas, the nearest available shelters lack sufficient protection, highlighting the need for improved facilities in certain locations. Additionally, insufficient stormwater drainage systems

Hurricanes and typhoons are the same weather phenomenon: tropical cyclones – a generic term used by meteorologists to describe a rotating, organized system of clouds and thunderstorms that originates over tropical or subtropical waters and has closed, low-level circulation (NOAA, 2024x)

The weakest tropical cyclones are called *tropical depressions*. If a depression intensifies such that its maximum sustained winds reach 39 miles per hour, the tropical cyclone becomes a *tropical storm*. Once a tropical cyclone reaches maximum sustained winds of 74 miles per hour or higher, it is then classified as a hurricane, typhoon, or tropical cyclone, depending upon where the storm originates in the world.

Tropical cyclones have strong, damaging wind and very heavy rainfall. An average of three tropical storms and one typhoon pass within 180 miles (330 kilometers) of Guam each year.

exacerbate flooding risks, particularly in flood-prone villages, reinforcing the necessity of designed and accessible typhoon shelters for residents.

Regular drills, public awareness campaigns, and well-coordinated emergency response plans complement the physical preparedness, so that communities know how to respond when typhoon warnings are issued. Emergency shelters are critical during typhoon events, and the G50SP requires the equitable distribution and upgrading of emergency facilities to ensure structural integrity and community accessibility. Existing structures, such as recreational facilities, are targeted for disaster retrofitting to serve as Tier 1–3 shelters, consistent with the Guam Hazard Mitigation Plan.[10]

3.7.3. Flooding

Flood hazard management is critical in Guam's sustainability and land use planning due to the island's heavy rainfall and coastal exposure. Flooding on Guam takes multiple forms – from riverine floods in low-lying valleys, to flash floods from intense downpours, to coastal inundation from storm surge. The island's geology creates distinct regional flood patterns: the porous limestone in northern Guam absorbs water, but the clay soils and steeper terrain in southern Guam generate high runoff, making the south more prone to flash flooding and erosion during torrential rains. Climate records show that extreme rainstorms occasionally overwhelm Guam's streams and storm drains, especially in the wet season, causing damaging floods in villages and farms. These risks are projected to **increase with climate change**, which may bring more frequent extreme rainfall events (EPA, 2016). Ensuring that new development does not worsen flood hazards (for example, by paving over absorbent ground or building in natural flow paths) is a guiding principle of land use policy.

Large projects require drainage impact assessments, and developers must incorporate features like retention basins, permeable surfaces, and slope stabilization to manage runoff. Special flood hazard areas – such as river floodplains and coastal zones – are subject to strict controls under Guam's building law and U.S. National Flood Insurance Program (NFIP) standards. Homes built to NFIP flood standards (elevated above base flood elevation, with reinforced foundations) have proven to incur far less damage and allow quicker recovery when floods do occur (GHS, 2025). By enforcing these standards, Guam reduces the risk to life and property in known flood zones. However, additional environmental challenges exacerbate these issues, such as insufficient ponding basin maintenance, which has worsened flooding according to local Mayors. They believe runoff negatively impacts the aquifer, posing risks to Guam's water

[10] As described in Guam's Hazard Mitigation Plan: "Tier 1 shelters provide immediate, short-term refuge; Tier 2 shelters offer more comprehensive services for longer durations; and Tier 3 shelters are equipped for extended stays, providing full-scale support including, healthcare, food, and long-term accommodation" (Guam Homeland Security, 2024).

supply. Other concerns include the preservation of indigenous snail populations, challenges in pipeline maintenance, and the presence of junk cars that may obstruct drainage.

Guam's land use planning for flooding is also informed by up-to-date flood mapping and planning. FEMA's Flood Insurance Rate Maps delineate areas at risk from 100-year and 500-year floods, guiding zoning decisions and insurance requirements. In addition, Guam agencies have conducted detailed watershed and flood studies – such as the Guam Comprehensive Flood Study and recent watershed assessments – to refine understanding of flood frequencies for local rivers (e.g. the Ugum, Umatac, and Talofofo watersheds) (BSP, 2020). These studies support evidence-based policies like preserving upstream wetlands and floodplains as natural buffers. Some areas are particularly vulnerable, such as parts of Mangilao, where flooding is a major issue in recreational open fields and along Route 15. In Hagat, poor drainage has led to flood-related backups in homes, with outdated road infrastructure compounding the issue as sewer systems are positioned below road levels, making proper drainage more difficult (see Figure 3-36 and Chapter 7).

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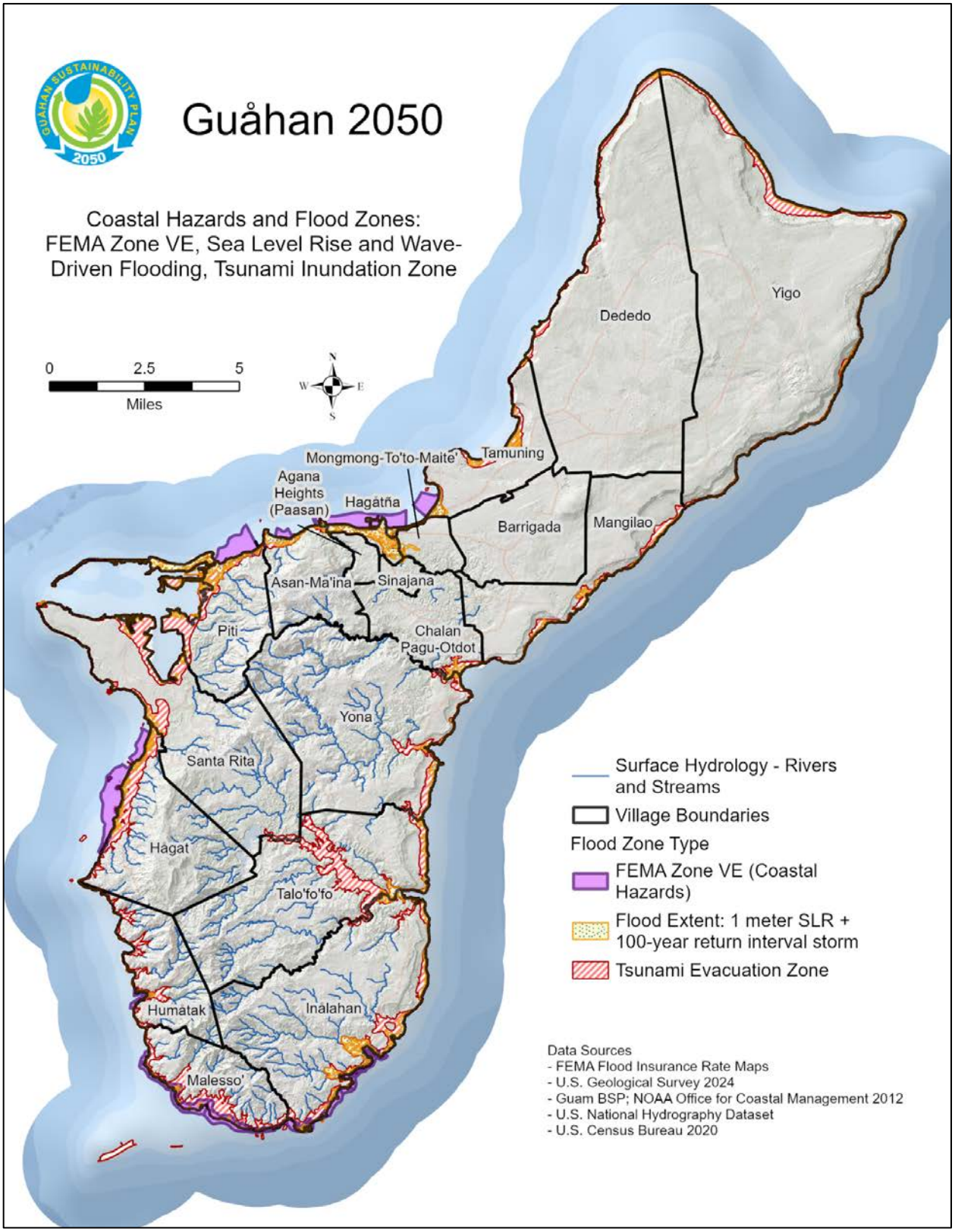

Figure 3-33. Map of Coastal Hazards and Flood Zones on Guam.

Figure 3-34. Flood Areas in Hagåtña.

The G50SP prioritizes keeping critical infrastructure (water wells, sewage treatment plants, etc.) and new development out of high-risk flood zones whenever possible. Where development already exists in flood-prone areas (for instance, parts of Hagåtña or low-lying coastal villages), mitigation measures should be pursued: floodwalls or berms, improved drainage systems, and even voluntary relocation or buyouts of the most vulnerable properties. Guam also participates in innovative interagency programs such as the *Silver Jackets* partnership to address flooding. The Guam Silver Jackets team unites federal and local agencies to implement non-structural flood risk reduction projects – examples include community education on flood preparedness, emergency action plan development, and better flood warning systems (BSP, 2022). These collaborative efforts ensure that flood risk management is comprehensive, covering everything from engineering solutions to public awareness. By combining accurate flood hazard mapping, responsible land use in floodplains, enforcement of building standards, and watershed management (e.g. reforestation to curb runoff and erosion), Guam will strengthen its resilience to flooding while protecting water resources and ecosystems.

3.7.4. Shoreline Hazards, Sea Level Rise, and Coastal Resilience

As an island in the Pacific, Guam faces significant coastal hazards that threaten its environment, infrastructure, and communities. Rising sea levels, coastal erosion, tsunamis, and other shoreline hazards necessitate proactive and sustainable policies to mitigate risks. In response, G50SP policies emphasize development safety, shoreline hazard mapping, site-specific hazard evaluation, and the limitation of shoreline protective devices. These measures ensure that development occurs in a manner that safeguards both human safety and natural coastal environments.

Guam's coastal areas are on the front line of climate change and geologic hazards, and the island's sustainability plan addresses these shoreline challenges through science-based adaptation and nature-based solutions. Sea level rise (SLR) is a growing concern for this low-lying oceanic island. Tide gauge data and regional models indicate Guam has already seen about 4 inches of sea-level rise since the early 1990s (Figure 3-37). Projections suggest an additional rise of roughly 0.5 to 1.5 feet by 2050 and potentially 3+ feet by 2100 under intermediate-to-high scenarios (BSP, 2022). Such an increase will gradually submerge low-lying coastal flats and exacerbate coastal flooding and erosion during high tides and storms.

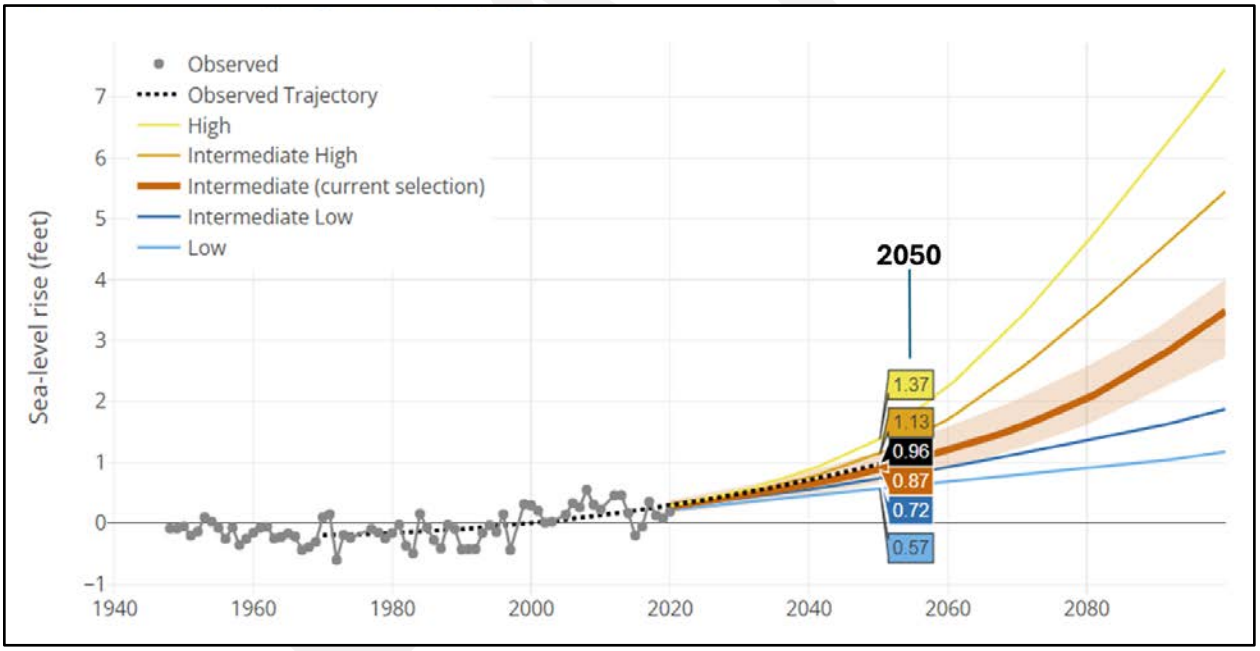

Figure 3-35. APRA Harbor Sea Level Rise Projections (NASA, 2024).

The G50SP includes policies to anticipate these changes. Setback requirements along the shoreline would be expanded – new construction must be sited further inland from the current high-tide line to allow for erosion and inundation buffers over the coming decades. In particularly vulnerable spots (e.g. parts of Tumon Bay or Malesso' village waterfront), adaptation planning and considerations will become increasingly important.

Another critical facet of shoreline hazard planning is addressing coastal erosion and extreme wave events. Guam's beaches and coastal bluffs face steady erosion from natural wave action, which is being intensified by higher sea levels and the loss of protective ecosystems. To mitigate these risks, Guam has implemented coastal land use regulations and early warning systems. Tsunami inundation maps and evacuation routes are posted in coastal villages, and new buildings in tsunami hazard zones are required to incorporate vertical evacuation options (like rooftop refuge areas) or meet structural designs to withstand certain wave forces. Additionally, local Mayors emphasized the need for environmental protection efforts to safeguard the ocean, coral reefs, and mangroves, recognizing their role in coastal resilience (see Chapter 5 also).

Many of Guam's shorelines are protected by wide fringing reefs, which results in a relatively mild wave climate along the shoreline, except during infrequent typhoon events. This results in narrow and mildly sloped beaches, often backed by vegetated beach berms. These areas are not as vulnerable to erosion, but will be affected by rising sea levels, as larger waves may be able to transform across the reef and reach the shoreline. The primary areas of concern are those in which buildings and roadways exist very close to the shoreline. In these areas, as sea levels rise, homeowners, businesses, and the Government of Guam will be required to adapt by using protective structures, elevating smaller infrastructure, or even by retreating from the shoreline. Residents and Mayors in affected villages have identified sea level rise as a significant problem, particularly where it causes erosion near roads and residential areas.

In the Guam Shoreline Atlas, shorelines were classified into three categories based on susceptibility to erosion: critical, potentially critical, and non-critical (Figure 3-38):

- Critical is defined as existing and/or continuing shoreline erosion, protective structure failure, or storm damage vulnerability that is an immediate threat to existing structures or public facilities, and thereby justifies protective action.
- Potentially Critical is defined as existing and/or continuing shoreline erosion, protective structure failure, or storm damage vulnerability that is a potential threat, and justifies protective action. However, protective action is not as urgent as for critical status.
- Non-critical is defined as shoreline erosion, protective structure failure, or storm damage vulnerability that is either not currently a threat or does not exist, and does not justify protective action. These areas could become potentially critical or critical if erosion begins to threaten existing structures or public facilities

Figure 3-36. Guam Shoreline Atlas Shoreline Status, Tamuning.

For daily erosion issues, Guam's Coastal Management Program encourages "living shoreline" approaches over hard structures wherever feasible. This includes restoration of mangroves and coastal vegetation to anchor shorelines, beach nourishment projects to replace lost sand, and establishing setback zones where no new construction is allowed so that natural beach migration can occur. Coral reef restoration is also recognized as a key nature-based solution to shoreline hazards – Guam's coral reefs are vital breakwaters that dissipate wave energy before it hits the coast. Unfortunately, reefs have been degraded by warming, pollution, and Crown-of-Thorns starfish outbreaks, reducing their protective function. In response, local and federal partners (e.g. NOAA, University of Guam Marine Lab) are working on reef resilience projects, such as outplanting nursery-grown corals and improving water quality to support reef recovery.

Healthy reefs, along with intact seagrass beds and mangroves, help buffer the shore from storms, reducing erosion and flood damage. Guam's sustainability plan highlights these nature-based adaptations: planting mangroves in vulnerable bays, conserving reef flats as no-fishing marine preserves to boost reef health, and possibly constructing artificial reef structures in key locations to enhance coastal protection. By coupling hard infrastructure where needed (raised seawalls, tide gates, etc.) with ecosystem-based approaches, Guam may build layered defense against coastal hazards. This integrated strategy aims to safeguard coastal communities, critical infrastructure (like the Port of Guam and seaside roads), and invaluable natural resources from the threats of sea-level rise, coastal erosion, and tsunamis in the coming decades. Community sentiment supports these efforts, with a majority (68%) of G50SP Community Engagement Survey respondents believing that development in coastal areas should be restricted due to sea level rise (Figure 3-39).

3.7.4.1. Shoreline Hazards and Development Safety

Ensuring the safety of new developments near the shoreline is a crucial policy goal. The construction of infrastructure and buildings must be planned and executed with long-term risk assessments in mind. Policies dictate that new developments, including land divisions, must avoid or minimize exposure to coastal hazards, including shoreline erosion, wave runup, and sea-level rise impacts. Crucially, structures should not rely on shoreline protection devices over their anticipated lifespan. This requirement aims to prevent excessive artificial modifications to the coastline, which can disrupt natural sediment movement and exacerbate erosion.

3.7.4.2. Shoreline Hazard Mapping

A vital component of hazard mitigation is the continuous updating of shoreline hazard maps. These maps must integrate the latest scientific findings to accurately reflect risks such as wave action, flooding, tsunamis, and erosion. The incorporation of best available science ensures that policymakers, developers, and residents have access to reliable data, facilitating informed decision-making regarding coastal planning and infrastructure placement. Regular updates are essential, as sea levels and climate patterns change over time, affecting risk levels.

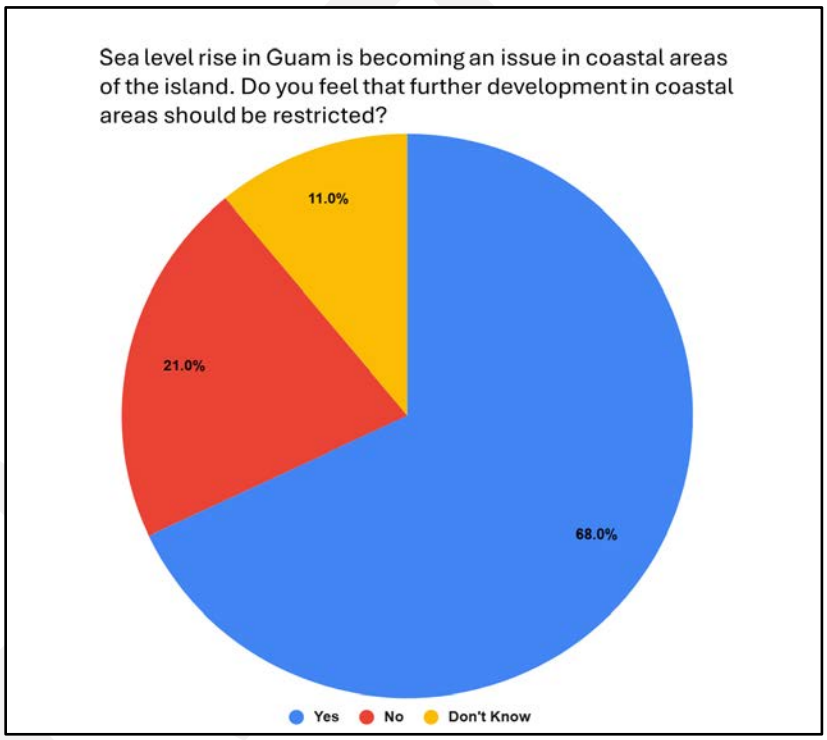

Figure 3-37. Public Response to Sea Level Rise and Coastal Development

3.7.4.3. Site-Specific Shoreline Hazard Evaluations

To further refine risk assessments, policies require that any new development proposed in areas subject to shoreline hazards undergo a site-specific hazard evaluation. These evaluations must be conducted by professionals specializing in coastal processes and should consider the structure's lifespan, expected sea-level rise projections, and 100-year storm events. Blufftop developments, in particular, must meet specific safety factors for both static and seismic conditions. These stringent requirements ensure that developments are resilient and do not contribute to future coastal degradation or instability.

3.7.4.4. Bluff-Clifftop Development Setbacks

Bluff and cliff top areas are highly susceptible to erosion, making strict setback regulations necessary. Before permitting new blufftop developments, a detailed evaluation must demonstrate that the design and location can ensure stability over the structure's lifespan. The policies require a safety factor greater than or equal to 1.5 for static conditions and 1.1 for seismic conditions. Additionally, developments must not contribute to erosion, geologic instability, or other environmental damage. These measures help maintain the integrity of bluff ecosystems and protect coastal communities from hazardous collapses.

3.7.4.5. Beach Setbacks and Land Division Policies

For beachfront development, setback policies ensure that structures remain safe from coastal flooding and long-term erosion. Developments must be positioned inland far enough to account for projected sea-level rise and seasonal changes in shoreline morphology. Similarly, land division policies restrict the creation of new lots near beaches or blufftops unless they can be developed without future reliance on shoreline protection devices. These provisions help prevent overdevelopment in high-risk areas and reduce the necessity for costly and environmentally harmful interventions. It may be beneficial to reevaluate and strengthen seashore reserve policies by extending the mandatory setbacks from the mean high water mark (MHWM), which is currently 33 feet, to a minimum of 100 feet. This adjustment could provide enhanced protection against a range of coastal hazards, including the increasing risks posed by storm surges, sea level rise, and coastal erosion. Establishing a wider setback will not only safeguard infrastructure and human activities, but also help preserve natural coastal ecosystems that play a vital role in mitigating such hazards. Moreover, adopting these updated setbacks is essential for long-term resilience, allowing coastal communities to better adapt to the evolving impacts of climate change, while maintaining the ecological integrity of coastal areas.

3.7.4.6. Assumption of Risk for Development in Hazard Areas

An important policy mechanism involves placing the responsibility of risk on property owners. New developments in hazardous areas must include deed restrictions that acknowledge potential dangers, waive claims against the Government of Guam, and accept the possibility of relocation or removal due to future hazard conditions. This policy ensures that developers and property owners understand the risks associated with building in coastal zones, thereby reducing liability for the government while promoting responsible development.

3.7.4.7. Limitations on Shoreline Protective Devices

Policies strictly limit the use of shoreline protective devices to coastal-dependent land uses, such as boating and fishing facilities, or for protecting pre-existing structures under imminent threat of erosion. Even in these cases, the chosen protective measure must be the least environmentally damaging option, with resource impacts mitigated appropriately. This limitation

discourages reliance on artificial barriers that can accelerate erosion on adjacent properties and disrupt natural shoreline dynamics.

3.7.4.8. Protection of Critical Facilities and Infrastructure

While general policies restrict shoreline protective devices, exceptions are made for critical infrastructure necessary for public services. Interim shoreline protection may be permitted for public safety facilities, hospitals, and essential utilities, provided that feasibility assessments explore relocation options. Adaptation plans must be included to transition these facilities away from high-risk areas in the long term. These measures ensure that vital public services remain operational while promoting sustainable land use planning.

3.7.4.9. Nature-Based Solutions and Coral Reef Restoration

Guam prioritizes nature-based solutions as alternatives to hard infrastructure for shoreline protection. Strategies such as dune restoration, dynamic revetments, cobble wave trippers, vegetative planting, and sand nourishment provide natural buffers against coastal hazards while preserving ecological integrity. Coral reef restoration is also a key focus, as healthy reef systems reduce wave energy and serve as natural barriers against coastal flooding. These environmentally friendly approaches offer sustainable protection while enhancing biodiversity and ecosystem services. In addition to promoting reef restoration, it is important to prioritize protection of coral nurseries, such as the Piti Bomb Holes, Dogleg Reef (Apra Harbor), and Malesso' Coral Nurseries.

3.7.4.10. Tsunami Inundation Zone Policies

Due to the high tsunami risk in Guam, stringent policies govern development in tsunami inundation zones. New building sites are generally discouraged in these areas, especially for critical community facilities such as hospitals and schools. Infill development is permitted under specific conditions, requiring disclosure of tsunami risks and indemnification of the government against liability. Clear evacuation plans and routes must be established for all developments in tsunami-prone areas to ensure public safety in the event of an emergency.

3.7.4.11. Land Acquisition and Shoreline Adaptation Planning

To further enhance resilience, Guam's policies support the acquisition, land trades, and or purchase of development rights of at-risk properties in erosion-prone areas. This land can then be used for implementing adaptation strategies, including shoreline restoration and the creation

of vegetation buffers. Additionally, maintaining and updating the Guam Shoreline Atlas supports long-term adaptation planning. These plans incorporate vulnerability assessments, projected shoreline changes, and strategies for minimizing risk while preserving public access and coastal resources.

3.7.5. Land Stability and Seismic Safety

Guam's hilly terrain and seismic setting pose additional land use challenges, and the island's policies promote careful site planning and engineering to ensure land stability and seismic safety. In southern Guam, which is dominated by volcanic soils and steep slopes, landslides and soil erosion are persistent concerns. Heavy rainfall—especially during typhoons or monsoon storms—can oversaturate the thin topsoil on hillsides, causing slope failures and debris flows. In some cases, a single landslide can strip a large area of vegetation within minutes, creating exposed badland scars on the mountainsides (Guampedia, 2025).

These barren areas then contribute to further erosion and sediment runoff, as they lack plants to hold the soil. To combat this, Guam has implemented hillside development restrictions by requiring geotechnical evaluations and strict erosion control measures for any project on slopes above a certain grade (e.g., 15% slope or greater).[11] The G50SP includes a policy restricting development on slopes greater than 30%, except for critical infrastructure projects that must demonstrate safety feasibility through detailed geotechnical studies.

Builders are often mandated to include terraces, retaining walls, or vegetative cover to prevent cuts and fills from sliding. Furthermore, activities that exacerbate erosion – like indiscriminate clearing of vegetation on steep land – are regulated or discouraged. The government works with private landowners on reforestation initiatives in critically eroding watersheds, planting trees and vetiver grass to stabilize soils. There is also recognition of the link between wildfires and landslides: wildland fires (often human-caused in the dry season) leave hillsides bare and prone to mudslides in the next heavy rain.

Thus, wildfire prevention and post-fire revegetation (discussed in the next section) are integral to maintaining slope stability. By guiding intensive development away from unstable slopes and enforcing site-specific safeguards (like proper retaining structures and controlled drainage), Guam's land use policies aim to minimize landslide hazards and protect downhill communities and coral reefs from the cascade of sediment.

[11] As noted in the Comprehensive Development Guide, Guam has a policy addressing Erosion and Siltation: Development shall be limited in areas of 15% or greater slope by requiring strict compliance with erosion, sedimentation, and land use districting guidelines, as well as other related land use standards for such areas.

Seismic safety is an equally important pillar of Guam's planning framework. The island is in a seismically active region near the Mariana Trench; it experiences frequent earthquakes and occasional major seismic events. In fact, ground shaking intensities in Guam can rival those in California's most quake-prone areas (Structuremag, 2025). A notable event was the 1993 Guam earthquake (Mw 8.1), which caused significant ground motion and even soil liquefaction in parts of the island (for example, around Apra Harbor). All of Guam is considered susceptible to earthquakes, and numerous surface faults traverse the island (with a concentration of faults east of Apra Harbor).

These realities have led Guam to adopt some of the strictest seismic design requirements in the Pacific. Building codes mandate that structures be designed for high seismic loads; engineers must account for strong ground shaking in structural calculations, similar to practices in earthquake-prone U.S. states. Since the late 1970s, when modern seismic codes were first introduced on Guam, new buildings have been constructed with features like reinforced concrete frames, shear walls, and anchoring systems to resist quakes. The transition to the IBC code in 2010 further improved seismic provisions, bringing Guam up to date with the latest International Building Code standards for seismic risk.

Critical infrastructure – bridges, utilities, and especially lifeline facilities like hospitals and airports – undergo rigorous seismic design reviews. For instance, fuel storage tanks and power plants are evaluated for seismic-induced settlement or liquefaction potential, given that the 1993 quake caused ground settlement near the island's main power plant (though the plant itself remained structurally sound).

Additionally, retrofitting older structures remains a priority: many buildings constructed before 1980 (when seismic codes were minimal) may be undergoing upgrades such as column wrapping, roof-to-wall anchoring, or bracing of parapets to improve earthquake resilience. Guam also conducts regular emergency drills for earthquake response and has public education on "drop, cover, and hold" and tsunami awareness, recognizing that a local quake could generate tsunamis. Overall, through stringent building code enforcement for new construction and strategic retrofits of older buildings, Guam is fortifying its built environment against seismic shocks. When combined with prudent land use on steep slopes, these measures help ensure that the island's growth is geologically safe and secure.

3.7.6. Wildfire

Wildfires on Guam present a unique hazard intersection of human activity, climate, and land management, and the island's sustainability plan addresses these through fire risk mitigation and adaptive land use practices. Although Guam is a humid tropical island, it experiences a pronounced dry season from December to June, during which the landscape can become prone to wildland fires (PacificFireExchange, 2025). Unlike some regions, Guam has no natural ignition

sources (such as lightning); nearly all wildfires are caused by human actions – whether accidental campfires, arson for hunting (to flush out game), or military training exercises.[12]

Wildfires pose a growing threat to Guam's rural and agricultural lands, particularly during extended dry periods. The G2050SP discourages development in fire-prone areas, promotes fuel break maintenance, and mandates fire-resistant landscaping with native species. To further enhance wildfire resilience, the plan requires:

- Emergency vehicle access improvements to ensure quick response times.
- Adequate fire flows and hydrant upgrades for rural developments.
- Incentives for rainwater capture and drought-adaptive practices on agricultural lands.

This multi-faceted approach helps reduce fire hazards while protecting ecological integrity.

During severe droughts or El Niño events, vegetation dries out more extensively, heightening fire risk. In an average dry season, hundreds of fires occur across the island's grasslands and scrub areas. For example, in one recent season over 430 grass fires were reported, burning an estimated 1,100 acres of land (Kuam.com, 2025). These fires primarily torch the southern and central "savanna" terrain covered in swordgrass and shrubs, which can ignite easily and spread fast with the wind. While typically not on the scale of massive mainland forest fires, Guam's wildfires threaten infrastructure and ecosystems on a recurring basis. They can damage power lines and put rural homes at risk, especially those built at the wildland-urban interface. Moreover, wildfires contribute to the formation of the earlier-mentioned badlands by removing protective vegetative cover; subsequent rains then erode the exposed soil, causing landslides and sending sediment into rivers. This linkage means fire hazards are entwined with flood and erosion issues. Reducing wildfire incidence is thus a key strategy not only for direct property protection but also for safeguarding watersheds and coastal reefs from erosion impacts (GDO, 2024).

[12] Guam regulations prohibit the use of fire in hunting activities: GARR § 11117. Use of Lights and Fire Prohibited. The use of fire or artificial light of any kind as an aid to the taking of game is prohibited (5 GCA § 63125).

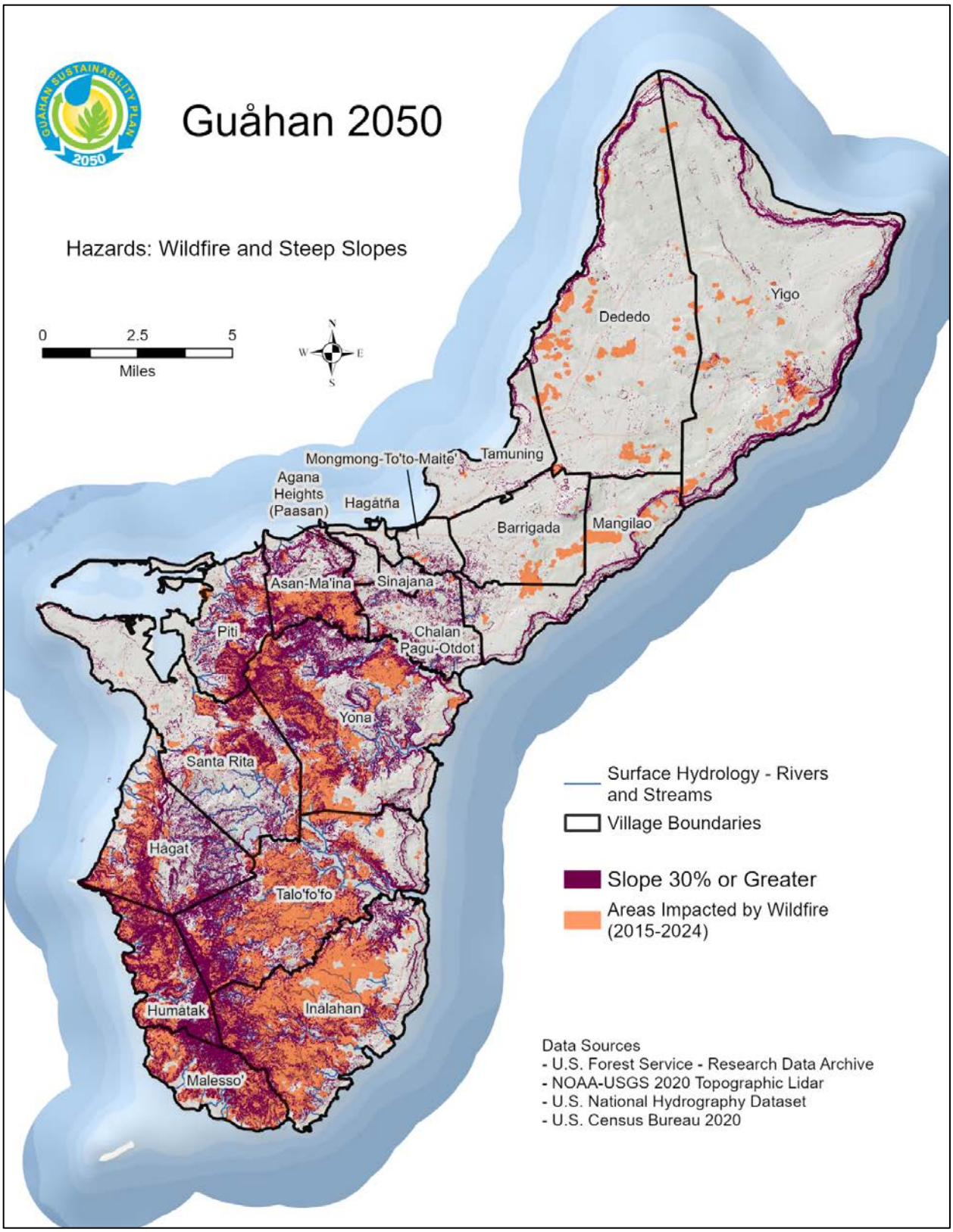

Figure 3-38. Guam Wildfire Hazards and Steep Terrain

However, according to several Mayors both in the north and south of the island, “the police and fire departments were deemed insufficient, with a planned expansion never realized, leading to inefficiencies in service delivery. The reliance on services from the northern villages has often created response delays in southern villages, prompting the need for a local ambulance, police, and/or fire station to expedite response times during emergencies.” These limitations heighten the challenges posed by wildfires, as rapid response times are essential for minimizing damage, especially in rural and hard-to-reach areas.

Guam’s land use and environmental policies take several strategies for wildfire risk mitigation. First, there is an emphasis on preventing ignitions through public outreach and interagency cooperation. The Guam Forestry Division and Guam Fire Department run annual awareness campaigns (e.g. “Munga Masongge Guåhan, Don’t Burn Guam!” during peak fire season) to discourage arson and educate residents about the dangers of uncontrolled burning. They also maintain firebreaks in high-risk areas – these are cleared or greenbelt strips (often along roads or around villages) that can slow or stop a grassfire’s spread.

DRAFT

How People, Rainfall, and Vegetation Shape Fire Regimes in Micronesia

Key Findings

- Fire plays a significant role in shaping landscapes across the high islands of Micronesia.
- Human activity, particularly the long-term use of fire by Pacific Islanders, has influenced the persistence of savanna ecosystems.
- The extent of savannas is positively correlated with island age and rainfall variability, suggesting historical and climatic influences.
- Fire occurrence is highest in drier regions with pronounced seasonal rainfall, with Guam, Rota, and Yap experiencing some of the highest annual burn rates.
- Despite suitable conditions for forest growth, savannas remain stable due to fire recurrence, soil conditions, and potential dispersal limitations.

Climate & Fire

- Fire activity is strongly linked to El Niño events, with increased dry-season intensity leading to higher fire occurrence.
- Lightning activity is rare across the region, reinforcing the idea that most fires are human-caused.
- Annual burned areas range from 2% to 10% of island land area, largely occurring in savannas.

Ecological Impact

- While often seen as degraded landscapes, Micronesian savannas support native vegetation and endemic species.
- Soil characteristics in savannas, such as high acidity and aluminum content, may limit forest re-establishment.
- Frequent fires contribute to erosion and sedimentation, impacting nearshore marine ecosystems.

Implications for Fire Management

- Understanding the historical role of fire can help develop better fire management and restoration strategies.
- Fire risk assessment should integrate climate variability, land cover changes, and human activity patterns.
- Recognizing the cultural and ecological value of savannas is essential for sustainable land use planning.

Citation:

Trauernicht, C., Frazier, A. G., Dendy, J., Bubb, I., Camacho-Fejeran, C., Friday, J. B., King, R., Manglona, J., Ruegorong, F., Singeo, A., Giardina, C. P., & Cordell, S. (2023). *How people, rainfall, and vegetation shape tropical island fire regimes across Micronesia*. *Journal of Biogeography, 00*, 1–17. https://doi.org/10.1111/jbi.14763

In terms of development, new subdivisions near savanna areas are encouraged to create defensible space around homes (by clearing brush and using fire-resistant landscaping in a buffer zone). Building guidelines recommend non-flammable roofing and siding materials for houses in these fringe areas, to prevent ember intrusion during grassfire events. The hazard mitigation plan identifies zones of "high" wildfire hazard (indeed, 239 major utility and public assets are rated at high or very high wildfire risk), and in these zones land managers prioritize fuel reduction projects. Such projects include grazing programs (using cattle or goats to keep grasses short), strategic controlled burns under safe conditions to eliminate excessive fuel build-up, and invasive species control since some invasive grasses can increase fire intensity.

Guam's conservation agencies are also restoring native forests in certain areas; healthy forest is much less fire-prone than degraded grassland. For instance, planting fast-growing trees in fire-scarred savannas can, over time, shade out flammable grass and reduce future fire spread. Emergency access is another consideration in land use planning: road designs in rural neighborhoods must accommodate fire trucks, and water storage or hydrants are installed to ensure firefighting water supply in remote areas. The island's community planning integrates Wildland-Urban Interface (WUI) best practices from the U.S. Forest Service and FEMA, tailored to Guam's environment. After any significant wildfire, Guam's Forestry and Soil & Water Conservation teams quickly move in for rehabilitation – reseeding burned slopes, stabilizing soil with mulches, and repairing any damaged infrastructure (trails, culverts) to prevent post-fire erosion. By addressing wildfire through preventive education, smart land management (fuel breaks and fire-resistant design), and rapid post-fire response, Guam is working to reduce the incidence and impact of fires. These efforts not only protect lives and properties directly but also preserve the island's ecological health, contributing to the overall resilience of Guam in the face of climate variability.

3.7.7. Natural Hazards Policy and Sustainability.

Guam's 2050 Sustainability Plan includes natural hazards policies that align with multiple UN SDGs. For example, the comprehensive hazard mitigation efforts contribute directly to SDG 11 (Sustainable Cities and Communities), especially Target 11.5 which calls for reducing deaths, people affected, and economic losses from disasters. By enforcing safe building codes, relocating vulnerable structures, and educating the public on disaster preparedness, Guam aims to minimize casualties and damage when hazards strike – effectively working toward "significantly reducing the number of people affected by disasters" by 2030 (SDG 11.5).

Likewise, Guam's integration of climate projections into land use decisions and its emphasis on adaptation align with SDG 13 (Climate Action). Target 13.1 is to "strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries". G50SP policies – from coastal adaptation plans for sea level rise to drought and wildfire management – serve as local fulfillment of SDG 13.1 by proactively building adaptive capacity in this island community. Progress on these targets can be measured through indicators such as disaster loss statistics (which Guam tracks via its mitigation plan monitoring) and the integration of climate risk into local planning (an indicator of adaptation governance).

In addition to SDGs 11 and 13, Guam's hazard resilience measures support several other Goals in the 2030 Agenda. Protecting coastal ecosystems through reef restoration and watershed conservation ties into SDG 14 (Life Below Water) and SDG 15 (Life on Land), since healthy coral reefs and forests are key to a sustainable and resilient island. For instance, restoring coral reefs not only buffers Guam against storm waves (a resilience benefit) but also achieves SDG 14.2, which is to safeguard and restore marine ecosystems. Similarly, wildfire prevention and reforestation efforts contribute to SDG 15.3 on land degradation neutrality by rehabilitating burned lands and preventing soil erosion.

Ensuring resilient infrastructure, such as typhoon-resistant roads and reliable power grids, advances SDG 9 (Industry, Innovation, and Infrastructure), particularly the aspect of building infrastructure that is sustainable and can withstand climate disasters. Moreover, the plan's focus on equity in resilience planning (e.g. providing shelters and resources for all communities, including the most vulnerable) resonates with SDG 10 (Reduced Inequalities) and SDG 1 (No Poverty) targets about bolstering the resilience of the poor and those in vulnerable situations (Target 1.5).

Through its integrated land use policies, hazard mitigation strategies, and climate adaptation efforts, the Guam 2050 Sustainability Plan provides a comprehensive framework for addressing natural hazards while promoting long-term sustainability, safety, and environmental resilience.

NATURAL HAZARD POLICIES

General Hazard Policies

SC-90. Best Available Hazard Information.

The Guåhan Sustainable Development Plan shall use, maintain, and continually improve the best available science and mapping concerning Guam's built and natural assets and their vulnerability to natural hazards.

SC-91. Hazard Risk Reduction.

Development shall minimize and reduce risks of natural hazard damage to buildings and infrastructure, especially essential facilities, major utilities, and transportation systems.

SC-92. Disaster Safety.

Promote disaster-resistant development and disaster recovery.

SC-93. Health and Safety.

Development shall protect human health and safety.

SC-94. Flood Safety.

Development shall avoid and minimize flooding risks to life and property.

SC-95. Building Safety.

Assure that habitable structures are fit for habitation, including structural safety, sanitary standards, adequate means of ingress and egress, fire safety, regular maintenance, or any other dangers to human life or safety.

SC-96. Building Maintenance, Dumping, and Public Nuisance.

For the protection of neighborhoods and communities, any residential, commercial, and other existing buildings and properties shall be maintained, free of unauthorized waste dumping, disposal, or other nuisance, and not abandoned. The Government of Guam shall enforce this provision to the maximum extent, consistent with public health and safety regulations, including abatement of public nuisances.

Typhoons, Storms, and Other Hazards

SC-97. Extreme Events.

Design and construct buildings that can resist, with minimal damage, reasonably expected natural disasters and weather events, including typhoons/high winds, storms, and flooding, earthquakes, tsunamis, drought, wildfires, landslides, and extreme heat.

SC-98. International Building Code Requirements.

Locate, design, and construct buildings in compliance with Guam building code standards, including adopted International Building Codes as applicable.

SC-99. Extreme Wind Hazards.

Design and construct buildings to withstand minimum wind loads as prescribed in applicable International Building Codes and the Guam building code. Decreases in wind load due to shielding from other structures is prohibited.

SC-100. Powerline Undergrounding.

Install new and existing primary and secondary power distribution lines underground to the maximum extent feasible.

SC-101. Emergency Shelters.

Assure equitable distribution of adequate emergency shelters for Guam's population, including Tier 1, 2, and 3 shelters, consistent with the Guam Hazard Mitigation Plan. Upgrade existing facilities (such as recreational facilities) through hardening to enhance their structural integrity and equip them to function as emergency shelters.

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Flooding

SC-102. Flood Hazard Studies and Mapping.

Maintain and update flood hazard mapping to using best available science, including but not limited to the most current official FEMA FIRM to determine the general location of flood hazard areas. Conduct targeted flood studies for major rivers, watercourses, and drainages. Consider developing flood management incentive programs to relocate existing development out of flood hazard areas, consistent with SC-90.

SC-103. Flood Hazard Avoidance for New Development.

Ensure that no new permitted development causes or contributes to flood hazards.

SC-104. Flood Protection Evaluation.

Require new development proposals to evaluate potential impacts to adjacent or downstream properties from all proposed structural flood protection measures to ensure that the flood protection measures will not create adverse direct and/or cumulative impacts either on-site or off-site. Single-family residential projects may comply with this policy by complying with other applicable flood hazard policy, ordinances, and FEMA requirements for flooding impact avoidance and mitigation.

SC-105. New Development in Watercourses.

Prohibit new development within the 100-year flood hazard zone of a watercourse, except for uses allowed pursuant to the policies of Chapter 5, such as stream restoration or necessary flood control measures. If no alternative building site exists, proper mitigation measures shall be provided to minimize or eliminate risks to life and property from flood hazard, and to ensure the development would not constitute a public nuisance, decrease watercourse capacity, or direct flows outside of the watercourse.

SC-106. Flood Protection.

Prohibit habitable space at elevations subject to flood risk. New development that must be located in areas subject to current or future flooding shall be sited and designed to be capable of withstanding such impacts in compliance with FEMA, NFIP, and applicable Guam public law. This shall include elevating all finished floor elevations at least 2 feet above the 100-year flood event, taking into account future climate change and projected storm events. Allow retrofitting for existing development in areas subject to current or future flood, including through elevation of habitable areas, use of break-away walls, etc. Ensure that flood protection measures are consistent with the visual and other resource protection policies of this Land Use Plan.

SC-107. New Development Adjacent to Flood Zones.

Require new development in areas outside of the identified 100-year flood hazard zones to identify opportunities to improve site drainage, address biological resource and water quality issues, and reduce contributions to flood hazards.

SC-108. Priority Flood Zone Development.

Prioritize open space, recreation, and conservation land uses within and adjacent to identified flood zones.

SC-109. Flood Hazard Abatement.

Implement flood hazard abatement projects that consider the following: a. Removal or relocation of development from flood hazard areas; b. Prioritizing green stabilization and infrastructure approaches; c. Restoration of flood plains and meander belts of drainages in public and private stormwater systems that were previously channelized; d. Use of impoundments or channel diversions when necessary, provided that adequate mitigation of environmental impacts can be demonstrated; and e. Debris clearance and silt removal conducted in a manner so as not to disrupt existing riparian communities.

Shoreline Hazards

SC-110. Development Safety.

Ensure that new development, including land division, is sited, sized, and designed to avoid or minimize shoreline hazards risks such as coastal flooding, shoreline erosion, wave runup, tsunami inundation, seawater intrusion, and other sea level rise impacts without requiring a shoreline protection device at any time over the anticipated life span of the structure.

SC-111. Shoreline Hazard Mapping.

Maintain and update shoreline hazard maps to incorporate significant updates in best available science and information when such significant updates are available, including areas subject to wave action, flooding, tsunamis, and erosion due to sea level rise.

SC-112. Site-Specific Shoreline Hazards Evaluation.

All new development proposed in areas that may be subject to shoreline hazards, including all beaches and beachfronts, blufftops, and areas mapped in the shoreline hazard overlay, shall require the submittal of a site-specific evaluation report of shoreline hazard risks over the anticipated life of the proposed development. Analyses shall be conducted by a qualified professional with expertise in coastal processes and shall establish the appropriate setback from the beach or bluff edge based on the anticipated life of the structure, best available science including utilizing the highest projected sea level rise amounts appropriate for the type of proposed development with a 100-year storm event and for blufftop development, a demonstrated factor of

safety greater than or equal to 1.5 for static conditions and greater than or equal to 1.1 for seismic conditions.

SC-113. Blufftop Development Setbacks.

Permit new blufftop development only if, as demonstrated by the site-specific evaluation required by Policy SC-93, (1) design and setback provisions are adequate to assure stability and structural integrity for the anticipated life span of the development, taking into consideration long-term future erosion and short-term episodic erosion including the influence of sea level rise, plus an added geologic stability factor of safety greater than or equal to 1.5 for the static condition and greater than or equal to 1.1 for the seismic condition, without reliance on existing or proposed shoreline protective devices; and (2) the development (including associated stormwater runoff, foot traffic, grading, irrigation, and septic tanks) will neither create nor contribute to erosion, geologic instability of the site or surrounding area, or otherwise harm coastal resources.

SC-114. Beach Setbacks.

Ensure that new beachfront development is set back far enough inland from the beach and other low-lying areas, as demonstrated by the required Shoreline Hazards Evaluation, such that the development will not be endangered by coastal flooding, seasonal and long-term erosion (including sea level rise induced erosion), and other shoreline hazards over the anticipated life span of the structure without the use of an existing or proposed shoreline protective device.

SC-115. Land Divisions near Beachfront and Blufftops.

Land divisions, including subdivisions, lot splits, and lot line adjustments that create new lots near beaches or blufftops, shall not be permitted unless the lots can be developed in accordance with the bluff and beach setback policies of the G2050SP and without requiring a current or future shoreline protective device.

SC-116. Assumption of Risk.

As a condition of approval for all development that may be subject to shoreline hazards, require a deed restriction to ensure that property owners understand and assume the risks of development in a hazardous area. Recorded restrictions shall include a waiver of claim of damage or liability against the Government of Guam, waiver of rights to future shoreline protection, and acknowledgement that the development may need to be removed and the site restored in response to future hazard conditions. In the event that development is threatened by shoreline erosion or other hazards and needs to be removed or relocated, the owner shall bear full responsibility for all costs and must work to implement the mitigation in a timely manner.

SC-117. Shoreline Protective Device Limitations.

Shoreline protective devices shall be permitted only to serve a coastal-dependent land uses (such as boating and fishing facilities) or to protect an existing structure (as of G2050SP adoption date) in imminent danger from erosion; when found to be the least environmentally damaging feasible alternative to address the danger; and when all resource impacts are appropriately and proportionally mitigated.

SC-118. Protection for Critical Facilities.

Notwithstanding the shoreline protective device limitations of Policy xxx, interim shoreline protective devices may be permitted to protect critical public infrastructure and facilities required to continue providing needed services to the community. Approval of facilities shall include a feasibility assessment of relocating the infrastructure out of the hazard zone and, where feasible, an adaptation plan for implementing relocation.

SC-119. Shoreline Protective Device Siting and Design.

Allowable shoreline protective devices shall be sited, designed, engineered, and constructed by qualified professionals to avoid resource impacts to the maximum extent feasible, including through preserving the maximum amount of existing beach, protecting lateral public access along the shoreline, protecting and enhancing public views, minimizing alteration of and visually blending with the surrounding natural shoreline; avoiding impacts to cultural resources; and not encompassing an area larger than that necessary.

SC-120. Nature-based Solutions.

Maximize use of nature-based solutions ("living shorelines") where feasible and appropriate as a preferred alternative to the placement of hard shoreline protection in order to protect development or other resources and to enhance natural resource areas. Examples of soft solutions include vegetative planting of native plant species, dynamic revetments, cobble wave trippers, dune restoration, and sand nourishment. In addition, the use of native plants in restoration, adaptation, and other projects should be prioritized.

SC-121. Coral Reef Restoration.

Prioritize coral restoration on reefs adjacent to coastal/wave-driven flood zones as natural infrastructure and habitat restoration. Protect coral nursery locations such as the Piti Bomb Holes and Merizo Coral Nurseries.

SC-122. Mitigation and Monitoring for Shoreline Protection Impacts.

Impacts of shoreline structures shall be avoided or minimized where feasible. Unavoidable impacts shall be mitigated through onsite, in-kind, or in-lieu fee measures proportional to the impact.

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SC-123. Tsunami Inundation Zone.

Limit the creation of new building sites in the tsunami inundation zone. Avoid, if feasible, locating critical community facilities, including public safety, hospitals, and schools, in the inundation zone. Infill development on existing building sites may be permitted in the tsunami inundation zone, provided that a disclosure of hazard presence and a hold harmless clause indemnifying the Government of Guam from any harm caused to permitted development by tsunami inundation are recorded against the property.

SC-124. Tsunami Evacuation Plans.

Provide clear evacuation routes and plans in each village. Development in tsunami hazard zones shall include evacuation plans ensuring hazards notification to occupants and procedures for expediting emergency evacuation.

SC-125. Land Acquisition.

Identify and acquire land and at-risk properties in erosion-prone areas to implement coastal adaptation and erosion control measures, including shoreline restoration, living shorelines, vegetation buffers, and other stabilizations techniques.

SC-126. Shoreline Adaptation Plans.

Maintain the Guam Shoreline Atlas in support of shoreline adaptation plans for areas subject to wave hazards, erosion, and long term sea level rise. Plans should include short and long-term goals consistent with the G50SP, management strategies, policies, and actions to achieve the goals, and monitoring to ensure effectiveness. Plans should consider shoreline vulnerability, projected shoreline changes, and preferred strategies for maintaining safety, maximizing public access and recreation, and avoiding natural resource impacts, including shoreline restoration, realignment or relocation of development elevation and flood-proofing, living shorelines, and other protective measures.

Land Stability and Seismic Safety

SC-127. Minimize Geologic Hazards.

New development in areas of high geologic and seismic hazard shall minimize risk to life and property and neither create nor contribute to geologic and seismic hazards. Geologic and seismic hazards are defined to include soil stability, erosion, sedimentation, landslides, subsidence, seismicity, and liquefaction. Assure stability of new development for its economic life.

SC-128. Geological Reports.

Require submission of a site-specific geologic hazards report prepared by a qualified professional for new development proposed in areas of high geologic hazard risk, including as indicated on the Seismic Hazards and Liquefaction Potential map (xxx). The report shall describe the threats and impacts from geologic hazards arising from,

for example, seismic events, watercourse erosion, landslides, expansive soils, and subsidence areas. Reports shall identify appropriate hazard setbacks, siting and design options, and mitigation measures where necessary to minimize potential impacts to life and property.

SC-129. Hillside Construction Slope Limitation.

Require submission of a soils and slope stability report prepared by a qualified professional for all new development on slopes 20 percent or greater. Development of new structures on hillside slopes 30 percent or greater shall be prohibited, with the exception of critical facilities and public infrastructure that cannot be located elsewhere.

SC-130. Seismic Standards.

Development shall be located, designed, and constructed to avoid and minimize risks from seismic events, including through setbacks from major faults and meeting all applicable building codes.

SC-131. Landslide Remediation and Stabilization.

Permit the remediation or stabilization of landslides that affect existing structures or that threaten public health or safety except along coastal bluff or other eroding edges, such as streambanks. Permit remediation or stabilization to the extent necessary where an existing landslide prevents development of private property and remediation does not shift risk to other property, and the remediation project includes mitigation monitoring and reporting. Alternative remediation or stabilization techniques shall be analyzed to determine the least environmentally damaging alternative. Maximum feasible mitigation shall be incorporated into the project in order to minimize adverse impacts to resources.

Wildfire

SC-132. Minimize Fire Hazards.

Minimize fire hazards by appropriately siting development and managing fuels and ensuring adequate firebreaks and buffers around high-risk areas.

SC-133. Development in Natural Areas.

Avoid development in rural, natural, and grassland areas. Prohibit the creation of new developable lots within high fire hazard zones. Site new development to minimize fire risk and the need to remove native vegetation. Use development buffers from significant vegetation with high fire risk.

SC-134. Fire Hazard Avoidance of Critical Facilities.

Locate, where feasible, new critical facilities outside of high fire risk areas, including, but not limited to, hospitals and health care facilities, emergency shelters, emergency command centers, and emergency communications facilities.

SC-135. Greenbelts and Fuel Breaks.
Identify and protect greenbelts to minimize the Wildland-Urban Interface. Use and maintain fuel breaks outside of sensitive habitats.

SC-136. Risk Mitigation and Native Vegetation.
Balance the need for fire protection for existing structures with the need to protect natural resources. Examples include prioritizing sprinkler system retrofits, smart landscaping, and integrated habitat restoration and use of fire breaks.

SC-137. Fire-resistant Landscaping.
Use fire-resistant and native species in development landscaping. Avoid non-native grasses and other species conducive to wildfire.

SC-138. Landscape Restoration.
Remove non-native vegetation and restore native, fire-resistant landscapes.

SC-139. Drought Adaptive Practices.
Use rainwater capture and other drought adaptive practices on rural and agricultural lands.

SC-140. Emergency Vehicle Access.
Assure adequate emergency vehicle ingress and egress to developed areas. Ensure that new subdivisions are established with adequate emergency vehicle access, evacuation standards for residential development, and can be maintained without requiring fuel modification within native vegetation.

SC-141. Street Identification and Visibility.
Ensure that all roads, streets, and major public buildings are identified in a manner that is clearly visible to fire protection and other emergency vehicles.

SC-142. Fire Safety Compliance.
Development shall comply with applicable fire codes.

SC-143. Adequate Fire Flows.
Evaluate, prioritize, and upgrade as necessary fire flow capabilities in developed areas.

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Chapter 4. **Prosperous Economy**

4.1. Introduction

Economic prosperity is central to sustainability. Guam's economy has played a pivotal role in shaping land use patterns, which reflect the island's unique characteristics as a regional hub for tourism, defense, and commerce in the western Pacific. Land use planning and policy can also shape the economy of the future to support a thriving economy and environmental and cultural sustainability. To do so, economic development and land use policies must address sustainable growth, economic diversity, and equitable opportunities while ensuring that Guam's limited land and water resources are utilized efficiently.

The Guåhan 2050 Sustainability Plan embodies an approach where economic growth aligns with preserving cultural heritage and the environment, fostering a prosperous and balanced economy.

> **Goal:** *Foster a resilient and diversified economy that supports long-term prosperity, uplifts communities, and aligns development with Guam's land, culture, and sustainability principles.*
>
> **Land Use Objectives:**
>
> - Encourage mixed-use and walkable commercial districts that revitalize existing built areas and reduce sprawl.
> - Promote economic development in village centers that reflects local character and supports small businesses and artisans.
> - Prioritize redevelopment over new construction in tourism areas, and support eco-cultural and agricultural tourism island-wide.
> - Reserve and appropriately site lands for critical infrastructure and priority uses, including fishing, boating, telecommunications, and renewable energy.
> - Protect productive agricultural lands and promote local food production to reduce dependency on imports and increase economic resilience.
> - Support equitable economic opportunity through land use policies that enable affordable housing, workforce development, and business space in underserved areas.

As elaborated in following sections, these economic objectives seek to move Guam's existing economy, currently dominated by tourism, the U.S. military presence, and construction activity, toward a more holistic and equitable economic prosperity that supports cultural heritage, natural resource conservation, agriculture, and emerging local economies and businesses.

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4.2. Economic Conditions and Land Use

4.2.1. Overview of Economic Conditions

Guam's existing economic land use reflects its predominant sectors: tourism, defense, construction, and federal investments. The substantial land holdings of the U.S. Department of Defense for military activities have long influenced the economic opportunities and constraints for economic development. This extensive military presence, combined with tourism development along Guam's coastal areas, has dominated the north and central parts of the island. The economy of southern Guam and more rural regions are characterized more by local businesses and agricultural activities, although both of these also are important to the north and central parts of Guam. The equitable distribution of land use for economic purposes must consider these historic allocations while promoting diverse and sustainable growth in areas that could benefit from increased economic activity and investment. As discussed in other chapters and below, the military presence and particularly the buildup have far-reaching implications for land use patterns and challenges, such as the need for affordable housing and adequate public services for new development.

Tourism: Pre and Post COVID-19 Pandemic

In the years before the COVID-19 pandemic, Guam's economy, as measured by such traditional markers as gross domestic product, was experiencing remarkable rates of growth, driven by a historic surge in tourism arrivals and consistent rates of local and federal investment. These factors contributed to a 24% rate of growth between 2002 and 2019 (Figure 4.1). The pandemic marked a significant shift in Guam's economy, with the Real Gross Domestic Product (GDP)

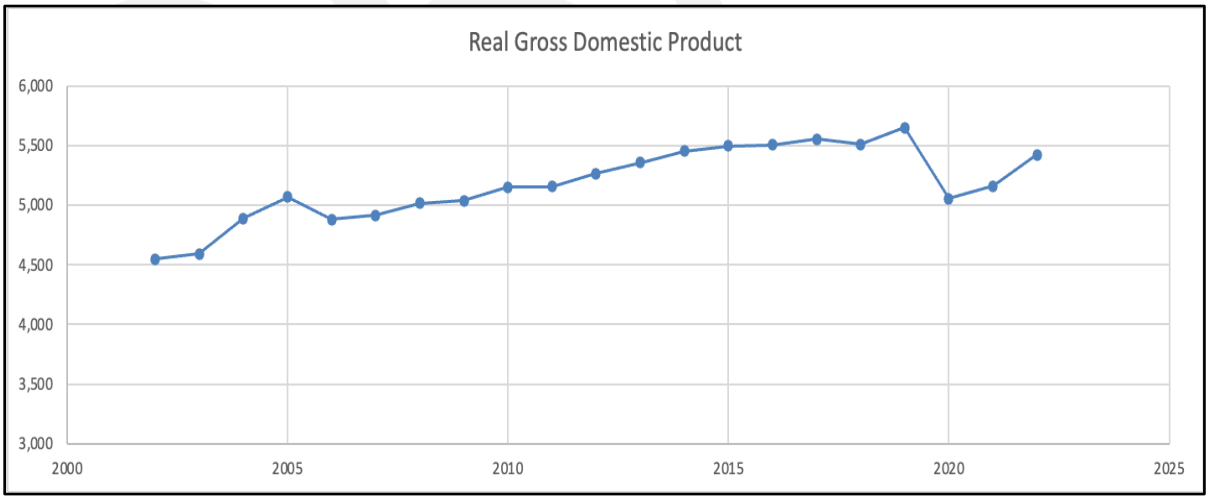


Figure 4-1. Gross domestic product between 2002 and 2019.

falling by 10.5% in 2020 due to halted international travel and business activity restrictions aimed at mitigating the spread of the virus. The consequences were particularly stark in the

tourism sector. In 2019, tourism contributed $1.85 billion to Guam's economy, with a record-breaking 1,664,934 visitor arrivals that year. By the end of 2020, this figure had fallen by 53.7%. Despite this setback, efforts to revitalize the sector continued through marketing initiatives and capital improvement projects funded by the hotel occupancy tax and federal assistance provided in response to the pandemic. These projects aimed to enhance Guam's historic sites and tourist attractions, supporting the long-term recovery and growth of the tourism industry.

In 2021, Guam's economy experienced a modest 2.1% increase in output, growing from $5.01 billion in 2020 to $5.16 billion in inflation-adjusted figures. This growth was primarily fueled by significant rises in personal consumption expenditures on durable goods, heightened private fixed investments, and increased spending by the territorial government. As of 2025, recovery toward pre-pandemic levels of economic activity continues, with the economy growing 5.1% between 2021 and 2022 and the size of total economic output reaching nearly 96% of the pre-pandemic economy in 2019.

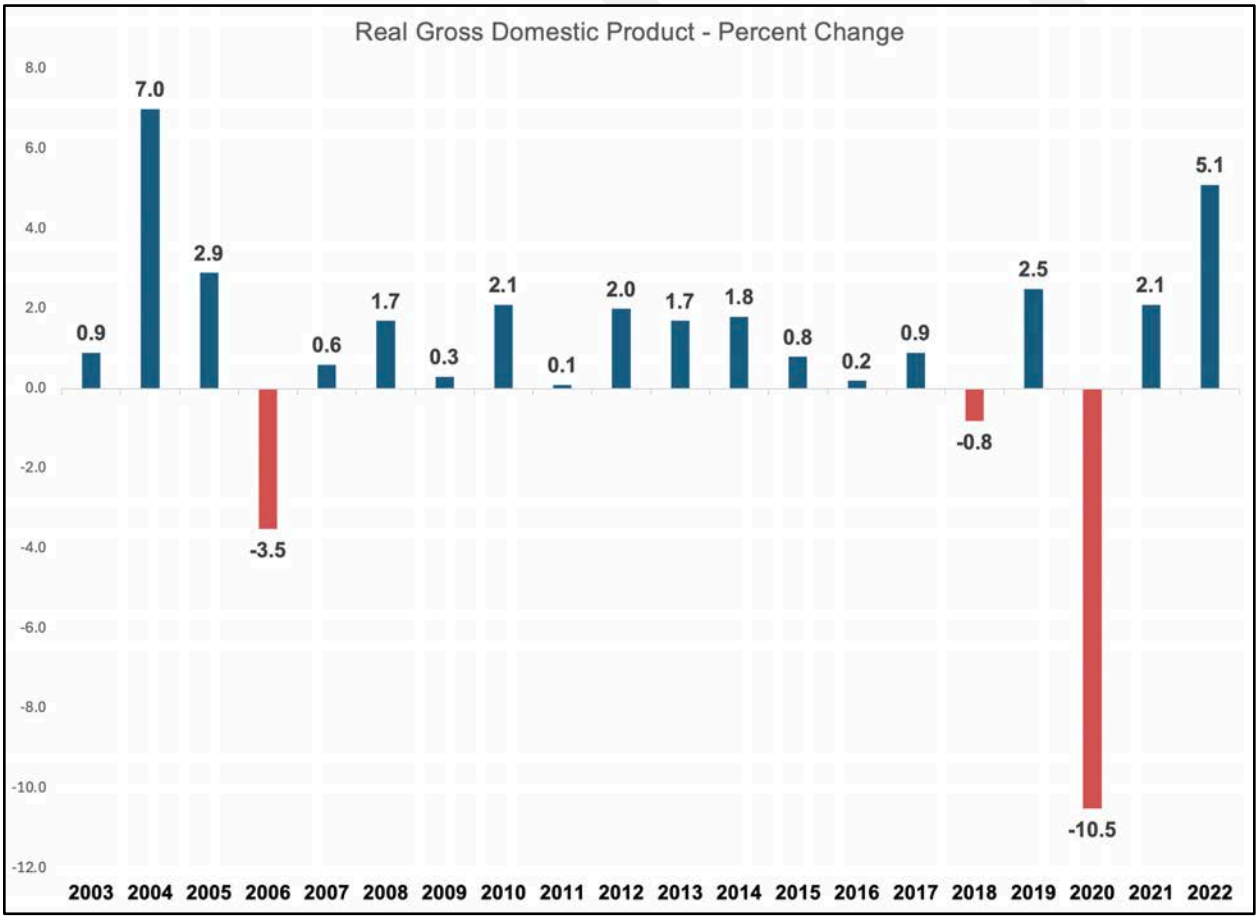


Figure 4-2. Real Gross Domestic Product percent change.

The Military Economy

The military sector constitutes a large portion of Guam's economy, particularly highlighted by the recent activation of Marine Corps Base Camp Blaz in Dededo, which will house

approximately 5,000 Marines. This base is part of a larger agreement between the U.S. and Japan to relocate Marines from Okinawa to Guam. The ongoing military buildup and related construction projects, with significant federal funding, will continue to bring investment and other economic support, aiding with the recovery of Guam from some of the adverse impacts of the COVID-19 pandemic on the island's economy.

Construction

The buildup is a significant driver for the construction sector in Guam. This sector has faced challenges due to labor shortages, particularly with restrictions on the H-2B visa program. Despite these hurdles, the sector is experiencing growth driven by federal construction projects related to the U.S. military buildup and civilian construction permits, which peaked at $1.4 billion in 2024. The increase in military and federal construction investments has bolstered the local economy and provided employment opportunities, contributing to general economic recovery post-pandemic and record government tax collections.

4.2.2. Tourism

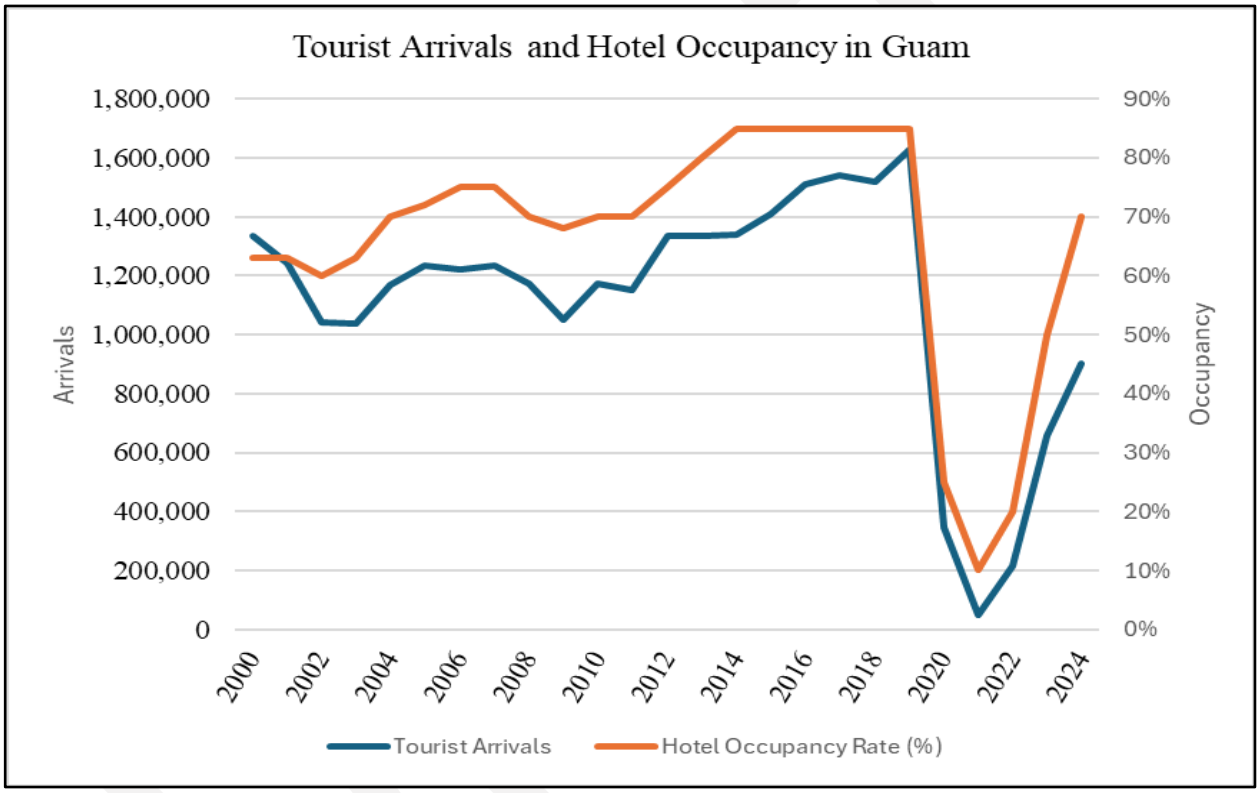
Guam's visitor accommodations sector offers a total of 8,404 rooms, spread across 35 primary hotels and resorts located in Barrigada, Dededo, Tamuning, Tumon, and Yona. Within Tamuning, the area of Tumon is the central hub of tourism activities hosting 69% of these establishments and 82% of the total room inventory. A notable addition to this sector is the Tsubaki Towers, which commenced operations in Tumon in 2020. Of the total accommodation inventory, 66% became operational prior to 2000 (GVB, 2022).

Hotel and resort developments in Tamuning are guided by the Guam Zoning Code, specifically the "H" Resort-Hotel Zone designation. Allowable uses within H-zoned parcels include a mix of amusement activities, cultural facilities, park recreational facilities, tourism-related shops, office and supporting services, and transient guest facilities. In Tamuning, H-zoned parcels cover approximately 536 acres, representing about 17% of the village's total area. These parcels contribute significantly to the economy, with the H-zoned parcels in Tamuning alone holding an aggregate land value of $615.1 million, which accounts for 31% of the total village land value.

Tamuning, with 1,616 establishments generating over $5.16 billion in revenue, stands as the primary economic hub of Guam. It houses the majority of hotels and resorts, particularly within the Tumon Bay area, which supports Guam's tourism industry. The significance of tourism is also evident in Tamuning's workforce, where 29,142 employees contribute to the sector's operations, highlighting the importance of

maintaining sustainable development practices and balancing growth with infrastructure capacity.

As tourism rebounds to pre-pandemic levels, the demand for further development of hotel and accommodation inventory in Guam, particularly in Tamuning's primary tourism corridor, will rebound as a priority. Prior to the pandemic, historical visitor arrivals had already necessitated the expansion of accommodation options. In 2014, plans to meet increased tourism demand projected an expansion from 8,451 rooms to 10,091 rooms, with a focus on "upper scale" and "luxury upper scale" rooms. To incentivize development, Guam Public Law 32-233 introduced a Special Hotel Qualifying Certificate Program, managed by the Guam Economic Development



Authority. This program aimed to encourage the development of 1,600 new hotel rooms by 2020 by offering developers a tax rebate or exemption amounting to 10% of total construction costs. Due to the pandemic, the program was extended by Guam Public Law 36-72 until 2031 or until the targeted 1,600 rooms are committed. In addition to the 35 existing hotels, two new developments are under review, aimed at increasing the total room stock toward the targeted 1,600 rooms, both of which are planned for Tamuning.

Figure 4-3. Tourist Arrivals and Hotel Occupancy in Guam 2000 - 2024.

Post-pandemic resurgence in tourism has lagged behind Hawaii and other U.S destinations. Hotel occupancy rates have been bolstered by military contractors and transiting military

personnel. Actual tourist arrivals between 2021 and 2022, were predominantly driven by South Korean tourists. However, still, measured against pre-pandemic levels, arrivals in 2024 were about 55% below those in 2019. Nonetheless, a rebound to pre-pandemic levels could sustain demand for new hotel developments, especially within the existing tourism corridors. Efforts will also be looked upon to diversify the tourism sector, particularly through promoting eco-tourism, cultural tourism, and agricultural tourism, aligning tourism growth with sustainable land use.

4.2.2.1. Developing Concepts for Tourism Expansion

In recent years, trends have emerged that not only promote economic growth but also raise land use implications and opportunities within the tourism sector. In 2025, the government of Guam was undertaking the Guam Tourism Recovery Plan Expansion - Tourism Repositioning Study. This study seeks to thoroughly analyze market trends, demographics, and analytics, providing repositioning and rebranding strategies supported by comprehensive, data-driven research. The final report is anticipated to be completed in August 2025. The project's first phase strategic conclusions and land use implications are summarized below.

Ecotourism. Complementing the island's cultural and historical preservation efforts, ecotourism has become an important but still underdeveloped component of Guam's tourism sector. Visitors are increasingly traveling to Guam to participate in cultural activities and enjoy the island's natural scenic environment. The rise in Free Independent Travelers (FIT)[13] over the past year has prompted local businesses and hotels to enhance their sustainability practices.

These efforts are critical to maintaining Guam's ecosystem, with local businesses playing a key role in providing educational information to both residents and visitors. Land use planning must ensure that areas suitable for ecotourism remain protected from overdevelopment, and that infrastructure projects support environmental conservation. As discussed elsewhere in the plan, southern Guam presents an opportunity for eco- and heritage

[13] A Free Independent Traveler is someone who plans and books their own trips, without relying on group tours or pre-packaged itineraries. FITs have the freedom to choose their transportation, accommodations, and activities.

tourism expansion, but with attention to the appropriate scale and cultural designs of new development and tourism activities.[14]

Education Tourism. Guam's unique environment also presents opportunities for education tourism, particularly in marine and environmental studies. Guam's coral reefs and marine life attract world-class academic researchers and students interested in field research, offering first-hand experience in these areas. Historical sites further strengthen the island's appeal to those studying its history and culture.

Guam's academic institutions, such as the University of Guam (UOG) and Guam Community College (GCC), already support education tourism with programs like UOG's English Language Institute and English Adventure Program. These programs cater to international students, particularly from China, South Korea, and Japan, which are key tourism markets for Guam. Given this connection between tourism and education, land use planning should support the development of educational facilities and accommodations to cater to this growing sector.

Heritage Tourism. Hagåtña, the capital of Guam, holds historical significance, with many of its historical sites tracing back to Spanish and pre-Spanish periods. Despite the destruction caused by World War II, remnants of Spanish colonial architecture and ancient CHamoru stone pillars remain, making the village an important cultural destination.

Public Law 24-110, known as the Hagåtña Restoration and Redevelopment Act, established the Hagåtña Restoration and Redevelopment Authority (HRRA) to oversee the revitalization of Hagåtña as the governmental, cultural, and commercial heart of the island. The project aims to re-establish Hagåtña as a vibrant mixed-use area that attracts both businesses and visitors. Redevelopment efforts are intended to expand low- and moderate-income housing, create employment opportunities, and enhance the overall social and economic well-being of the area. Land use

[14] For example, the El Camino Real Road that extends to Humåtak and the Taleyfac Tollai Åcho' Bridge in Hågat present opportunities for cultural and historical interpretation geared towards visitors.

policies in this region will need to carefully balance redevelopment with the preservation of historical sites, ensuring that Hagåtña remains a focal point for both cultural heritage and economic growth. Lessons learned from this effort should be captured and expanded to support redevelopment efforts across Guam.

4.2.2.2. Guam Tourism Recovery Plan (2024)

The Guam Tourism Recovery Plan, Phase 1, offers a comprehensive roadmap to restore and reposition Guam as a competitive global destination. Central to the plan is the recognition that tourism must be guided by policy, planning, and investment strategies that align with Guam's environmental limits, cultural values, and economic aspirations.

STRATEGIC RECOMMENDATIONS

Key long-term strategies identified in the Recovery Plan include:

- **Reforming the regulatory framework** to reduce barriers for tourism-related small businesses.
- **Establishing a governance model** for coordinated public-private tourism development.
- **Investing in airlift capacity and connectivity**, particularly with Japan, Korea, and emerging feeder markets.
- **Rebranding Guam's tourism identity** around CHamoru culture, natural landscapes, and marine-based recreation.
- **Becoming a standard-bearer for sustainable tourism** through best practices in environmental, social, and governance (ESG) principles.

Short-term actions emphasize other strategic projects and activities:

- Launching a **"lighthouse" tourism project** to catalyze brand renewal.
- Leveraging **public-private financing tools**, such as bond issuances, to support infrastructure.
- Strengthening **digital marketing** and community-based tourism initiatives.

LAND USE AND DEVELOPMENT IMPLICATIONS

The recovery plan acknowledges that tourism development must be carefully sited and scaled. As noted, large proposed hotel projects—including the 913-room Honhui Hotel and the 736-unit Vista Del Mar Resort—have raised significant concerns regarding their environmental and cultural impacts, particularly in sensitive coastal and scenic areas like Tumon Bay and Two Lovers Point.

The land use implications of the findings include that ensuring that tourism growth supports rather than undermines sustainability. Guam must:

- **Align new tourism development with land use policies** that protect cultural sites, coastal ecosystems, and scenic landscapes.
- **Prioritize infill and redevelopment** of underutilized urban and resort zones (e.g., vacant hotel sites) before expanding into greenfield or high-value conservation areas.
- **Implement clear permitting standards** for tourism infrastructure that account for carrying capacity, hazard exposure, and community impact.
- **Encourage low-impact, culturally grounded tourism models**, including eco-tourism, village-based experiences, and CHamoru heritage tours.

Strategic tourism investment must be planned in concert with land use, environmental, and infrastructure policies to avoid overdevelopment and ensure long-term economic resilience. The plan underscores that Guam's future competitiveness will depend not on volume, but on place-based, sustainable tourism that respects the land, the people, and their shared heritage.

4.2.3 Defense

Defense spending remains a key component of Guam's economy, with military land holdings constituting 27% of the island's total land area. The recent activation of Marine Corps Base Camp Blaz and other defense-related developments underscore the importance of military investments, which contribute over $2.5 billion annually to the economy.

Defense personnel, including active duty, civilian, National Guard, and Reserve personnel, receive $825.7 million in payroll annually, with active duty personnel accounting for the largest share. In FY 2022, the DoD awarded $1.7 billion in contracts, with a majority directed to construction and services. These contracts not only support military infrastructure but also create jobs and stimulate local businesses. Locally based contractors are heavily involved, with about 68% of military project contracts awarded to Guam-based firms in FY 2020.

The combination of payroll and contract awards sustains a large portion of the island's workforce and economy. The defense sector also creates a ripple effect, supporting industries such as housing, retail, and construction, which benefit from the presence of military personnel and their families. But as the military expands its presence, there is growing pressure on land availability for civilian purposes. Villages such as Dededo and Mangilao, which are adjacent to military installations, must balance their residential and commercial growth with the needs (and opportunities) of the defense sector. Zoning policies in these areas need to accommodate both military-related activities and the expansion of civilian housing and commercial services.

Defense-driven infrastructure projects, such as the construction of Marine Corps Base Camp Blaz, require significant land and resources. These projects bring substantial economic benefits. But they also necessitate infrastructure upgrades to support the increased demand for water, energy, wastewater and transportation. In addition, as discussed elsewhere in the plan, they present distinct impacts and challenges to the environmental and social sustainability of Guam. Ensuring that these projects are integrated into Guam's overall land use plan is critical to avoiding infrastructure bottlenecks, crowding out "outside of the fence" investment opportunities, and overburdening local resources, especially the natural environment.

Changes to U.S. defense policy have driven the increase in investment and economic gains in recent years and have had a significant resulting impact on Guam's economy, particularly during periods of military downsizing. Following the end of the Cold War and the fall of the Soviet Union in 1991, U.S. defense strategy called for the widespread closure of many defense facilities within the United States and its territories. Through the Base Realignment and Closure Commission's (BRACC) two-phased realignment strategy in 1993 and 1995, Guam saw a steep reduction in the presence of federal civilian employees and uniformed military personnel.

This reduction led to the turnover of the Apra Harbor Ship Repair Facility, the closure and transfer of Naval Air Station at Tiyan, and a reduced military presence at Andersen Air Force Base. Transfers of the closed military facilities to the Government of Guam added to the revenue of publicly owned lands, but also contributed to the abandonment and deterioration of certain properties. This realignment led to a more than 40% decline in uniformed military personnel on Guam between 1995 and 2000. This decline resulted in the loss of the tax revenues from the income tax payments of military personnel, which was once provided to the government of Guam. Consequently, government revenue dropped significantly, prompting property tax increases on the resident population.[15] The corresponding economic effects of downsizing saw a surge in bankruptcies, business closures, and unemployment that persisted for nearly a decade (Rogers, 2011 pp. 269-270).

[15] Under Guam's Organic Act, federal income taxes derived from active members of the United States Armed Forces and pensions paid to retired civilian and military employees of the United States, or their survivors, who reside in, or who are domiciled in Guam, are annually "covered over" to the Guam Treasury to support the operations, activities, and programs of the local government (48 U.S. Code 1421 Section h) (DOI, 2025).

U.S. Military Presence and Investment in Guam

A STRATEGIC HUB IN THE INDO-PACIFIC

Overview of U.S. Military Presence

Guam, the westernmost U.S. territory, plays a critical role in U.S. military strategy in the Indo-Pacific. It is home to approximately 6,400 active-duty personnel, with plans for further military expansion. The Department of Defense (DOD) controls about 25% of Guam's land, hosting major installations:

- **Andersen Air Force Base:** Strategic airpower projection hub.
- **Naval Base Guam:** Homeport for nuclear-powered submarines.
- **Marine Corps Base Camp Blaz:** Established to support the relocation of 5,000 U.S. Marines from Okinawa by 2028.

Military Investments and Spending Trends

The U.S. has significantly increased its military spending on Guam, particularly in infrastructure and missile defense. Key investments include:

- **$7.3 billion for military construction** (FY2024-FY2028) to expand base capacity and missile defense.
- **$1.7 billion allocated** for an Integrated Missile Defense System.
- **$12.5 billion in disaster recovery funding** following Typhoon Mawar in 2023, including 51 military construction projects.

Land Use and Planning Challenges

- **Strain on Civilian Infrastructure:** Military expansion increases pressure on roads, water, and electrical grids, raising concerns among local communities.
- **Housing Shortages:** Military personnel influx is affecting real estate and housing affordability for Guam residents.
- **Workforce Limitations:** Guam's local construction workforce is insufficient to meet military demand, necessitating reliance on foreign labor under H-2B visa programs.
- **Environmental Concerns:** Expansion raises issues regarding deforestation, habitat destruction, and contamination from military activities.
- **Tensions Over Land Control:** Guam's indigenous Chamorro population has voiced concerns about land seizures and historical dispossession, impacting local support for military expansion.

Conclusion

While the U.S. military investment in Guam enhances regional deterrence and readiness, it also presents economic, environmental, and social challenges. Balancing national security priorities with the well-being of Guam's residents remains a crucial policy consideration for Congress.

4.2.4. Construction

Construction is a vital part of Guam's economy, generating over $1.46 billion in revenue and employing 6,774 people. The sector is key to the island's development, supporting both residential and commercial growth. Major construction activities are concentrated in areas like Tamuning and Dededo, where housing, tourism, and business infrastructure projects are rapidly expanding. Construction also plays a critical role in building essential infrastructure such as roads, and utilities, along with being an essential and growing sector for the development of planned Defense installations and upgrades.

4.2.5. Agriculture and Emerging Sectors

As discussed in Chapter 3, Guam's agricultural sector, while relatively small, has grown a little in recent years after the precipitous declines of past decades. Guam recently completed a master plan for agriculture (see Chapter 3). In 2018, the number of farms on the island rose to 264, a 154% increase from 2007. These farms covered 2,441 acres, or about 2% of Guam's total land area, reflecting a 144% increase in farmland. The average farm size was 9.2 acres, and there was substantial growth in sales of vegetables, melons, nursery crops, and livestock products. Protecting this growing sector from encroachment by other land uses is crucial for food security and economic diversification.

Emerging industries, such as aquaculture and additive manufacturing ((AM) a process that uses a digital model to create a physical object. It's also known as 3D printing)), also offers promising opportunities for Guam's future economic growth, but may require careful land allocation and infrastructure investment. The Center for Island Sustainability has developed and promoted the Guam Green Growth (G3) Circular Economy Makerspace & Innovation Hub, located in Chamorro Village in Hagåtña, using 3D printing technology for creative reuse of materials. Another example in this area is a recent report about the Astro-Guam Gamma initiative, which raises key land use planning issues related to facility siting, zoning, infrastructure coordination, workforce housing, and integration with Guam's strategic development goals (Astro America, 2024). These issues should be addressed through supportive land use policies, zoning reforms, and infrastructure planning to enable successful implementation while ensuring environmental and cultural

protections. Additive manufacturing (AM) offers a blueprint for new avenues in entrepreneurship and job creation, moving Guam from dependence on tourism and military construction to part replacement for vehicle maintenance and repair. AM aligns with sustainability goals by reducing material waste, energy consumption, and carbon emissions.

AM has the potential to transform local production by reducing material waste and disposal and enabling on-demand production of parts. This technology is particularly beneficial for industries like defense and medical manufacturing, which require rapid access to customized components. Guam's development of AM, led by collaborations between government, academic institutions, and private industry, is expected to play a pivotal role in building local manufacturing capabilities, reducing dependency on imports, and supporting critical sectors like defense.

Aquaculture presents another opportunity. A recent feasibility study concluded that with strong land use planning and government collaboration, Guam has the potential to build a resilient and profitable aquaculture industry that supports local food security, economic growth, and environmental sustainability (see call-out). Executive Order 2024-01, issued by Governor Lourdes A. Leon Guerrero, establishes the Division of Aquaculture within the Guam Department of Agriculture (DoAG). The Order is grounded in existing legal authority that grants the DoAG broad mandates including land conservation, sustainable farming, and the management of natural resources. Recognizing the growing global demand for seafood, the Order highlights Guam's strategic interest in advancing aquaculture to support seafood security and environmental stewardship. It notes that aquaculture now accounts for over 50% of global seafood consumption and that Guam has already invested in aquaculture development. The creation of this Division affirms aquaculture as a priority on par with other agency objectives and enables focused allocation of resources and pursuit of external funding.

To guide the new Division, the Executive Order establishes an Aquaculture Advisory Board composed of government agency representatives, academic leaders, and aquaculture industry members. This Board will provide expertise and recommendations to ensure a sustainable, scientifically informed aquaculture industry on Guam. It also rescinds Executive Order 2019-12, which had established the Guam Aquaculture Task Force, with the new Board intended to carry forward and incorporate its contributions. Through these actions, the Executive Order formalizes a long-term institutional framework to promote, regulate, and support aquaculture as an essential part of Guam's agricultural and economic development strategy.

Together, agriculture, aquaculture, and additive manufacturing represent important pathways for Guam's economic diversification. Strategic land allocation, combined with infrastructure investments, will be key to supporting the long-term sustainability and success of these sectors.

Guam Aquaculture Feasibility Study

KEY FINDINGS AND RECOMMENDATIONS

- **High Dependence on Imports**: Guam imports 5 million pounds of seafood annually, valued at $20 million, with local aquaculture production covering less than 5% of consumption.
- **Economic and Food Security Potential**: Aquaculture presents an opportunity for economic diversification, job creation, and enhanced food security by reducing reliance on imports.
- **Challenges in Expansion**: High costs of land, labor, water, and energy, along with the need for imported aquaculture inputs, create barriers to growth.
- **Strategic Site Selection**: The Tanguisson Beach area is recommended for the Guam Aquaculture Innovation Center (GAIC), contingent on decommissioning the power plant.
- **Government Role**: Policy support, financial incentives, and infrastructure investments are critical to accelerating industry growth.

RECOMMENDATIONS

Land Use Planning Priorities:

- ☑ Identify aquaculture as a coastal-dependent activity in land use plans.
- ☑ Provide priority zoning for aquaculture developments.
- ☑ Ensure access to water resources for aquaculture operations.

Infrastructure Development:

- ☑ Establish Guam Aquaculture Innovation Center (GAIC) to support research, seedstock production, and industry incubation.
- ☑ Develop a Guam Aquaculture Commercialization Park (GACP) with pre-approved permits and essential utilities.

Policy and Regulatory Support:

- ☑ Establish a Department of Aquaculture to oversee and facilitate industry growth.
- ☑ Create a one-stop permitting system to streamline regulatory approvals.
- ☑ Offer tax incentives and financing programs to encourage private investment.

Species and Market Focus:

- ☑ Expand production of shrimp, tilapia, and other high-value species.
- ☑ Position Guam as a supplier of Specific Pathogen-Free (SPF) shrimp broodstock for export.
- ☑ Promote sustainable marine ornamental and reef restoration aquaculture.

Sustainability and Workforce Development:

- ☑ Strengthen partnerships with University of Guam (UOG) and Guam Community College (GCC) to develop workforce training programs.
- ☑ Support sustainable practices, including alternative energy solutions for aquaculture farms.
- ☑ Implement biosecurity measures to protect local species from disease risks.

4.3. Economic Activity Across Guam

The economic landscape of Guam is marked by varying levels of commercial activity across its villages, with significant disparities between the more urbanized centers and rural areas. Understanding the varying levels of commercial activity is critical for informing land use decisions and guiding future development efforts to ensure balanced economic growth.

4.3.1. Tamuning Municipality

Tamuning stands out as the most economically active village, contributing 59% of the island's total commercial revenue. With 1,616 establishments generating over $5.16 billion in revenue, Tamuning is the commercial center of Guam, hosting the majority of the island's hotels, shopping centers, and business districts. These establishments employ a significant portion of the island's workforce, with 29,142 employees supported by an annual payroll of $985 million. The village's infrastructure and land use are heavily focused on tourism and retail sectors, underscoring the need to mitigate the risk of overdevelopment through managing future growth and sustainable planning.

4.3.2. Hagåtña Municipality

As the capital, Hagåtña is an important center for government and professional services. With 393 establishments generating $1.45 billion in revenue, it ranks second in terms of economic contribution. Hagåtña's workforce of 6,269 employees supports the government's operations and many of the island's legal and professional services. Despite its smaller size, the village's annual payroll of $214 million shows its role as the administrative center of Guam.

4.3.3. Dededo Municipality

Dededo, one of the largest residential areas in Guam, is also a significant economic center, with 501 establishments generating $1.22 billion in revenue. The village supports a workforce of 6,485 employees with an annual payroll of $189 million. Dededo's economy is driven by a mix of retail, service industries, and defense-related activities, particularly with the expansion of military facilities. This village serves as a vital connector between Guam's military and civilian economies, with operating expenditures amounting to $855 million.

4.3.4. Barrigada Municipality

Barrigada is another mid-sized economic center, with 278 establishments generating $743 million in revenue. It employs 4,204 people with an annual payroll of $121 million. Barrigada's

economy benefits from its strategic location as a transportation hub, offering a greater assemblage of logistics and industrial services. The village's relatively high operating expenditures, totaling $422 million, highlight its role in supporting Guam's transportation and distribution networks.

4.3.5. Mangilao Municipality

Mangilao plays a specialized role in Guam's economy, particularly in education and agriculture. With 126 establishments generating $659 million in revenue, Mangilao supports 1,970 employees, primarily in educational institutions like the University of Guam and Guam Community College. The village's focus on agriculture also makes it a key player in promoting food security on the island. Mangilao's high average employee pay of $41,150 and operating expenditures of $589 million emphasize the village's contribution to both education and sustainable land use.

4.3.6. Smaller Villages and Rural Areas

In contrast to the larger economic hubs, Guam's smaller villages, such as Inalåhan and Malesso', generate relatively modest economic output which provides for the smaller population sizes of these villages. Inalåhan's 9 establishments generate $5.2 million in revenue, employing 57 people with an annual payroll of $699,000. Malesso', with only 5 establishments, contributes $2.9 million in revenue and supports 25 employees, but it boasts the highest average employee pay at $47,000. These villages are vital for agriculture, eco-tourism, and maintaining Guam's cultural heritage. However, they face challenges in attracting new businesses and retaining local talent, making them areas in need of targeted development strategies. The former Cocos Island Resort used to be Malesso's main tourist attraction. Revitalizing this resort was thought to be an opportunity to contribute to the economy with employment opportunities and revenues. However, the island is vulnerable to storm water surge and has not been revitalized as of 2025. It is also a preserve for the Ko'ko' bird, an endemic species of Guam.

4.3.7. Implications for Land Use

The uneven distribution of economic activity across Guam's villages has significant implications for land use planning. Urban centers like Tamuning and Hagåtña are experiencing high levels of development pressure, which requires thoughtful zoning policies to prevent overbuilding and ensure the sustainable use of land. On the other hand, rural areas such as Inarajan and Malesso', while economically smaller, represent opportunities for growth in agriculture, eco-tourism, and cultural industries. Land use policies should focus on incentivizing development in these underutilized areas while protecting their environmental and cultural assets.

Villages like Dededo and Mangilao, serve as key connectors between different sectors – such as defense, agriculture, and education – and must be supported with infrastructure investments to balance their growth with environmental sustainability. Zoning adjustments in these areas

could help accommodate both residential expansion and commercial development, ensuring that Guam's economic growth is both equitable and sustainable.

Within Guam, area-based economic development incentive programs exist in the form of *Economic Opportunity Zones* – a federal program created in 2017 through the Tax Cuts and Jobs Act. This program allowed states and territories to designate low-income census tracts as "Opportunity Zones," making certain types of investments in these areas eligible for partial or full deferment of federal income taxes on capital gains. The program aims to promote job creation and long-term investment in distressed communities. However, the program is time-limited for qualified investments, and designation of Opportunity Zones was guided solely by an area meeting program guidelines for median family income within a specific tract.

Tax-based incentive programs like Opportunity Zones have existed in Guam through the Guam Economic Development Authority's Qualifying Certificate (QC) Program. The QC program aims to attract investment in key industries, such as tourism, agriculture, and green technology. Eligible businesses can receive up to 75% income tax rebates and 100% property tax abatements for up to 20 years. The program is designed to stimulate economic growth and diversification across various sectors on the island, but is not presently designed to target investment in specific locations on Guam.

DRAFT

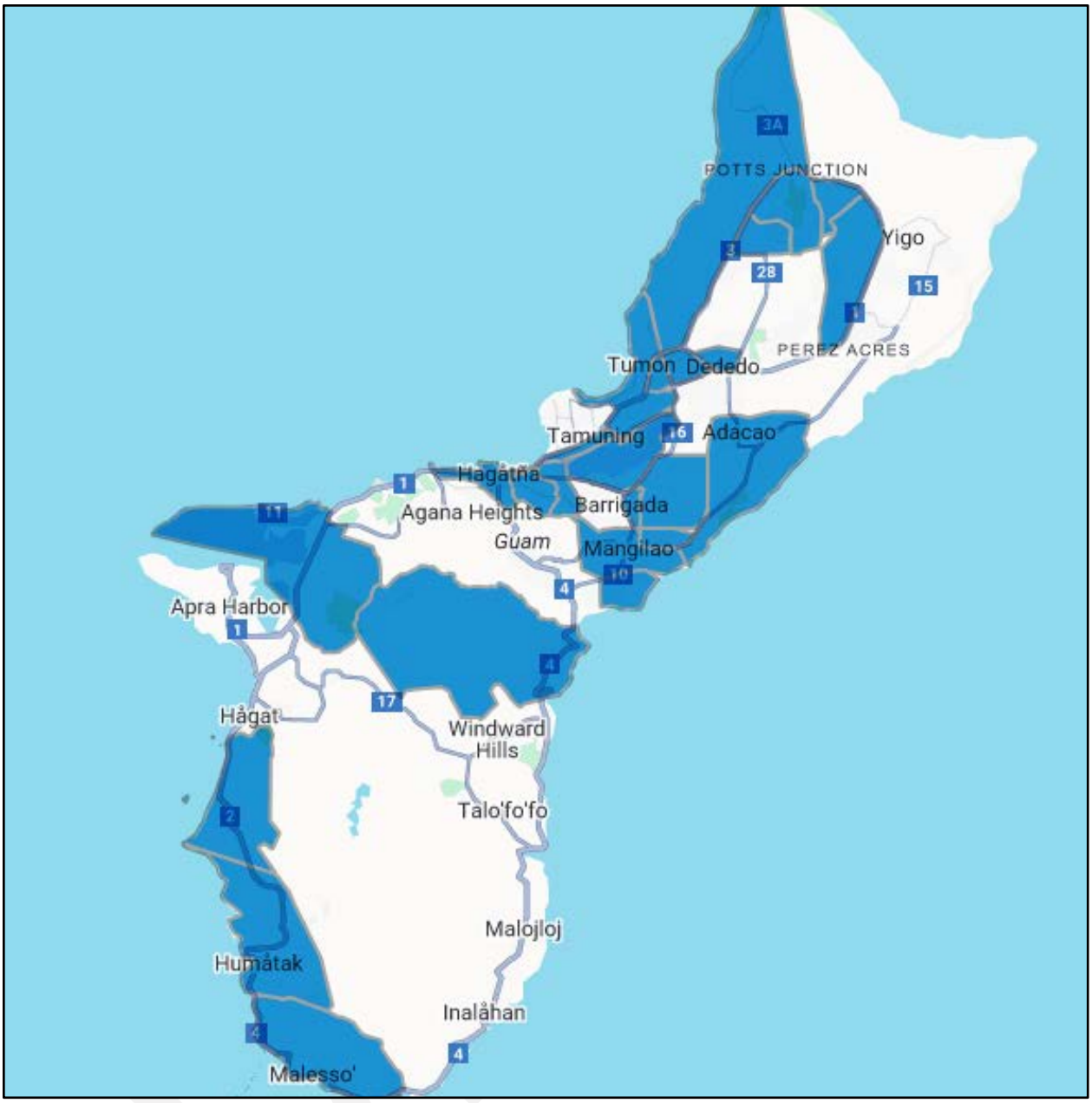


Figure 4-4. Economic Opportunity Zones in Guam.

Similar area-based economic planning can coordinate village-based priorities into specific development incentive packages that provide advantages for investors to off-set or recoup investments in targeted industries or in specific business locations within the villages. In emulating the spatially-segmented development zone overlays on Guam, specific development priorities can be known to investors, incentive programs can be crafted to foster interest in priority areas, and villages can align their respective development priorities with the investor incentive programs currently operated on Guam.

4.4. Economic Diversification and Land Use Implications

The strategic response to Guam's economic reliance on tourism and defense has led to efforts aimed at diversifying the economic base. The Governor's Economic Diversification Working Group, initiated by Governor Lou Leon Guerrero, the Chamber of Commerce, and the Guam Economic Development Authority, has established ten committees to evaluate the feasibility of introducing new industries to Guam. These industries have the potential to influence land use and zoning regulations. Guam's Comprehensive Economic Development Strategy also identifies strategic pathways for pursuing economic prosperity (see call-out).

4.4.1. New Industry Options

Alternative Dispute Resolution (ADR). The introduction of alternative dispute resolution services reflects a development option toward less space-intensive business activities, which could make use of existing commercial spaces more efficiently and may have minimal impact on new land use developments.

Captive Insurance. The expansion of the captive insurance industry could lead to optimized use of existing commercial real estate and specialized facilities. Modifying regulatory and fee structures could potentially increase land values and maximize utilization of currently underused properties.

Trust and Financial Services. The promotion of trust and financial services, particularly targeted at high-net-worth individuals from Asia, would likely necessitate the development of secure, high-quality office and residential spaces. This sector could enhance the economic use of land while requiring relatively minimal expansion of physical infrastructure.

Pharmaceutical Manufacturing. The potential establishment of pharmaceutical manufacturing, motivated by incentives similar to those successfully utilized in Puerto Rico, could significantly alter the industrial landscape of Guam. This industry requires specialized infrastructure and buildings, impacting land use planning and development.

Technology and Innovation. Proposals such as the Silicon Village initiative and satellite launching facilities call for specific types of land use, including high-tech office spaces and, for satellite operations, secure and extensive land areas suitable for such specialized activities. These initiatives may necessitate revisions to current zoning and land use policies to accommodate and support these high-tech industries that align with necessary technological infrastructure access.

4.4.2. Implications for Land Use Planning

The diversification efforts, as proposed by the Governor's Working Group, imply varied and potentially less intensive land use compared to the existing major economic drivers of tourism

and defense. Adapting land use planning to accommodate these new industries involves rethinking zoning laws and land management practices to ensure that economic expansion is balanced with sustainable development and efficient use of land. Additionally, consideration should be given to expanding the growth of these new sectors to villages with relatively lower economic activity, expanding job opportunities for residents and reducing transportation and housing pressures in more developed regions of Guam.

DRAFT

Guam's Economic Development & Land Use

A STRATEGIC RECOVERY PATH

The **Guam Comprehensive Economic Development Strategy (CEDS) 2020-2025 Pandemic Recovery Update** outlines strategies for sustainable growth, focusing on infrastructure development, labor market stabilization, and industry expansion.

KEY ECONOMIC DRIVERS & CHALLENGES

- **Tourism**: Previously contributing $1.85 billion annually, the industry saw a drastic decline due to travel restrictions. Recovery efforts target South Korean and Japanese markets, with government-backed investments in tourism infrastructure.
- **Defense & Construction**: Military-related projects remain a stable economic pillar, with over $2 billion in military construction projects planned. However, ongoing labor shortages, particularly in the H-2B visa workforce, present challenges.
- **Public Sector Investments**: Federal stimulus funds, including CARES and ARPA, have injected over $121 million into economic recovery initiatives, supporting small businesses and infrastructure projects.

LAND USE & DEVELOPMENT CONCERNS

- **Real Estate Market**: Rising housing costs, labor shortages, and an increasing military presence strain housing availability and affordability for local residents.
- **Infrastructure Needs**: Expanding military and tourism activities require upgrades in water, power, roads, and ports, prompting high-priority development projects.
- **Environmental & Cultural Considerations**: Sustainable land use planning is essential to balance economic growth with Chamorro cultural preservation and ecological conservation.

STRATEGIC ECONOMIC GOALS

- **Diversify the Economy**: Invest in alternative industries such as agriculture, aquaculture, telecommunication, and renewable energy.
- **Expand Workforce Development**: Address skilled labor shortages through training programs at institutions like the Guam Community College.
- **Enhance Infrastructure**: Improve ports, utilities, and transportation systems to support economic growth.
- **Strengthen Resilience**: Implement policies that protect against future economic shocks, including climate-related threats.

4.5. Redevelopment and Revitalization

Guam faces significant challenges with the increasing number of abandoned and neglected properties across the island. These range from large, once-functional government facilities to public parks and commercial buildings that have fallen into disrepair. These properties not only diminish the aesthetic and functional value of the island but also represent lost opportunities for economic revitalization. Some buildings have been unattended for years, contributing to safety concerns and the continued spread of blight across important commercial areas.

The management and containment of blighted properties is made more difficult with the impacts of natural disasters, the COVID-19 pandemic, and the rates of outmigration from Guam, but the challenge of abandoned properties has been a long-standing issue facing the island. In 2014, it was reported that there were approximately 300 abandoned homes in Dededo alone, with ownership of many structures unknown. These homes, originally built between the 1950s and 1970s, were often left vacant as owners passed away without leaving wills or as heirs moved off-island and could no longer maintain them. The probate process in Guam can be lengthy and costly, leaving many properties in legal limbo for years.

Recent efforts by the Department of Public Works (DPW) to address derelict buildings have made progress, though challenges remain. As of 2021, the DPW identified 115 derelict structures across the island, with 75 of those inspected and 56 citations issued. However, many properties remain unresolved, particularly when owners cannot be located or contacted. This has been a common issue in Dededo, Yigo, and other villages where ownership records are incomplete or outdated.

In addition to residential properties, abandoned commercial buildings in key areas like Tumon have raised concerns due to their prominence in Guam's tourism district. Large former hotel and resort facilities have been cited for violations but addressing the issues related to the disuse of these facilities remains an ongoing task. These derelict properties detract from the area's appeal to visitors, and their degradation further contributes to the economic stagnation of the surrounding districts.

The Government of Guam, primarily through the Department of Public Works (DPW), has several legal and policy tools to address derelict buildings, including enforcement of the Guam Building Code, public nuisance abatement, zoning compliance, and, potentially, condemnation. DPW may declare structures unsafe, order repairs or demolition, and recover costs through liens, while other agencies may act under health or environmental laws. Chapter 3 includes policy SC-77, "Building Maintenance, Dumping, and Public Nuisance," which directs that residential, commercial, and other existing buildings and properties be maintained, free of unauthorized waste dumping, disposal, or other nuisance, and not abandoned. The policy further directs that the Government of Guam shall enforce this provision to the maximum extent, consistent with public health and safety regulations, including abatement of public nuisances.

However, challenges such as limited resources, due process requirements, and unresolved property titles often hinder timely action. Strengthening building maintenance codes, creating a derelict property registry, and funding demolition efforts are recommended to improve effectiveness.

4.6. Economic Opportunity and Land Use Planning

G50SP policies related to Guam land use and economic development aim to balance growth while ensuring sustainability, accessibility, and economic opportunity. The provision of diverse commercial and industrial land use areas is essential in fostering economic activity that provides living-wage jobs, which is crucial for long-term economic stability. Strategic land allocation ensures that commercial and industrial sectors are appropriately placed, avoiding conflicts with residential areas and environmental concerns.

As discussed in Chapter 3, mixed-use development zones support a holistic approach to urban planning by integrating residential, commercial, and workplace spaces. The policy around mixed-use development zones encourages vibrant communities with reduced dependency on long commutes, fostering an environment where businesses and residents can mutually benefit. Promoting these zones contributes to enhanced economic vitality, job creation, and the provision of essential services within proximity to residents.

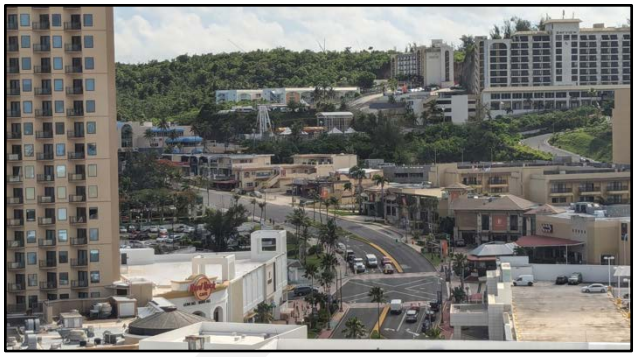
Priority expansion areas, such as Upper Tumon, Route 3, and North Marine Corps Drive, are targeted for economic growth and infrastructure development. Concentrating public investment in these corridors ensures that economic expansion is well-supported by essential utilities, transportation, and urban amenities. This strategic development approach mitigates urban sprawl and ensures efficient land use while stimulating business activities.

Higher education and vocational training facilities are integral to fostering a skilled workforce. By providing opportunities for technical and professional development, Guam can cultivate an educated labor pool that aligns with industry demands. Investments in educational infrastructure bolster long-term economic resilience and attract businesses that require specialized skills. This will also allow for Guam to retain individuals as job opportunities will increase. A majority of young adults graduating from the University of Guam or from the mainland universities do not stay or return to Guam due to the lack of job opportunities on the island.

4.6.1. Village Economic Development and Community-Centric Growth

A critical component of economic expansion in Guam involves strengthening village economies. The G50SP recognizes and directs commercial activity to village centers as *economic development areas*, to village centers, enhancing local accessibility to goods, services, and

employment. Pedestrian-scale development further enhances village economies by fostering local food markets, artisanal businesses, and cultural exchanges, which appeal to both residents and tourists.



Ensuring that growth reflects the needs of the people is equally important to economic development. The G50SP Community Engagement Survey identified key gaps, including lack of medical services, local restaurants, and retail options, as well as limited entertainment and recreational activities such as theaters and community gathering spaces (see *Figure 4.5)*. Many residents also emphasized the need for improved public transportation, advocating for increased bus frequency, expanded routes, and additional bus stops.

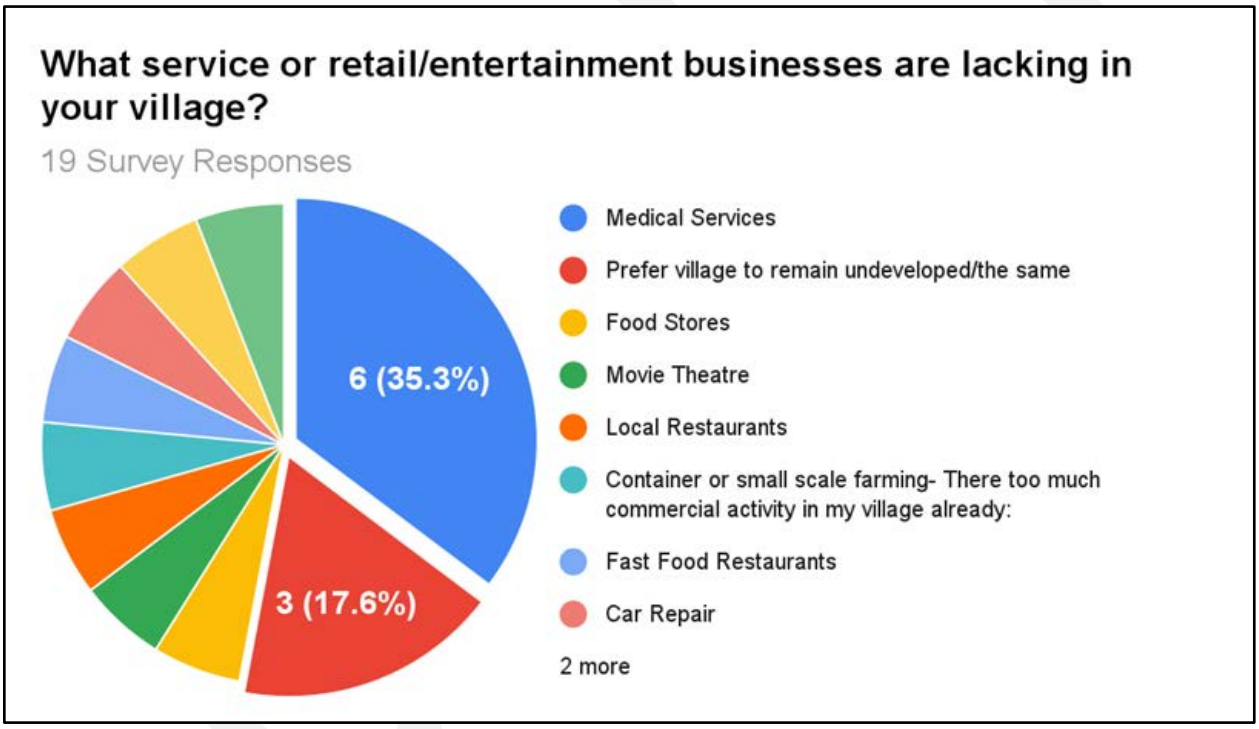


Figure 4-5. Results from the G50SP Community Engagement Survey.

Community input from the G50SP Residential Survey also highlighted concerns about overdevelopment and the preservation of village identity (Fig. 4-6). A majority of respondents (79%) preferred development tailored to the character of their village, indicating a strong desire to maintain local traditions and avoid excessive urbanization. There was limited support (10%) for no change, while 9% of respondents favored replicating the northern and central development models elsewhere in Guam. Additionally, there was low uncertainty (2%) regarding Guam's economic future, suggesting that most residents have a clear vision for the island's growth.

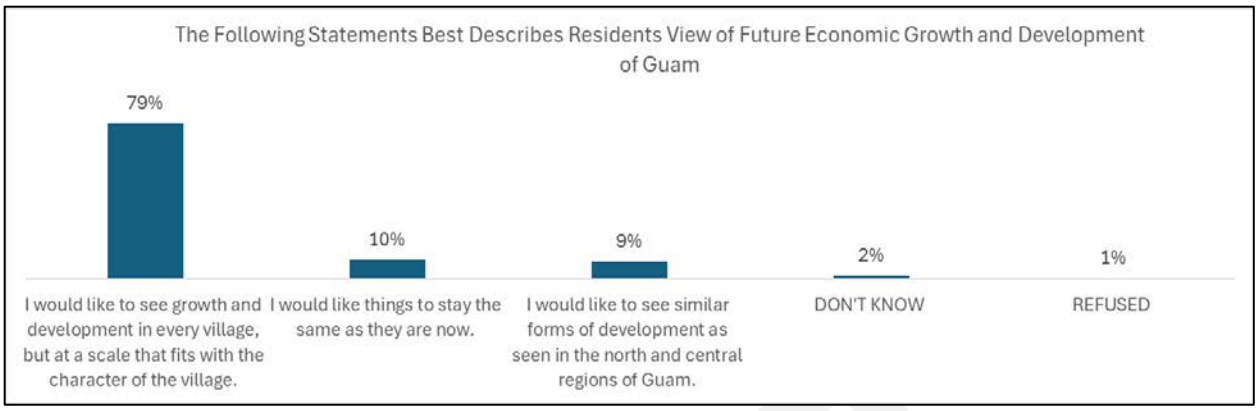


Figure 4-6. Results from the G50SP Community Engagement Survey.

Engagement at the community level is not only vital for economic development but also for fostering safe, vibrant spaces for families. As a local mayor expressed,

> *Well, of course, engagement of the entire community as far as making decisions, but also a safer [environment]... Activities for our children especially and families…Whether it be recreation, educational, or just incorporating activities where safe environments [exist]... additional parks where they can actually go out to open spaces rather than just staying indoors.*

This sentiment aligns with residents' redevelopment priorities, which include upgraded parks and beach access, creating community resource and education centers, and revitalizing underutilized buildings to serve as local hubs for economic and social activity. Moreover, it echoes responses from the G50SP Residential Survey which indicates community and social infrastructure development is a top priority (39%) for respondents (see Figure 4.7).

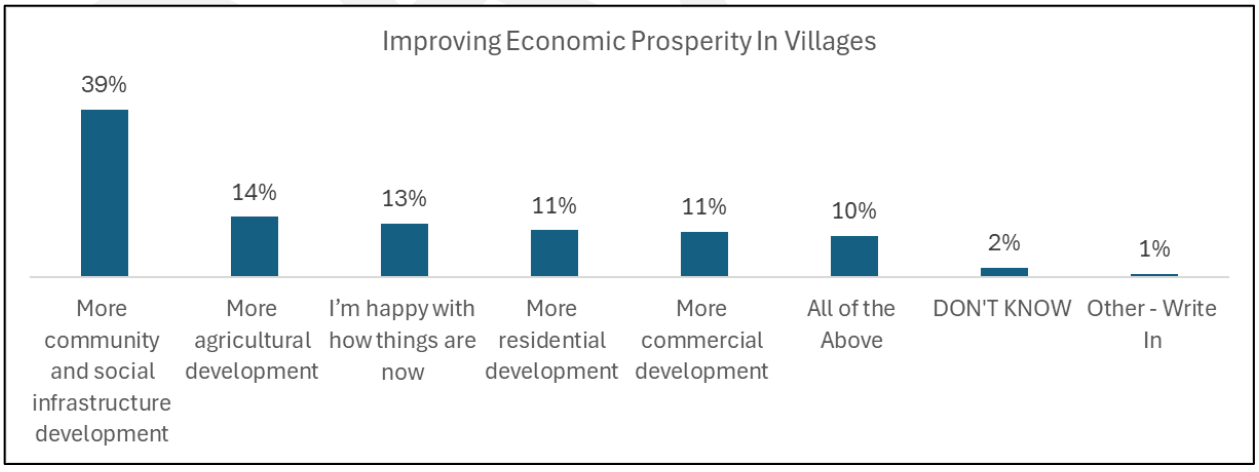


Figure 4-7. Results from the G50SP Community Engagement Survey.

Encouraging mixed-use developments that integrate residential, educational, and commercial facilities promotes civic engagement and sustainable growth. These developments enhance accessibility to essential services, promote walkability, and create dynamic spaces that

strengthen village economies. By prioritizing community-driven, family-friendly environments this localized approach ensures that small businesses thrive and that economic opportunities are inclusive and beneficial to Guam's diverse communities.

However, perspectives on new development vary across the island. As seen in Figure 4.8, *w*hile southern villages like Inalåhan and Talo'fo'fo' support strict building height limitations (2-3 stories), residents in central and northern villages such as Dededo and Agana Heights are more open to taller structures (4-5 stories). Opinions on industrial and commercial expansion are also mixed (see Figure 4.9)–many residents oppose new industrial development and hotels, but support sustainable commercial farming and multi-family housing projects.

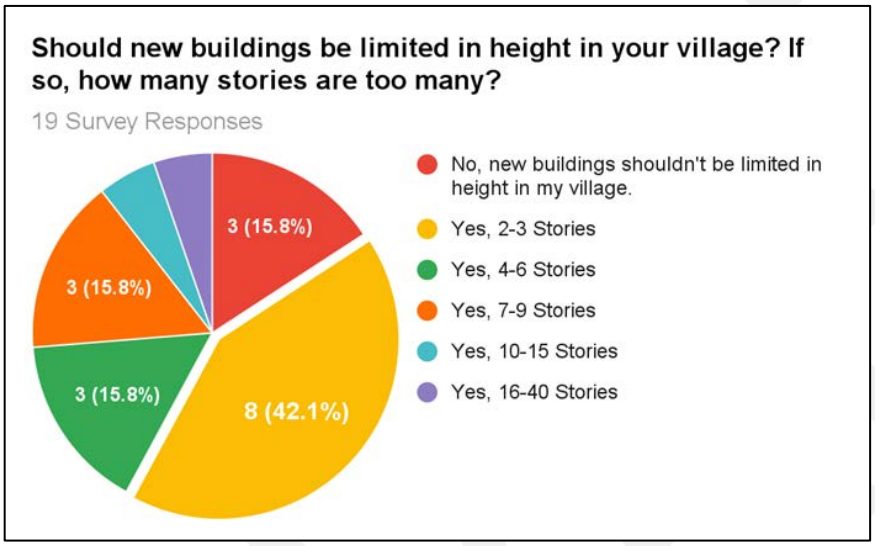


Figure 4-8. Results from the G50SP Community Engagement Survey.

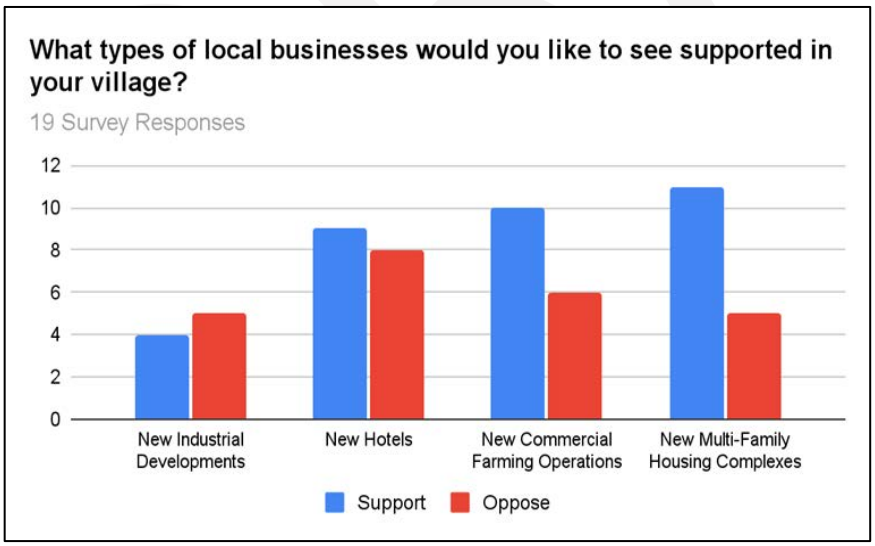


Figure 4-9. Results from the G50SP Community Engagement Survey.

Ultimately, Guam's economic future depends on a balanced approach that integrates growth, sustainability, and cultural preservation. The community strongly advocates for protecting CHamoru culture, safeguarding natural resources, and ensuring that businesses contribute to environmental stewardship. By fostering an economic model that prioritizes village revitalization, small business support, and sustainable development, Guam can build a resilient, community-driven economy that benefits both present and future generations.

4.6.2. Agricultural and Redevelopment Opportunities

Sustaining agricultural land use is fundamental to food security and economic diversification. By protecting fertile lands for commercial and subsistence farming, the policy supports a resilient agricultural sector. Encouraging small-scale farming initiatives strengthens community-based economies while preserving Guam's rural landscape and heritage.

There is overwhelming community support for expanding agricultural initiatives and activities in Guam's villages based on G50SP Community Engagement Survey results. As seen in Figure 4.10, a large majority (85%) of respondents favored local farming efforts, demonstrating broad enthusiasm for agriculture-driven economic development. Support for these initiatives was especially high among younger generations, with Gen Z (91%), Millennials (90%), and Gen X (89%) expressing strong agreement.

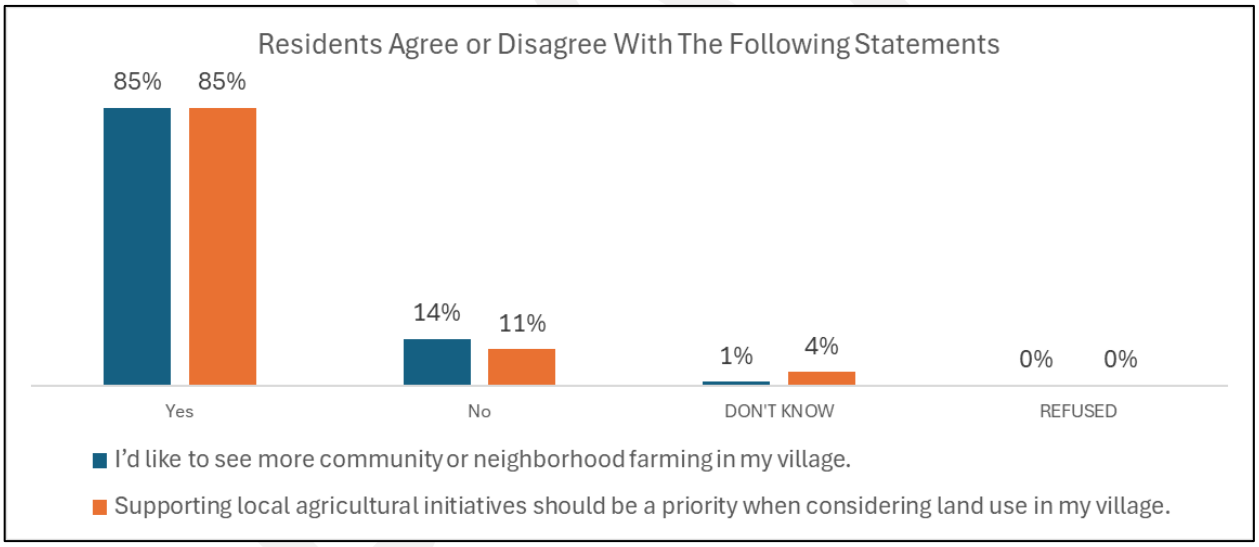


Figure 4-10. Results from the G50SP Community Engagement Survey.

Additionally, 14% of respondents supported farming and sustainability initiatives as a means to enhance village economies, reinforcing the importance of integrating agriculture into broader economic strategies (see *Chart X*).

Redevelopment policies focus on revitalizing existing urban spaces rather than expanding into undeveloped areas. Prioritizing commercial and residential property rejuvenation prevents unnecessary urban sprawl and ensures that infrastructure and public services are efficiently

utilized. Redevelopment also presents an opportunity to address affordable housing shortages by repurposing underutilized buildings. Implementing zoning amendments to support adaptive reuse can make redevelopment efforts more effective in meeting Guam's evolving housing needs.

Enhancing infrastructure and public services is crucial to sustaining urban growth. Investment in public transportation and critical infrastructure such as ports, airports, and energy facilities aligns with economic objectives by facilitating trade, tourism, and sustainable urban expansion. Maintenance of essential utilities, including water, wastewater, and road networks, ensures the longevity of economic initiatives and supports Guam's long-term economic vision.

4.6.3. Sustainable Tourism and Cultural Preservation

Tourism is a cornerstone of Guam's economy, and sustainable tourism development is essential in maintaining the island's appeal, environmental integrity, and livability. Right-sized development investments, particularly in village settings, help prevent overdevelopment while catering to visitor demand and luring boutique travelers. By limiting the height and density of accommodations, Guam can preserve its natural and cultural landscapes while maintaining a high-quality visitor experience.

Public sentiment strongly supports a sustainable and balanced approach to tourism development. According to the G50SP Community Engagement Survey:

- 92% of respondents agreed that Guam should prioritize the rehabilitation and improvement of existing hotels rather than building new ones.
- Only 23% agreed that Guam should build more hotels and retail buildings, while 75% disagreed with that approach.
- 77% supported building more tourist-serving attractions and optional tours, signaling a preference for enhancing the visitor experience through activities and services rather than new construction.
- Just 30% felt that Guam's hotel and tourism industry is fine the way it is, while 66% disagreed, suggesting there is still room for improvement–particularly through renovation, not expansion.
- Opinions were mixed regarding the extent of current development: 42% believed Guam has too much hotel and tourist-related development already, while 53% disagreed with that view.

These findings underscore the importance of rehabilitating existing infrastructure, developing culturally rich and environmentally sensitive attractions, and avoiding an overreliance on traditional mass tourism models. Cultural and eco-tourism initiatives support a diversified tourism sector, emphasizing historical preservation, environmental conservation, and community-based tourism activities. By integrating cultural landmarks and ecological sites into development plans, Guam ensures that economic benefits from tourism are equitably

distributed while preserving its unique heritage. The recent phase 1 study of the Tourism Recovery Plan Repositioning Study discussed above identifies three key areas for improving potential visitor perceptions of Guam:

- **Emotional Connections:** Position Guam as a desirable place to live, a destination that fulfills dreams and inspires pride in visiting.
- **Experiential:** Highlight the friendly locals, courteous service, and easy access of the island.
- **Uniqueness:** Promote Guam's cultural festivals, heritage, distinct cuisine, and unique shops.

This approach aligns with global tourism trends that favor authentic, sustainable experiences over mass commercial tourism, and reflects the community's clear preference for thoughtful, place-based development.

4.6.4. Prosperous Economy Land Use and Sustainability

The policies outlined align with U.N. SDGs, particularly those focusing on sustainable cities and communities (SDG 11), decent work and economic growth (SDG 8), and climate action (SDG 13). By promoting mixed-use development, prioritizing redevelopment over new expansion, and integrating infrastructure improvements, these policies support sustainable urbanization and economic inclusivity.

The focus on education and workforce development aligns with SDG 4 (Quality Education) by ensuring that the labor market is equipped with skilled professionals. Agricultural preservation and subsistence farming initiatives support SDG 2 (Zero Hunger) by promoting food security and sustainable land use. Additionally, infrastructure investments, particularly in renewable energy and transportation, contribute to SDG 9 (Industry, Innovation, and Infrastructure) and SDG 7 (Affordable and Clean Energy), reinforcing Guam's commitment to sustainable economic growth.

Overall, Guam's land use and economic development policies provide a comprehensive framework that balances economic expansion, community well-being, and environmental stewardship. By aligning with international sustainable development goals, these policies ensure that economic opportunities remain equitable, resilient, and beneficial to future generations.

Prosperous Economy Land Use Policies

LAND USE

PE-1. Development Opportunities.

Provide a diverse mix of commercial and industrial land use areas and capacity needed to meet future employment projections and encourage economic activity capable of providing living-wage jobs, reasonably scaled to the needs of the community and consistent with other plan policies.

PE-2. Promote Mixed-Use Development Zones.

Provide for mixed-use commercial, retail, and workplace development compatible with residential neighborhoods to provide easy access to jobs, shopping, and activities.

PE-3. Priority Expansion Areas.

Identify and prioritize specific areas and transportation corridors designated for future expansion of the economic base, such as the Upper Tumon area, Route 3 and North Marine Corps Drive. Provide public investment and infrastructure support to encourage development in these areas.

PE-4. Education Facilities.

Provide land and opportunities to establish, maintain, expand and support higher educational opportunities to ensure an educated and technically trained workforce. Expand opportunities in both new and existing institutions, including vocational, post-secondary and professional training opportunities.

PE-5. Co-location of Industrial Development.

Concentrate similar industrial uses and intensities to support development and limit offsite impacts.

PE-6. Priority Land Uses.

Provide adequate land to support priority economic development and infrastructure, including coastal-dependent uses and sustainable energy facilities, such as solar farms.

Village Economic Development

PE-7. Village Economic Development Areas.

Promote and direct appropriately designed and scaled commercial and other community development to village centers and economic and community enhancement areas.

PE-8. Pedestrian-scale Development.

Encourage development of pedestrian-oriented retail markets in Village Centers to connect local food and craft vendors to customers and tourists.

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PE-9. Community-Centric Development.

Engage local communities in the planning process to ensure developments meet their needs and preserve cultural heritage through appropriate siting and design. Co-locate residential and community uses to facilitate civic engagement including educational opportunities. Support small businesses and local artisans through zoning policies that enable markets, workshops, and co-ops.

Agricultural Opportunities

PE-10. Commercial Agriculture.

Protect the most productive soils and large undeveloped areas capable of supporting agriculture for commercial purposes, consistent with other plan policies.

PE-11. Subsistence and Community Agriculture.

Protect and promote agricultural and rural lands capable of supporting subsistence and community agricultural activities. Encourage small-scale farming in community gardens and on residential properties where appropriate.

Redevelopment

PE-12. Redevelopment.

Promote redevelopment of commercial and residential properties in designated areas. Consider opportunities for redevelopment before allowing new development in rural areas.

PE-13. Redevelopment for Affordable Housing.

Consider redevelopment of existing buildings for affordable housing. Amend zoning codes to support creative reuse.

PE-14. Rejuvenation of Existing Properties.

Promote investment, refurbishment, and enhancement of existing commercial and residential properties in core urban areas, especially the tourist and hotel districts in Tamuning. Use tax or fee reduction incentives to promote investment and refurbishment of dilapidated and blighted properties.

Infrastructure and Maintenance

PE-15. Infrastructure Improvements.

Enhance infrastructure, including in conjunction with approval of new commercial development.

PE-16. Infrastructure Maintenance.

Maintain infrastructure supporting urban development, including water, wastewater, and road capacity. Consider infrastructure improvement districts to finance maintenance and upgrades of needed facilities.

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PE-17. Infrastructure and Transportation Planning.
Invest in public transportation to reduce reliance on private vehicles and mitigate traffic congestion. Prioritize infrastructure projects that support economic activity, such as ports, airports, and renewable energy facilities.

Sustainable Tourism Development

PE-18. Expanding Tourism.
Support tourism-related development and infrastructure as appropriate in each of Guam's villages.

PE-19. Appropriate Village Scale.
Provide for right-sized development investments, consistent with village characteristics and community desires. Limit the height and density of tourist accommodations to prevent overdevelopment and maintain the island's visual appeal.

Cultural and Ecotourism

PE-20. Diverse Opportunities.
Promote diverse and unique cultural, nature-based, and recreational tourism developments, attractions, and experiences.

PE-21. Eco-tourism.
Promote eco-tourism initiatives that respect local culture and natural resources.

PE-22. Diverse Community Opportunities.
Recognize a wide variety of cultural, tourism, and active recreational programs with regional and neighborhood facilities, providing well-rounded recreational and tourism opportunities.

PE-23. Cultural and Historical Preservation.
Protect and integrate cultural and historical landmarks into development plans to promote cultural tourism.

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Chapter 5. **Thriving Environment**

5.1. Climate Change and Environmental Sustainability

Guam's natural environment is the foundation of its cultural heritage, economic vitality, and quality of life. As a small island community, Guam faces unique environmental challenges, including the looming impacts of climate change, rapid development, and resource depletion. This chapter of the Guåhan 2050 Sustainability Plan frames a comprehensive strategy for protecting the island's natural resources while enhancing resilience to environmental and climate-related risks. The chapter establishes policies and practices for the following: Climate Resilience and Land Use Planning, Watershed Protection, Sensitive Habitats and Species, and Coastal and Marine Habitats.

At its core, a thriving environment is pursued through an integrated set of land use policies and planning and broad environmental objectives:

> **Goal:** *Conserve Guam's land and marine environments and strengthen climate resilience through integrated land use and ecosystem planning*.
>
> **Objectives:**
>
> - Implement nature-based climate adaptation and green infrastructure.
> - Protect watersheds and drinking water sources through zoning and BMPs.
> - Designate and protect critical terrestrial and marine habitats.
> - Strengthen coastal zone management and enforce shoreline protections.

5.1.1. Building Climate Resilience

Climate change poses a growing and perhaps the greatest threat to Guam, with extreme heat, rising sea levels, increased storm intensity, coastal erosion, and saltwater intrusion affecting both residents and the natural and built environment. To protect communities and ecosystems from these threats, Guam must strengthen its climate resilience by integrating sustainable land-use policies, nature-based solutions, and disaster-ready infrastructure. Key strategies include implementing coastal setbacks to reduce development in high-risk areas, prioritizing mangrove and coral reef restoration for natural shoreline protection, and enhancing water conservation measures to mitigate drought impacts. Green infrastructure, such as permeable surfaces and urban tree canopies, will also play a crucial role in reducing the urban heat island effect and managing stormwater runoff.

Beyond infrastructure, building resilience also means preparing communities for climate-related challenges. Disaster-resilient housing standards, renewable energy integration, and climate-smart agriculture will help Guam adapt to changing environmental conditions while reducing reliance on fossil fuels and external food sources. The island must also invest in education and community engagement to ensure residents and businesses are informed and equipped to take part in climate adaptation efforts. Through proactive planning, adaptive management, and sustainable development, Guam can strengthen its ability to withstand environmental disruptions while ensuring long-term environmental and economic stability.

5.1.2. Protecting and Restoring Natural Resources

In addition to climate resilience, Guam's sustainability depends on the health of its watersheds, groundwater sources, and coastal and terrestrial habitats. Guam's terrestrial and shoreline environments provide a unique setting in which numerous challenges and opportunities exist to balance protection, restoration, and projected growth. It includes habitats and species found nowhere else in the world, fragmented among geographically distinct land use patterns. The watersheds of the southern island feed vital streams and wetlands. The ancient volcanic and limestone cliff landforms and sheer coastal cliffs define a special character, appreciated for cultural values, recreational opportunities, and their intrinsic beauty. This limestone plateau provides a permeable surface for rainfall to infiltrate and recharge the Northern Guam Lens Aquifer (NGLA), the main source of drinking water for the island. Viable agricultural soils are limited, heightening their importance. The fringing coral reef ecosystems surrounding the island support a diversity of marine life and Guam's island culture, and are directly impacted by changes to the island's landscape.

Sustainability requires that the most important of Guam's natural resources be protected for future generations, and restored in instances where there is strong potential to revive native habitat. The G50SP includes a resource conservation land use designation for natural areas and basic policies to balance the siting and design of development with the protection or restoration of natural resources, recreation, and scenic. It includes protections for agricultural lands and native habitat. Habitat conservation policies will ensure that sensitive terrestrial ecosystems, such as limestone forests and riparian corridors, are protected from encroaching development. Policies also address water resource protection through strict regulation of wastewater discharges, stormwater management, and land-use practices that affect water quality. Watershed protection strategies and management plans will be implemented to reduce polluted runoff, preserve riparian and wetland areas, and improve groundwater recharge to sustain the Northern Guam Lens Aquifer. Efforts to safeguard coastal and marine waters will focus on reducing land-based sources of pollution, enforcing sustainable fishing practices, and restoring

coral reefs. Similarly, the Guam Sustainability Plan prioritizes a balance between responsible growth and ecological preservation, ensuring that future generations continue to benefit from the island's natural resources.

5.2. Climate Resilience and Land Use Planning

Climate change affects all aspects of Guam's environment and society (PIRCA, 2020). Hence, there is significant overlap between land use strategies and policies discussed in this section with certain discussions in other chapters of the G50SP, such as adapting to coastal hazards, building resilient housing, and water resource management (each discussed in Chapter 3), and protection of sensitive habitats (later in this chapter). But this climate resiliency section is important for tying together all of the various land use strategies in an integrated discussion of what may be the most significant environmental threat for Guam at this time. Guam faces massive challenges from climate change. According to Guam's Priority Climate Action Plan, per the 5th National Climate Assessment Chapter 30 Hawai'i and US-Affiliated Pacific Islands, the resources of Guam impacted from climate change are: Water, Food Security, Human Health, Built Environment, Ecosystems, and Cultural and Historical Resources (Guam's Priority Climate Action Plan, 2024).

As an island community, Guam's environmental resilience is closely tied to sustainable land use planning. Climate change affects all aspects of society, from infrastructure and economic development to cultural preservation and village life. To address these risks, Guam must adopt an integrated, proactive approach that prioritizes coastal resilience, green infrastructure, disaster-resilient housing, water resource management, climate-smart agriculture, renewable energy, and strong community engagement. By incorporating climate considerations into land use planning, Guam can protect vulnerable communities, ensure long-term environmental and economic sustainability, and preserve its unique cultural and natural heritage. The following strategies and policies will guide Guam toward climate resilience and a thriving environment.

5.2.1. Coastal Zone Management

Coastal zone management is integral to effective land use planning and sustainability on Guam. Guam's coastal zone management program is nearly fifty years old. It is discussed in more detail later in this chapter. But it is important to highlight at least three coastal management strategies for responding to climate change: coastal risk reduction, hazard avoidance, and nature-based solutions. G50SP policies direct that these strategies be applied in land use planning and development decisions.

Coastal Risk Reduction: Setbacks. Guam's low-lying coastal areas are particularly vulnerable to rising sea levels and extreme weather events. Since 1993, sea levels around Guam have risen by approximately 4 inches. As presented in Chapter 3, projections indicate a rise of 1 to 3 feet in the next century. Development in high-risk areas must be restricted to avoid increased exposure

to storm surges, flooding, and erosion. Implementing coastal setbacks will help reduce vulnerability, requiring construction to be positioned away from hazard-prone areas.

Hazard Avoidance and Updated Mapping. Land-use planning must integrate updated hazard maps that account for projected sea-level rise and extreme weather patterns. Construction should be prohibited in high-risk flood zones, and at-risk areas should be designated for conservation or nature-based solutions (see Chapters 3 and 7).

Nature-Based Shoreline Protection. Guam's mangroves and coral reefs act as natural barriers, absorbing wave energy and reducing erosion. Healthy coral reefs reduce wave energy by 97% before it reaches the shore, making them a cost-effective alternative to artificial seawalls (Ferrario et al, 2014). Restoration and conservation of these ecosystems should be prioritized to protect coastal communities.

5.2.2. Green Infrastructure Development

Another important land use strategy for addressing climate change is the use of *green infrastructure*, especially in urban areas. G50SP policies address the following aspects of green infrastructure:

Urban Development with Natural Systems. Incorporating natural systems into urban development helps mitigate climate impacts. Green infrastructure—such as rain gardens, bioswales, bioretentions, and permeable pavement—reduces flooding and improves water quality by allowing stormwater to filter into the ground instead of overwhelming drainage systems.

Green Spaces and Tree Canopy Expansion. Guam's urban heat island effect is exacerbated by increased paved surfaces and deforestation. Expanding tree-lined streets, urban forests, and green spaces reduces temperatures, improves air quality, and enhances stormwater management. Urban trees can reduce local temperatures by up to 9°F (Guam DoAG, 2025).

Climate-Resilient Infrastructure. New infrastructure projects should incorporate elevated roads, flood-resistant materials, and energy-efficient designs. Investment in climate-resilient transportation networks, water systems, and stormwater infrastructure will reduce long-term costs and vulnerability to extreme weather.

5.2.3. Disaster-Resilient Housing

As discussed in more detail in Chapter 3, climate change necessitates that Guam focus even greater attention on assuring that new housing is resilient to natural hazards and storm events, especially typhoons. Policies in this chapter underscore the following aspects of resilient housing:

Building Code Updates for Extreme Weather. Guam is frequently impacted by typhoons and tropical storms. Recent storms, such as Typhoon Mawar (2023), caused over $100 million in

damages (FEMA, 2025). Updating building codes to require storm-resistant roofing, reinforced foundations, and elevated construction will strengthen Guam's housing stock.

Retrofitting and Renewable Energy Integration. Many homes in Guam were built before modern climate considerations were incorporated into building codes. Retrofitting older structures with climate-resilient materials, solar energy systems, and battery storage will enhance disaster preparedness and energy security. Incentives should be provided for climate-smart renovations.

5.2.4. Water Resource Management

Chapter 3 and other sections of this chapter address water resource management in more detail, but together, the policies of the G50SP present a multi-pronged strategy for addressing climate change vulnerabilities of Guam's drinking water supplies and watersheds, while promoting water conservation and reuse:

Addressing Climate Impacts on Water Resources. Guam's primary drinking water source, the Northern Guam Lens Aquifer (NGLA), is at risk due to climate change. Rising temperatures and prolonged droughts reduce groundwater recharge rates, while sea-level rise increases the risk of saltwater intrusion (Gingerich, et al., 2019).

Watershed Protection and Sustainable Water Use. Deforestation and urban sprawl threaten watersheds, leading to reduced groundwater recharge and increased erosion. Stricter land-use regulations must protect watershed areas by limiting deforestation, preserving riparian zones, and restricting pollution sources.

Rainwater Harvesting and Greywater Recycling. Rainwater harvesting and greywater reuse should be integrated into new developments to reduce strain on freshwater resources. Policy incentives, such as tax credits or grants for water-efficient systems, can encourage adoption.

5.2.5. Climate-Smart Agriculture

Climate-smart agriculture is another important component of the G50SP climate resilience strategy. This includes food security and agroforestry, also addressed in Chapter 3.

Strengthening Food Security. Guam imports over 90% of its food supply, making it highly vulnerable to climate-related disruptions in global food systems (Epicenter, 2020). Expanding local, climate-resilient food production is crucial for food security. The strong support (85%) expressed by respondents in the G50SP Community Engagement Survey for agricultural initiatives not only signals a recognition of this urgent need, but may also reflect deeper, collective nostalgia for Guam's rural and agrarian past–an identity rooted in self-sufficiency and connection to the land.

Promoting Agroforestry and Soil Health. Agroforestry—integrating trees with agricultural crops—improves soil health and reduces carbon emissions. Encouraging composting, crop diversification, and regenerative agriculture will enhance resilience and productivity.

5.2.6. Renewable Energy Integration

Renewable energy, too, is critically important to a sustainable Guam. Both of the broad strategies listed below are elaborated in Chapter 3, with a particular focus on the land use challenges to securing a renewable energy system by 2050. Notably, seen in Figure 5-1, respondents of the G50SP Community Engagement Survey expressed overwhelming support for renewable energy projects within their own villages, signaling a strong community willingness to participate in Guam's clean energy transition due to cost savings, climate change, and importance of environmental preservation.

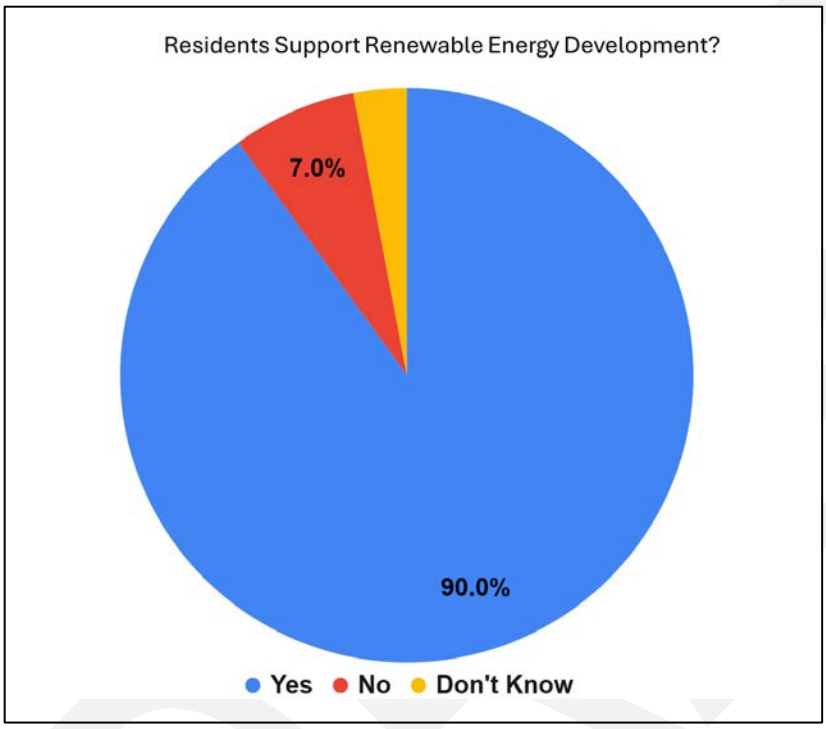

Figure 5-1. Public Support for Renewable Energy

Summary of Water Resources on Guam

KEY CHALLENGES & RECOMMENDATIONS

(Gingrich et al, 2019)

Guam's freshwater supply relies primarily on the Northern Guam Lens Aquifer (NGLA) for groundwater and the Fena Valley Reservoir (FVR) for surface water. However, climate change, population growth, and aging infrastructure pose significant threats to water availability and quality. Projected temperature increases, decreased rainfall (by 7%), and reduced groundwater recharge (by 19%) will lead to water shortages and higher salinity levels in drinking water sources. Rising sea levels (up to 3.2 feet by 2100) further increase the risk of saltwater intrusion into groundwater supplies, threatening long-term sustainability.

Key Challenges:

- **Decreasing Water Supply:** Lower rainfall and increased evaporation reduce streamflow (by 18%) and groundwater recharge.
- **Saltwater Intrusion & Contamination:** Higher sea levels and over-extraction increase chloride concentrations, affecting drinking water.
- **Sedimentation & Storage Loss:** The FVR has lost 17% of its storage capacity due to sedimentation from erosion and typhoons.
- **Infrastructure & Demand Growth:** Aging water systems, population growth (projected 200,581 by 2035), and military expansion increase demand and strain resources.

RECOMMENDATIONS

- ☑ **Infrastructure Upgrades:** Rehabilitate water pipelines, expand wastewater systems, and improve leak detection.
- ☑ **Climate Adaptation Measures:** Lower water intake in the FVR, raise spillway height, and reduce high-salinity well withdrawals.
- ☑ **Land Use Planning:** Restrict development in recharge areas, enforce septic system regulations, and improve stormwater management.
- ☑ **Water Conservation Programs:** Encourage rainwater harvesting, greywater reuse, and public conservation initiatives.
- ☑ **Integrated Management & Policy Coordination:** Enhance collaboration between Guam Waterworks Authority (GWA), Department of Defense (DoD), and environmental agencies to improve long-term water sustainability.
- ☑ By **implementing these strategies**, Guam can ensure a resilient and sustainable water supply amid climate change and increasing demand.

Building a Resilient Energy System. Climate resilience requires transitioning to renewable energy. Guam relies on imported fossil fuels for nearly 90% of its energy, making it vulnerable to global supply chain disruptions and price volatility (NREL, 2024).

Solar and Wind Energy Expansion. Policies should promote the development of solar and wind farms, including potentially offshore wind, as well as community microgrids that enhance energy independence.[16] Large-scale developments should be required to incorporate renewable energy installations. According to the G50SP Community Engagement Survey (see *Figure xx*), sixty-six percent (66%) of respondents believed there should be renewable energy projects (e.g., solar and wind farms) constructed in conservation areas. This strong public support underscores the urgency and community backing for integrating renewables more broadly, even in traditionally protected spaces, provided environmental impacts are carefully managed. However, while expressing a desire for renewable energy, it may not reflect a desire to override conservation of sensitive environmental areas, which was also strongly supported in other survey responses (see Chapter 3).

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[16] Recent federal activity highlights growing interest in assessing Guam's offshore wind energy potential. In January 2025, the Bureau of Ocean Energy Management (BOEM) issued a Call for Information and Nominations for commercial wind energy leasing on the Outer Continental Shelf (OCS) offshore Guam, covering approximately 2.1 million acres in water depths ranging from 350 to over 2,200 meters (BOEM, 2025a). This followed the formation of a Guam Intergovernmental Renewable Energy Task Force, which first convened in September 2024 to coordinate planning among federal agencies, the Government of Guam, and the U.S. Department of Defense (BOEM, 2024). BOEM was also collaborating with NOAA's National Centers for Coastal Ocean Science (NCCOS) to develop spatial suitability models and biogeographic assessments, with results anticipated in 2026–2027 (BOEM, 2025b). These actions potentially support Guam's legislated targets of 50% renewable energy by 2035 and 100% by 2045. A potential offshore wind lease sale was previously targeted for 2028 as part of BOEM's five-year leasing roadmap (OffshoreWind.biz, 2024), prior to the Trump administration move away from offshore wind.

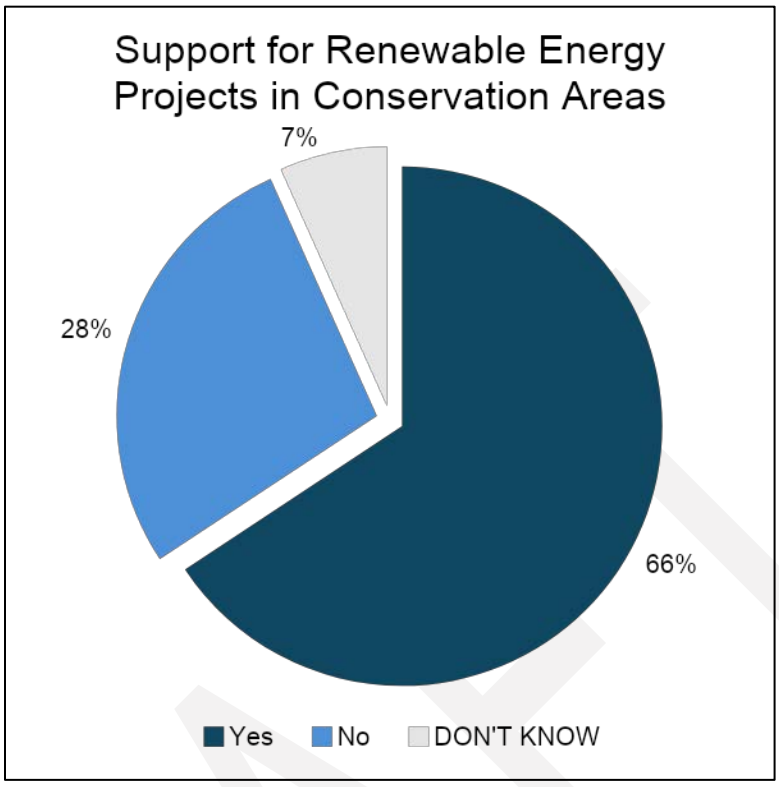

Figure 5-2. Support for Renewable Energy Projects in Conservation Areas.

5.2.7. Community Engagement and Education

As with other planning concerns, climate resilience can only be achieved and strengthened with robust community engagement and education. The G50SP recognizes this through two primary policy objectives:

Public Involvement in Land Use Planning. Community participation is vital in shaping resilient land use policies. Public consultations and education campaigns will empower residents to take part in climate adaptation initiatives.

Community-Led Adaptation Initiatives. Supporting shoreline restoration projects, tree planting campaigns, and local conservation efforts will foster a culture of environmental stewardship. Partnerships with schools and businesses can further expand outreach efforts.

5.2.8. Monitoring and Adaptive Management

Finally, a climate resilience strategy must be informed by on-going monitoring and adaptive management. Though the broad directions and magnitude of potential changes driven by climate change are well understood, the specific changes, and their timing, have significant uncertainties around them. If Guam is to maintain a sustainable land use system, it will need to

keep track of climate changes and effects, and adjust its management systems and land use policy accordingly.

Continuous Assessment and Policy Adjustments. Climate change is an evolving challenge, requiring ongoing monitoring and adaptation. A dynamic land-use framework must be established to assess coastal erosion rates, flood risks, and water resource depletion.

Regular Policy Updates. As new climate data emerges, hazard maps, zoning laws, and environmental regulations must be updated accordingly. Funding should be allocated for scientific research and pilot projects to test innovative resilience strategies.

5.2.9. Climate Resilience, Land Use and Sustainability

Guam's Land Use Climate Resilience policies align closely with the United Nations SDGs, particularly those focused on climate action (SDG 13), sustainable cities and communities (SDG 11), life below water (SDG 14), and clean water and sanitation (SDG 6). The Coastal Zone Management policies, which prioritize resilience against sea level rise, storm surges, and erosion, directly support SDG 14.2 (Sustainably manage and protect marine and coastal ecosystems) by ensuring that Guam's shorelines remain resilient to climate impacts. Implementing coastal setbacks and hazard avoidance furthers SDG 13.1 (Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters) by enforcing development regulations that prevent high-risk construction in flood-prone areas. The emphasis on nature-based shoreline protection, including the preservation of mangroves and coral reefs, aligns with SDG 14.5 (Conserve at least 10% of coastal and marine areas by 2020 and beyond) by actively restoring natural coastal buffers.

The Green Infrastructure Development policies contribute to multiple SDG targets. Encouraging permeable surfaces, rain gardens, and tree-lined streets in urban development supports SDG 11.7 (Provide universal access to safe, inclusive, and accessible green and public spaces, particularly for vulnerable populations) by integrating sustainable, accessible green spaces into urban environments. Incorporating climate-resilient infrastructure aligns with SDG 9.1 (Develop quality, reliable, sustainable, and resilient infrastructure to support economic development and human well-being) by mandating the inclusion of climate-adaptive designs in new infrastructure projects, such as elevated roads and storm-resistant materials. These strategies reduce urban

heat island effects, enhance stormwater management, and mitigate flooding risks, making Guam's communities more adaptable to climate change.

The policies on Disaster-Resilient Housing strongly support SDG 11.1 (Ensure access for all to adequate, safe, and affordable housing and basic services and upgrade slums) by requiring housing developments to incorporate resilience against extreme weather events. Enforcing building codes that require homes to withstand typhoons and other climate hazards aligns with SDG 13.1 (Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters) by ensuring structures are built to endure extreme weather conditions. Encouraging climate retrofits and the integration of renewable energy in housing developments contributes to SDG 7.2 (Increase the global share of renewable energy in the energy mix) by incentivizing solar energy and other renewable technologies. Similarly, Water Resource Management policies align with SDG 6.1 (Achieve universal and equitable access to safe and affordable drinking water for all) by protecting drinking water sources through the establishment of buffer zones, and SDG 6.4 (Substantially increase water-use efficiency across all sectors to address water scarcity) through the promotion of rainwater harvesting and greywater recycling systems.

Other Guam policies, such as Climate-Smart Agriculture and Renewable Energy Integration, contribute to SDG 2.4 (Ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, help maintain ecosystems, and strengthen capacity for adaptation to climate change) by supporting agroforestry and climate-resilient crops. Renewable energy policies further SDG 7.2 by designating land for solar and wind energy projects, increasing the renewable energy share in Guam's energy mix. Community engagement and education initiatives align with SDG 4.7 (Ensure all learners acquire the knowledge and skills needed to promote sustainable development, including climate change awareness and adaptation strategies) by fostering public participation in climate resilience efforts. Finally, the Monitoring and Adaptive Management policy aligns with SDG 13.3 (Improve education, awareness, and human and institutional capacity on climate change mitigation, adaptation, impact reduction, and early warning systems) by establishing a framework for continuous assessment and policy adaptation based on climate impact monitoring. Collectively, these policies reinforce Guam's commitment to sustainable development, ensuring environmental resilience, community participation, and long-term climate adaptation in alignment with the U.N. SDGs.

5.2.10. Climate Resilience Land Use Plan Policies

Coastal Zone Management

TE-1. Coastal Resilience.

Protect and enhance the resilience of Guam's coastal zone against rising sea levels, flooding, storm surges, and erosion.

TE-2. Coastal Setbacks.
Implement development setbacks consistent with policies SC-93, 94, and 95.

TE-3. Nature-Based Shoreline Protection.
Prioritize the preservation and restoration of mangroves and coral reefs as natural buffers against storm surges. Prioritize and incorporate living shoreline strategies as appropriate in lieu of more traditional engineered seawalls and other hard armoring structures.

TE-4. Hazard Avoidance.
Prohibit, to the maximum extent feasible, construction in high-risk flood zones identified by updated hazard maps.

Green Infrastructure Development

TE-5. Urban Development.
Incorporate natural systems and features as feasible into urban planning to mitigate the impacts of climate change.

TE-6. Green Infrastructure.
Promote the use of permeable surfaces, green roofs, and rain gardens to reduce urban heat and manage stormwater runoff.

TE-7. Green Space and Trees.
Include tree-lined streets and public green spaces in urban developments to improve air quality and reduce heat island effects.

TE-8. Climate Resilient Infrastructure.
Require new infrastructure projects to include climate-resilient design features, such as elevated roads and storm-resistant materials.

Disaster-Resilient Housing

TE-9. Safe Housing.
Ensure that housing is designed and constructed to withstand extreme weather events, consistent with Chapter 3 of this plan.

TE-10. Typhoons and Extreme Events.
Implement building codes that require homes to be designed to withstand typhoons and other extreme climate events consistent with Chapter 3 of this plan.

TE-11. Climate Retrofits.
Encourage the retrofitting of existing structures with climate-resilient materials and technologies.

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TE-12. Incentivize Renewable Energy.
Provide incentives for housing projects that integrate renewable energy systems, such as solar panels and battery storage.

Water Resource Management

TE-13. Climate Change: Droughts and Saltwater Intrusion.
Protect Guam's water resources from the impacts of climate change, including droughts and saltwater intrusion.

TE-14. Watershed Protection and Deforestation.
Enforce land use regulations that protect watershed areas and limit deforestation.

TE-15. Rainwater Harvesting and Greywater Recycling.
Promote rainwater harvesting and the use of greywater recycling systems in residential and commercial developments.

TE-16. Drinking Water Protection.
Establish buffer zones around aquifers and water sources to prevent contamination and over-extraction.

Climate-Smart Agriculture

TE-17. Food Security and Climate.
Support sustainable agricultural practices that enhance food security and resilience to climate variability.

TE-18. Soil Health and GHGs.
Designate agricultural lands for sustainable farming practices that improve soil health and reduce greenhouse gas emissions.

TE-19. Agroforestry.
Promote agroforestry and the cultivation of climate-resilient crops suitable for Guam's environment.

TE-20. Water Irrigation and Conservation.
Implement water-efficient irrigation technologies and practices to conserve water in agricultural areas.

Renewable Energy Integration

TE-21. Resilient Energy Systems.
Transition to renewable energy systems to reduce greenhouse gas emissions and enhance energy security.

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TE-22. Renewable Energy Land Use Planning.
Designate zones for the development of solar, wind, and other renewable energy projects, consistent with Chapter 3 of this plan.

TE-23. Renewable Energy in Large Developments.
Require large-scale developments to include renewable energy installations as part of their project plans.

TE-24. Community Energy Supply.
Promote community energy projects, such as microgrids, to improve energy resilience in remote areas.

Community Engagement and Education

TE-25. Education and Participation.
Foster public awareness and community participation in climate resilience efforts.

TE-26. Public Engagement.
Require public consultations for all major land use planning initiatives to ensure community input and support.

TE-27. Climate Education.
Develop educational programs that inform residents about climate risks and resilience strategies.

TE-28. Community-led Adaptation.
Support community-led adaptation projects, such as shoreline clean-ups and native vegetation planting.

Monitoring and Adaptive Management

TE-29. Adaptive Land Use Planning.
Establish a dynamic framework to assess and adjust land use policies based on changing climate conditions.

TE-30. Monitoring.
Implement a system for regular monitoring of climate impacts on land use, such as coastal erosion rates and flood frequency.

5.3. Watershed Protection

A watershed is an area of land that drains precipitation into larger bodies of water, such as the ocean. Watersheds are vital landscape features that may help filter contaminants out of ground water supplies and protect near-shore coral reefs from sedimentation. The size and shape of a watershed is highly dependent on the topography of the land. Guam is divided into 19 distinct watersheds, with 18 concentrated in the central and southern parts of the island. The northern

portion of the island contains the “Northern” watershed, consisting of a relatively flat, shallow soil layer on top of highly permeable limestone. This sub-watershed has been further delineated into sub-basins as more complete data on the flow of water through the northern aquifer become available (Figure 5.1).

In the southern part of Guam, the Mount Lamlam mountain ridge runs along the western coast, topographically defining many of the watersheds, which consist of smaller and steep areas with short streams in the west, and broader floodplains with longer, larger rivers in the east (Digital Atlas of Southern Guam).

While each southern watershed is different, they all face similar threats to their overall health, function, and water quality. Erosion and associated sedimentation, land development and land use change, wildland fires, invasive species, and pollutants are the major threats impacting all watersheds on the Island (NOAA 2012). As discussed in Chapter 3, groundwater contamination and saltwater intrusion are a primary concern in the NGLA.

The Manell-Geus watershed has been identified by NOAA as a Habitat Focus Area. The watershed, primarily located in the village of Malesso’, flows into the coral reefs in Achang Reef Flat Marine Preserve and Cocos Lagoon. The seagrass beds and coral reefs support a strong fishing tradition and provide habitat for sea turtles. Risks to watershed health include erosion of hillsides and streambanks due to impacts from wildfires, ungulates, and off-roading vehicles. The erosion has resulted in poor water quality and increased sedimentation leading to declining coral health. As a Habitat Focus Area, NOAA works with the local community to develop and test various watershed restoration techniques, such as streambank stabilization, bamboo removal, and placing riparian buffers in the sub-watersheds of Geus, Liyog, and Asgadao (King, 2014; NOAA, 2025a, 2025b).

The Water Planning Committee, also known as the Watershed Planning Committee, completed an assessment of the island’s watersheds in 2019 and selected three, Northern, Ugum, and Talofofo watersheds, as its highest priority watersheds due to their value as drinking water resources. The designation of Ugum as a high priority watershed is important as there is no other water source for the southern villages.

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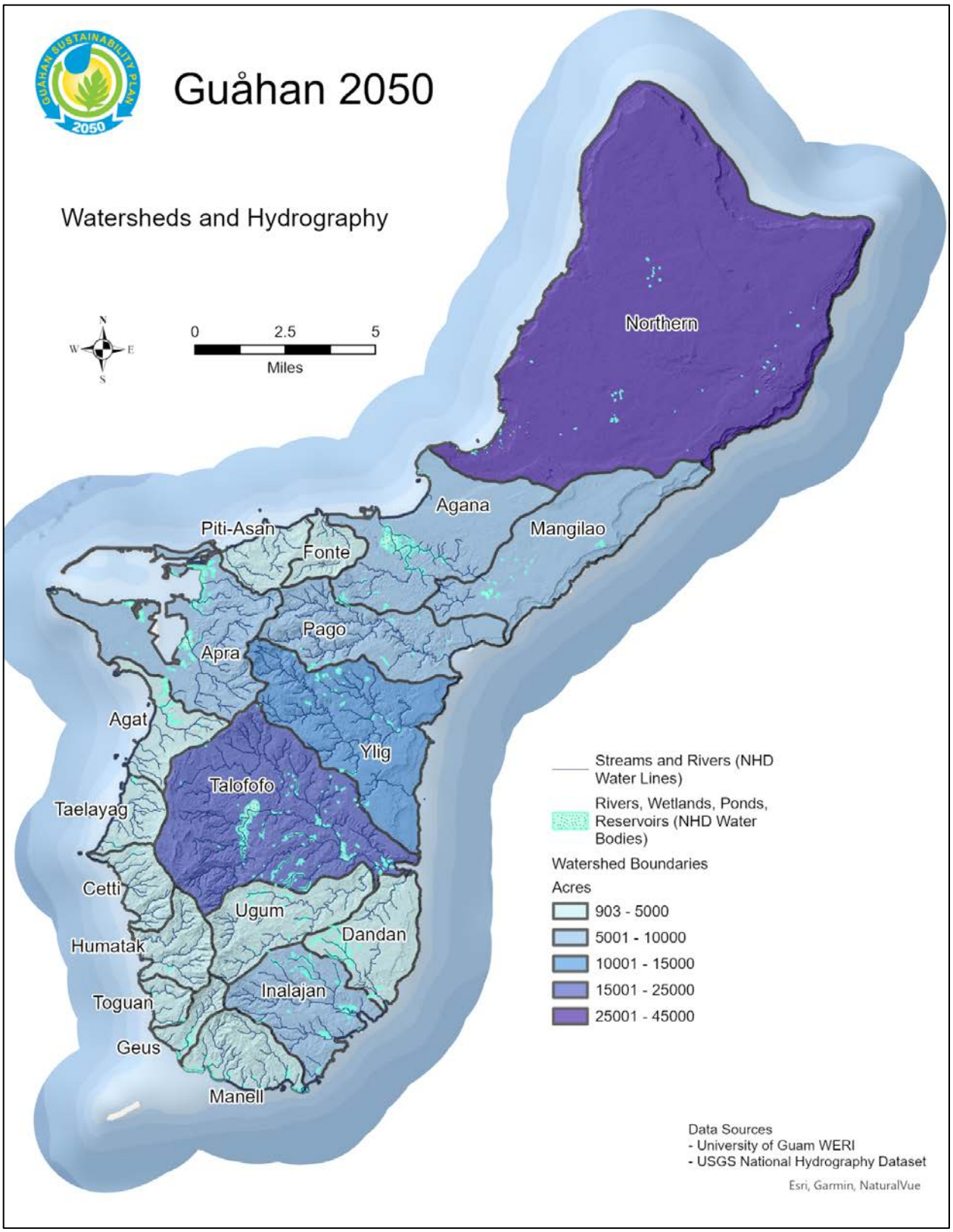

Figure 5-3. Guam Watersheds and Hydrography.

5.3.1. Groundwater Protection

5.3.1.1. Northern Guam Lens Aquifer (NGLA)

Guam has very few freshwater resources. The freshwater environments of Guam can be classified as wetlands, lentic environments (ponds and artificial impoundments), lotic environments (streams and rivers), and groundwater. The distribution of freshwater in Guam is controlled by local geology and topography. Surface freshwaters are common in the south, where the land is dominated by volcanic bedrock and clays. In the north, surface water is rare as the terrain is made of highly porous limestone. As a result, southern Guam has numerous rivers but limited groundwater areas, whereas northern Guam has no rivers, but is underlain by groundwater.

Wetlands are limited to freshwater marshes on clayey limestone and limited swamp vegetation around Pago River. In the subsurface, the aquifer represents a complex freshwater ecosystem in which different habitats can be recognized: freshwater zone, brackish water zone, salty groundwater beneath the aquifer, large water-saturated cavities, small water-saturated interstices, open-surface freshwater pools and streams inside caves, and coastal springs (Digital Atlas of Guam).

The NGLA supplies about 80% of Guam's population with portable water (USACE 2022; WERI, 2013). In 1978, the EPA designated the NGLA as a principal source of drinking water for the island of Guam and that, "if the ground waters were contaminated, a significant hazard to public health would exist" (43 Fed. Reg. 868; also Guam Clean Water Action Plan, 1998). The NGLA encompasses all of northern Guam and consists of the limestone bedrock that is located north of the Pago-Adelup fault (geologic fault that separates the volcanic terrain of southern Guam from the limestone plateau in northern Guam). This lens-shaped aquifer is the thickest in the island's interior and thinnest along the island's perimeter. Because freshwater is less dense than seawater, this fresh groundwater lens floats upon saltwater that permeates the bedrock beneath it. Under future conditions, the NGLA is likely to be threatened by saltwater intrusion as ocean levels rise and pumping from supply wells increases in drought years (Grecni et al. 2020).

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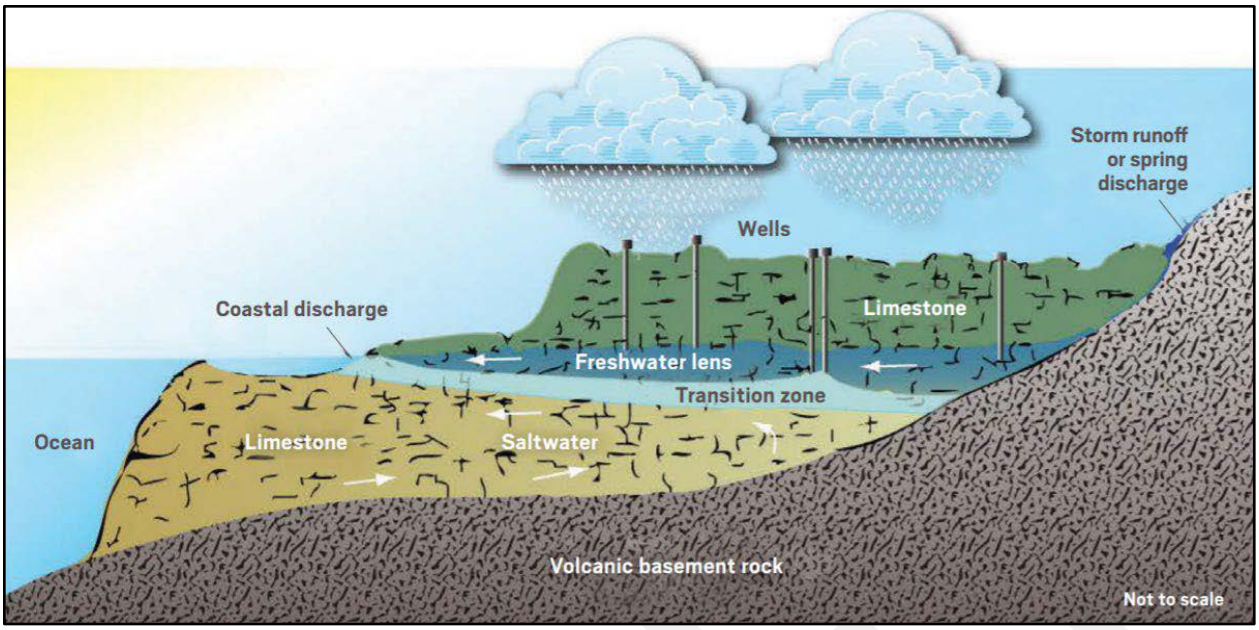

Figure 5-4. Northern Guam Lens Aquifer.

Unlike other aquifers (for example, the Floridan Aquifer), the NGLA does not hold its water in a subterranean lake within underground rooms, rather, water is contained within the rocks. These rocks, mainly limestone, though solid and dense, are full of holes and empty space that can accommodate a large volume of water. The empty spaces include pores and gaps that were created by coral when the limestone was still a live reef. Cracks and fractures developed from earthquakes and tectonic movements, and karst voids were created by water as it moved through the rocks and removed some of the limestone bedrock in solution. These spaces make the NGLA particularly vulnerable to contamination from above.

Protecting the NGLA from contaminants is crucially important for public health and sustainable development. Drinking water is pumped from the underground aquifer into the water distribution system. Contaminants can affect the water supply from beneath the aquifer and from the land surface. Seawater contamination is a major risk in island aquifers. For example, salty groundwater that normally underlies the aquifer is kept in its place by the weight of fresh groundwater sitting atop of it. If too much freshwater is removed by pumping, the saltwater will move upward into the aquifer to achieve equilibrium. In addition to contamination from percolation and runoff of surface pollution (including trash and debris), saltwater intrusion is also a risk for the aquifer. The risk of saltwater intrusion depends on recharge rates, the hydraulic properties of the rocks, and well location and depth (USGS-WERI 2003). Roughly 120 wells are used on Guam to withdraw water from the NGLA, and the halocline (transition zone) of brackish and freshwater will thicken as fresh water is reduced during over pumping and droughts.

Other sources of contaminants are at the land surface. Domestic wastewater and sewage, industrial spills, and agricultural and stormwater runoff can contaminate the aquifer through

infiltration or cracks and fractures in the bedrock. Several thousand septic tanks and pit toilets sit right above the NGLA and are major sources of contaminants. Septic tanks alone discharge roughly five (5) million gallons of wastewater into the environment each day. The extent to which contaminants have impacted the chemical and biological integrity of the NGLA is currently unknown and cannot be ignored due to the well-connected open spaces which facilitate rapid movement of water (and any contaminants therein) without being filtered (Digital Atlas of Northern Guam).

As detailed in Chapter Three, the Consolidated Commission on Utilities (CCU) comprises the Guam Waterworks Authority (GWA) and the Guam Power Authority (GPA). The CCU supplies power, drinking and wastewater services for all of Guam. Sources of water supply other than the NGLA include freshwater springs and rivers. Surface sources used by GWA include an intake from the Ugum River in addition to water purchased from the US Navy Water System (FENA). Spring water from Santa Rita is used to supplement the water supply from FENA for the villages of Asan, Piti, Anigua, Agat, Santa Rita and some areas of Barrigada and Mongmong-Toto-Maite.

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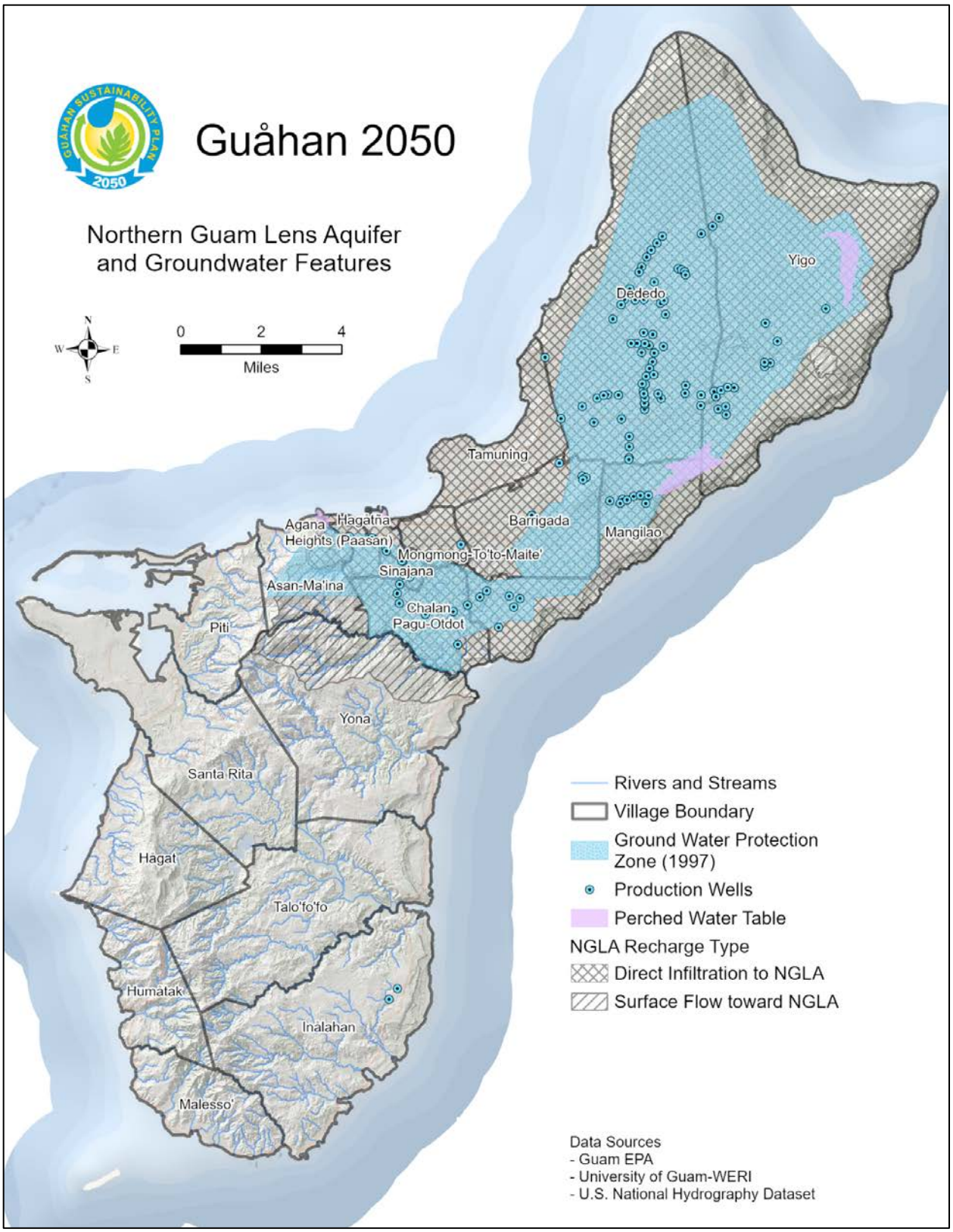

Figure 5-5. Map of (1) NGLA composition and (2) Groundwater Protection Zone.

5.3.2. Erosion and Runoff Control

5.3.2.1. Sedimentation

According to the 2022 Guam Watershed Plan, sedimentation as a result of erosion is one of the biggest environmental threats on Guam (USACE, 2022). Though erosion occurs naturally over time, the process is expedited by human-caused land management issues. For example, when land is cleared of vegetation for the purpose of development (e.g. agricultural, industrial), sediments and soil that were once held in place by plants become vulnerable to runoff from heavy rains and drain into nearby streams and rivers.

Sedimentation usually occurs via nonpoint source pollution, which comes from many different origins such as rainfall and runoff from impervious surfaces, agricultural land, etc. Sedimentation can result in adverse effects to aquatic life in both freshwater and marine ecosystems. Increased turbidity due to suspended sediments can affect the amount of light able to reach submerged vegetation and can result in an increase in water temperature, leading to reduced plant productivity and potential disturbance to aquatic organisms that may not tolerate higher water temperatures. Sedimentation is the biggest threat to coral reefs around Guam. Corals can be smothered by deposited sediment, depleted of light via turbidity, and be exposed to excess nutrients carried with sediment (Horsley Witten Group, Inc., 2006).

5.3.2.2. Nonpoint Source

In addition to sedimentation, other nonpoint source pollution types include nutrient runoff and bacteria. Nitrogen and phosphorus are commonly nutrients found in fertilizers, sewage, animal waste, maintained lawns, and other organic sources. When these nutrients enter streams, lakes, and other water bodies in high amounts via runoff, eutrophication can occur over time. The excess nutrients often lead to algal blooms, and in turn, deplete sunlight and oxygen for aquatic plants, fish, and wildlife below the surface. Bacteria pollution is typically a result of runoff from livestock/pet wastes and faulty or overflowing septic systems. Stormwater can carry high concentrations of bacteria and is a public health concern on Guam which has led to several beach closures in recent years (Horsley Witten Group, Inc., 2006).

5.3.3. Stormwater Management

Stormwater runoff is generated from rain that flows over land or impervious surfaces, such as paved streets, parking lots, and building rooftops, and does not soak into the ground. Construction sites, lawns, improperly stored hazardous wastes, and illegal dumping are all potential sources of stormwater pollutants. During a rain event, stormwater runoff picks up pollutants like trash, chemicals, and dirt/sediment discharges into streams, lakes, and groundwater (EPA 2024).

5.3.3.1. Stormwater Issues in Guam

The Commonwealth of the Northern Mariana Islands (CNMI) and Guam have a tropical marine climate. The average annual rainfall exceeds 100 inches per year in many locations. During the rainy season, typhoons can drop 10-15 inches of precipitation in a single storm event. These climatic conditions combined with the region's unique limestone geology, volcanic geologic formations, sensitive water resources and significant land development forces make stormwater a very significant environmental and economic issue. Historically, stormwater has been viewed as strictly a drainage issue and has been routed to the nearest discharge location, infiltrated into the highly-permeable limestone with little or no pre-treatment, or conveyed directly to receiving waters (CNMI and Guam Stormwater Manual (Horsley Witten Group, Inc., 2006)).

Seasonality also poses significant challenges to stormwater management. A trademark of the tropical marine climate is warm and humid weather moderated by seasonal tradewinds and a distinct wet and dry season. The dry season typically lasts from January to June, while the wet season, also known as the typhoon season, occurs typically from July to December (USGS 2024). About 70 percent of the total annual rainfall is recorded during the wet season. Topographical differences between the north and south sides of the Island result in annual precipitation totals varying as much as 30 inches with southern Guam receiving more rainfall. In northern Guam, the average rainfall during the wet season is about 12 inches per month (Camp, Dresser & McKee, Inc. 1982). During the dry season, the seasonal average rainfall is about five (5) inches per month on the northern portion of the island.

Urban development significantly intensifies stormwater runoff due to the conversion of permeable land to impervious surfaces. This leads to a dramatic increase in both the frequency and volume of storm flows (Figure X). For instance, the "bankfull" event, typically associated with a two-year storm (7.0 inches of rain in 24 hours in Guam), can occur two to seven times more frequently after development, and its discharge rate can increase by up to five times. This escalation is because impervious surfaces generate greater runoff, and drainage systems deliver water more rapidly to natural water bodies (Horsley Witten Group, Inc., 2006).

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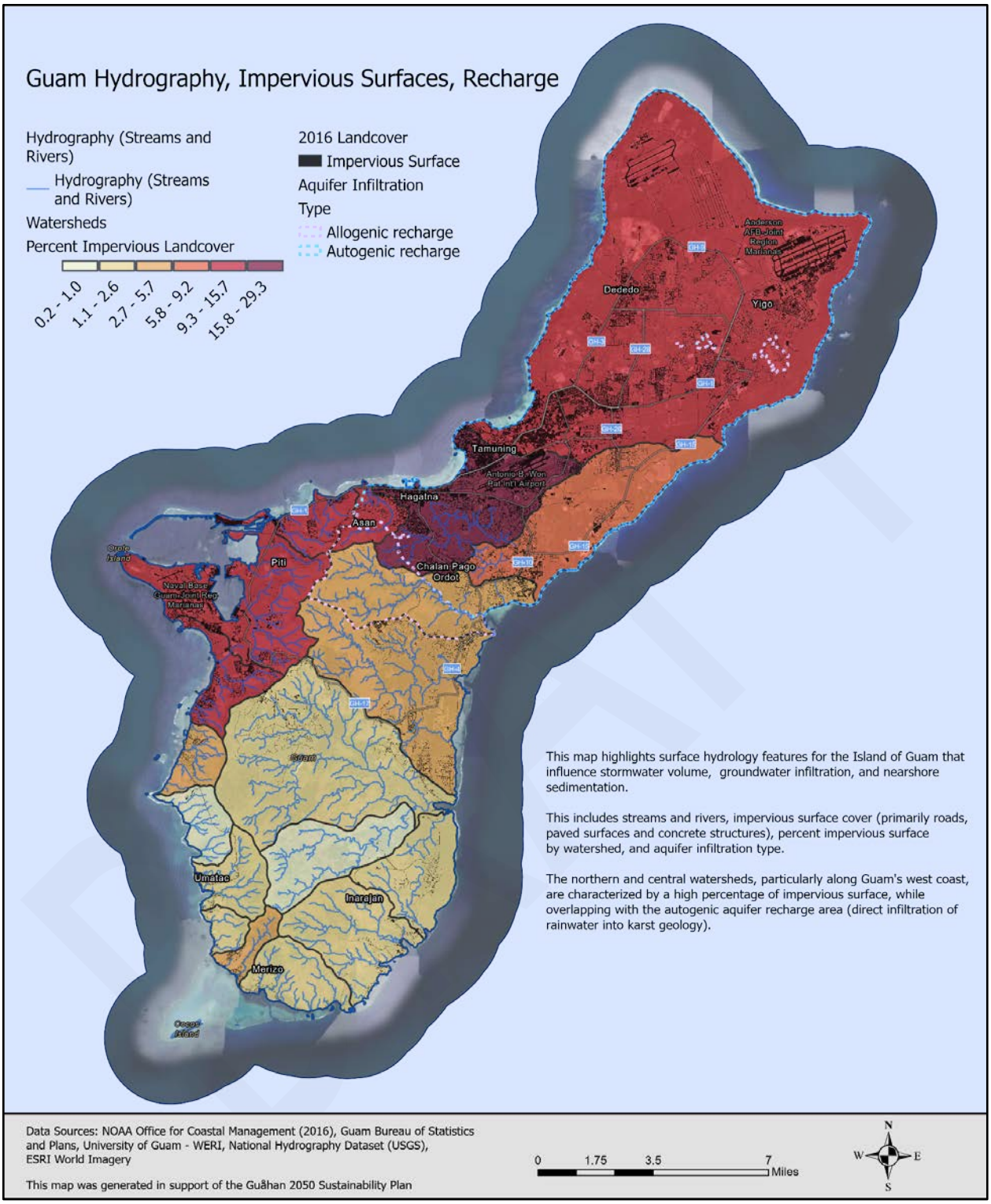

Figure 5-6. Map of Guam's surface hydrology features and impervious surfaces.

Land Use Planning Issues and Challenges in Guam Watershed Management

KEY ISSUES

Habitat Loss & Environmental Degradation

- Deforestation, wildfires, and invasive species are leading to loss of native forest and biodiversity.
- Coral reef degradation due to sedimentation, pollution, and climate stress weakens coastal protection.
- Nutrient loading from agricultural runoff and septic systems contributes to algal blooms and water quality deterioration.
- **Coastal & Inland Flooding Risks**
- Flash flooding from heavy rainfall affects life safety and property, especially in southern Guam.
- Riverine sedimentation, caused by erosion and runoff, exacerbates flooding risks and threatens marine habitats.
- Sea level rise and loss of natural coastal barriers (coral reefs and shoreline vegetation) increase shoreline erosion.
- **Land Use & Development Pressures**
- Unregulated development in flood-prone areas heightens vulnerability to flooding and infrastructure damage.
- Urban expansion in northern Guam threatens limited freshwater resources, increasing demand on the Northern Guam Lens Aquifer.
- Tourism development in Tumon Bay drives economic growth but poses risks to fragile marine ecosystems.

CHALLENGES IN SUSTAINABLE PLANNING

Balancing Conservation & Development

- Need for policies that protect ecological integrity while allowing economic growth.
- Zoning regulations required to prevent urban sprawl in sensitive watershed areas.

Resource Constraints & Enforcement Gaps

- Limited enforcement capacity for existing land use and conservation policies.
- Need for increased personnel for forestry management, wildland firefighting, and habitat restoration.

Interagency Coordination & Funding Needs

- Multi-agency efforts required for comprehensive watershed restoration and sustainable land use strategies.
- Lack of long-term funding for reforestation, sediment control, and infrastructure resilience.

PATH FORWARD

- Implement stricter **land use planning** and **zoning regulations** to mitigate urban expansion in high-risk areas.
- Enhance **watershed restoration** through reforestation, erosion control, and sustainable agriculture practices.
- Strengthen **coastal resilience** by protecting coral reefs and preventing shoreline degradation.
- Increase **interagency collaboration** and secure funding for long-term sustainability projects.

5.3.3.2. Existing Water Quality Legal Requirements, Policies, and Best Management Practices for Guam

Guam's water quality is governed by a comprehensive framework of federal and local regulations aimed at protecting freshwater and coastal ecosystems from pollution. The Guam EPA, the Guam Department of Public Works, and the US EPA play key roles in regulating stormwater runoff from construction sites through Guam's Soil Erosion and Sediment Control Regulations (GAR Title 22, Chapters 10 & 45) and the Clean Water Act (CWA). Under the National Pollutant Discharge Elimination System (NPDES), permits are required for pollutant discharges into water bodies. While Guam has not been delegated authority to manage NPDES permits, the US EPA integrates both federal and local water quality requirements into its permitting process. Additionally, the 401 Water Quality Certification (WQC) ensures that federally permitted projects comply with Guam's Water Quality Standards, protecting both surface and groundwater resources.

To mitigate the impacts of stormwater runoff, Environmental Protection Plans (EPPs) are mandated for most construction activities, requiring developers to outline erosion control measures. The CNMI and Guam Stormwater Management Manual (2006) sets 11 erosion and sediment control (ESC) standards, including minimizing unnecessary clearing, protecting waterways with buffers, stabilizing disturbed soils within 14 days, and implementing advanced sediment settling controls. Construction projects must phase development to reduce soil exposure, schedule activities during the dry season when feasible, and ensure ESC measures are maintained throughout construction. Additionally, sediment control best management practices (BMPs) require perimeter controls to prevent sediment-laden runoff from reaching coastal and inland waters, as well as specialized protections for steep slopes, riparian corridors, and wetlands to reduce erosion and habitat degradation.

Post-construction, water quality management strategies focus on maintaining groundwater recharge rates and minimizing impervious surfaces, with a limit of 70% impervious cover for developments over 1 acre. Stormwater BMPs must be designed to remove at least 80% of total suspended solids (TSS) and match pre-development infiltration rates. Additional performance criteria apply to critical areas, including coral reefs, wellhead protection zones, and recreational beaches. Redevelopment projects must either reduce impervious cover by 40% or implement stormwater controls for the equivalent area. Industrial sites must comply with stormwater pollution prevention plans (SWPPPs), while hotspot land uses with high pollutant loads require specific BMPs and pretreatment before any runoff is discharged into groundwater or surface waters.

To enhance Guam's resilience to climate change and sea level rise, new stormwater outfalls should be minimized in favor of green infrastructure solutions such as bioretention systems and permeable pavements. Where outfalls are necessary, they must be designed to reduce coastal impacts and, where possible, consolidated with existing systems. Additionally, Guam's Water Pollution Control Act mandates that water bodies must meet both aesthetic and ecological

standards, preventing the introduction of pollutants that cause excessive turbidity, toxicity, or undesirable aquatic growth.

These existing policies and best practices collectively ensure that Guam's freshwater and coastal ecosystems remain protected while allowing for sustainable development. They provide a strong basis for the GSP2050 policies presented following the next section. Together, they support integrated stormwater management for proposed development sites, as provided for in the 2006 Stormwater Management Manual for CNMI and Guam (Figure 5-7).

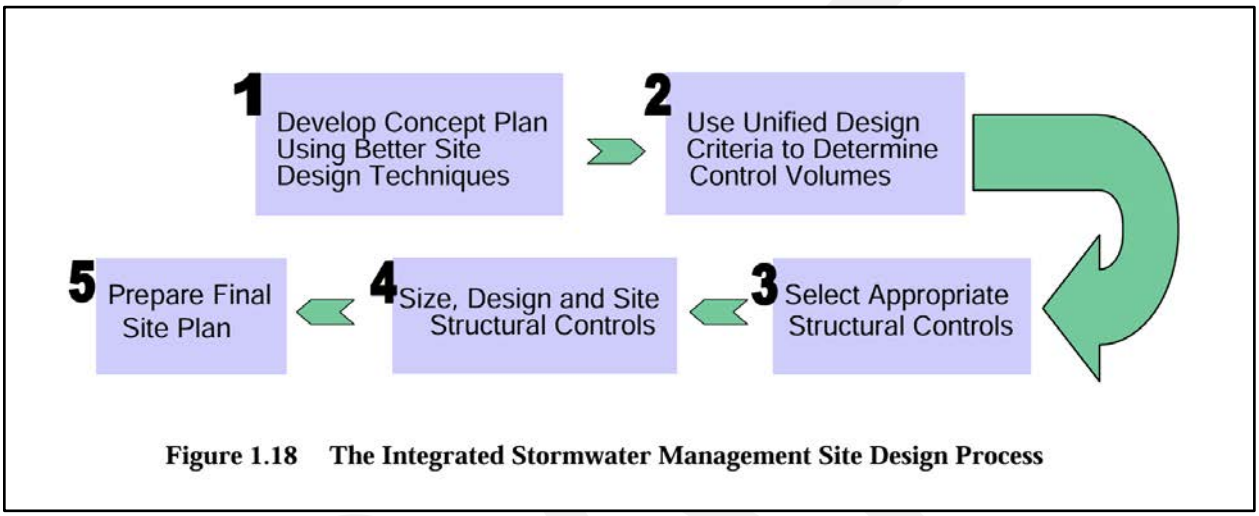

Figure 5-7. Stormwater Management for Proposed Development Sites (from CNMI and Guam Stormwater Management Manual).

5.3.4 Wetlands and Riparian Areas

Wetlands are unique transitional zones between aquatic and terrestrial areas that provide essential functions to maintain water quality, hydrology, and habitat functions for the island ecosystem and people of Guam. Wetlands are defined by the US Army Corps of Engineers as "*Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions*" (Environmental Laboratory 1987). These inundated or saturated areas not only retain water as it flows through the landscape, but they additionally work to cleanse the retained freshwater of pollutants and suspended sediment, directly affecting the quality of drinking water available to residents. On the southern portion of the island, many human-made freshwater wetlands were created historically for drinking water and crop irrigation, and some still function as drinking water reservoirs today (Wiles & Ritter 1993). Vegetation in wetlands can also act as important sources of food, medicine, and material to both humans and wildlife (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994).

Wetlands provide important areas of refuge for fish and wildlife – particularly juvenile fish, an important resource ecologically and economically. Mangrove wetlands, present along the

island's shoreline in some areas, are especially important breeding grounds for economically valuable reef fish and habitat for juvenile fish (Wiles & Ritter 1993). Mangrove wetlands additionally provide significant inland protection from storm events and flooding. Their complex network of roots stabilizes shoreline soils and prevents erosion during periods of intense wave action. Mangroves also protect marine aquatic resources such as eelgrass beds and coral reefs from the impacts of concentrated stormwater runoff from the island by filtering/trapping sediment and pollutants (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994; Ellison 2008). Overall, wetlands play a crucial role in the water cycle of the island ecosystem and provide essential habitat for its fish and wildlife.

5.3.4.1. Wetlands in Guam

Guam boasts the Mariana Islands' most abundant and diverse wetlands, categorized into four primary types: freshwater swamps, freshwater marshes, estuarine/mangrove wetlands, and river valley floodplains (Wiles & Ritter 1993). Smaller areas also feature savannah and salt marshes (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994).

Freshwater swamps, with their woody vegetation, are the most common, appearing at marsh and river valley edges and in isolated forested depressions. Freshwater marshes, largely grass and sedge-covered, range from under one to over 90 hectares. Estuarine wetlands, dominated by mangroves, are found along coastlines or in tidally influenced river valleys, with significant mangrove presence along the Malesso' shoreline, in Piti, and at the Atantano River mouth (Figure xx). River valley wetlands combine features of swamps and estuarine types, sustained by river flow and contained by topography. Wetlands are most concentrated in southern Guam, where abundant volcanic soils facilitate water collection and retention by slowing percolation. The USFWS National Wetlands Inventory (NWI), using 1975 aerial images, provides general wetland locations on the island (Figure 5.6X).

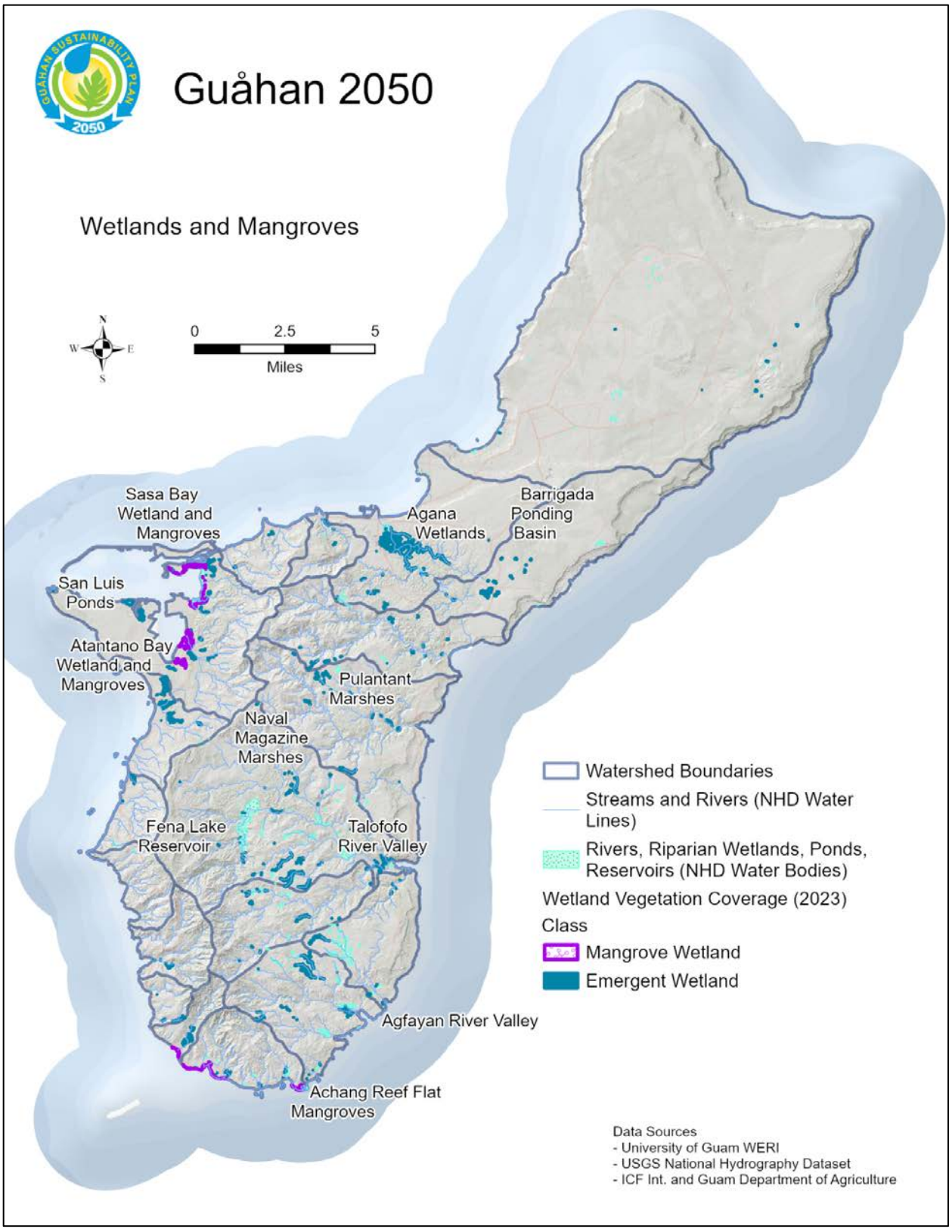

Figure 5-8. Map of Guam Wetlands by Type.

5.3.4.2. Issues

Currently, some of the greatest issues wetlands face are the impacts of fill/dredge and polluted runoff. Due to the increase in land development over the last few decades, many wetlands have been entirely or partially filled or altered as a part of construction (Guam EPA, 2020; Wiles & Ritter 1993; W.B. Flores & Associates/Strategic Planning Group, Inc. 1994). Complete or partial fill of wetlands decreases the overall stormwater/flood storage of the area, resulting in a variety of issues including increased flood damage, increased surface water turbidity, loss of habitat, and degradation of water quality.

The increased volume of stormwater created by the loss of freshwater wetlands carries heavy loads of sediment, excess nutrients, organisms, and heavy metals downgradient across the landscape and eventually into marine waters. When this occurs, economically and ecologically valuable marine resources such as coral reefs and their associated biota are negatively impacted (Wiles & Ritter 1993; Ellison 2008). Polluted urban runoff entering fishing areas poses risks to human health as well. Guam EPA lists urban runoff as one of the top ten greatest threats to Guam's groundwater resources (Government of Guam 2009).

Loss of mangrove/estuarine wetlands is also negatively impacting water quality and shoreline erosion. The presence of mangrove forests along the shoreline increases resilience against strong winds and wave action, forces which may be increased over time by climate change (Ellison 2008).

5.3.4.3. Policy Recommendations

A rapid evaluation method for measuring wetland functions and categorizing overall value would be advantageous for determining protections during permit review. The three main functional categories suggested for analysis would be water quality, habitat, and hydrology (water volume). These functions should be evaluated not only at the site level, but also by how they affect the whole island to accurately reflect the overall value of the wetland to the community. Wetlands assigned higher functional categories should receive greater protection and have more substantial mitigation requirements when impacted.

Currently, compensatory mitigation requirements do not consider the overall value of a wetland, only that its area is equally replaced via creation elsewhere. Establishing wetland creation ratios that correspond with the aforementioned functional categories would not only ensure no net loss of wetland area, but also aim to achieve no net loss of wetland function by preventing and/or reducing temporal loss (Redmond 2000). Temporal loss of function refers to the lag time between the construction of a created wetland, and the time when that created wetland reaches an equal level of function to the impacted or filled wetland (National Research Council 2001). Higher replacement ratios are recommended for wetlands with higher functional value (up to 4:1), and lower ratios are recommended for wetlands with less functional value.

Another recommended protection is the regulation of vegetated buffers surrounding wetlands to protect wetland functionality. Regulating development within wetland buffers in conjunction with the establishment of wetland mitigation ratios will help to ensure no net loss of wetland functionality. Some of the ways vegetated buffers protect wetland functions are by infiltrating runoff, trapping sediment, providing a visual and auditory screen for wildlife, additional wildlife habitat, preventing erosion, and aiding in temperature regulation (Castelle et al. 1992 & Desbonnet et al. 1994).

It is recommended that the width of the required buffer corresponds with the functional category determined via the rapid evaluation method described at the beginning of this section. This way, buffer widths should be higher for higher functioning wetlands, and narrower for degraded wetlands. The minimum buffer width for adequate protection of most wetlands is 15 meters (45 feet) ranging up to 200 meters (600 feet) depending on the specific wetland type, condition, and functionality (Castelle et al. 1994). Per Desbonnet et al. 1994, a 100 meters (300 feet) wide buffer provides approximately 80 percent or greater removal of sediment/pollutants, generally good wildlife habitat, and potential to protect significant wildlife habitat. Mitigation for impacts to wetland buffers is recommended at a 1:1 ratio, however mitigation can also include enhancing the remaining buffer via planting or averaging the buffer width by relocating a portion of the protected buffer to another area along the contiguous buffer.

5.3.5. Watershed Protection and Sustainability

The policies of the G50SP reflect a strong commitment to sustainable land use planning and environmental protection, aligning closely with the United Nations Sustainable Development Goals (SDGs). These policies address key sustainability challenges related to water conservation, pollution control, climate resilience, and biodiversity protection, ensuring that economic and social development occur within the framework of environmental stewardship.

The policies support SDG 6 (Clean Water and Sanitation) by safeguarding watersheds, groundwater sources, and water quality for human consumption and ecological balance. Regulations on wastewater discharges, wellhead protection, and aquifer preservation help

maintain clean drinking water and healthy aquatic ecosystems. The emphasis on stormwater management, sediment control, and pollution prevention ensures that water bodies remain free from contamination, directly addressing targets 6.3 (water quality improvement) and 6.6 (protection of water-related ecosystems).

Additionally, the integration of green infrastructure, low-impact development (LID), and best management practices (BMPs) contributes to SDG 11 (Sustainable Cities and Communities) by enhancing urban resilience to climate change and reducing environmental degradation. Provisions that limit impervious surfaces, protect riparian buffers, and restore wetlands help prevent flooding and promote natural water retention, ensuring that development supports long-term sustainability. These measures also align with SDG 13 (Climate Action) by incorporating climate adaptation strategies such as updated precipitation models, hydromodification measures, and habitat restoration to mitigate the effects of extreme weather events.

The policies also reinforce SDG 14 (Life Below Water) by minimizing pollution runoff into marine environments, protecting coral reefs, and ensuring coastal water quality remains high for both human use and biodiversity conservation. The prevention of point and non-point source discharges, limits on industrial waste disposal, and requirements for stormwater treatment contribute to SDG 14.1 (reducing marine pollution) and 14.2 (sustainable management of marine and coastal ecosystems).

Lastly, these policies align with SDG 15 (Life on Land) by emphasizing the protection and restoration of wetlands, riparian areas, and terrestrial habitats that support biodiversity and ecosystem services. Provisions that restrict development on steep slopes, regulate land clearing, and require habitat restoration for unavoidable environmental impacts contribute to SDG 15.1 (conservation of freshwater and terrestrial ecosystems) and 15.3 (combating land degradation). The no net loss policy for wetlands and required mitigation for riparian corridor disturbances further demonstrate a commitment to ecological preservation.

Overall, the policies below establish a comprehensive framework for sustainable land and water resource management, ensuring that development is balanced with environmental protection. By addressing water quality, climate resilience, habitat conservation, and responsible land use, they support multiple SDGs while promoting a future where economic growth and ecological integrity coexist.

5.3.6. Watershed Protection Land Use Plan Policies

Groundwater Protection

TE-31. Water Quality (CZM).

Safe drinking water shall be assured and aquatic recreation sites shall be protected through the regulation of uses and discharges that pose a pollution threat to Guam's waters, particularly in estuarine, reef and aquifer areas.

TE-32. General Water Quality Protection Policy.

Development shall:

a. Conserve, protect, maintain, and improve the quality of Guam's waters for human consumption (drinking, fish and shellfish harvesting and food processing); for the growth and propagation of aquatic life; for marine research; for the preservation of coral reefs and wilderness areas; and for domestic, agricultural, commercial, industrial, recreational and other legitimate uses;

b. Provide that no pollutant is discharged into any of Guam's waters, unless: (A) the discharge first receives processing/treatment to remove all harmful or hazardous products, or provides the control technology necessary to protect the designated beneficial uses of waters; (B) the discharge meets the effluent limitations established for that discharge; and (C) best management practices are applied as necessary;

c. Provide for the prevention, abatement and control of new and existing water pollution sources;

d. Maintain and improve the chemical, physical and biological integrity of the waters of Guam as necessary to meet Clean Water Act Section 101(a);

e. Provide protection from point or non-point source discharges to wetlands in the same way as other surface waters;

f. Provide protection from point and non-point discharges, including discharges from ponding basins and sinkholes to groundwater in the same way as surface waters; and

g. Eliminate all point source discharges to certain near-shore waters.

TE-33. Requirement to Protect the Northern Guam Lens Aquifer (NGLA).

Development within the Groundwater Protection Zone (GPZ), as delineated and regulated by the Guam Environmental Protection Agency (GEPA), shall protect and enhance the Northern Guam Lens Aquifer to the maximum extent feasible.

TE-34. Wastewater Discharges.

Development over the NGLA shall connect to the public wastewater system whenever feasible. Development using private wastewater systems shall comply with all applicable GEPA policies and regulations.

TE-35. Wellhead Protection.

Development shall avoid and protect wellhead protection zones, consistent with GEPA requirements.

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TE-36. Additional Requirements in the GPZ.

Unless specifically modified by other provisions of this plan, the following additional development restrictions shall apply in the GPZ and over the Northern Guam Lens Aquifer:

a. Industrial development should not occur without adequate public sewer infrastructure;

b. High density residential development, more than one (1) dwelling per one-half (1/2) acre, should not occur without adequate public sewer service;

c. Individual wastewater disposal systems and ponding basins and similar point source waste or storm water disposal works should not be permitted within a Wellhead Protection Zone; and

d. As practical, storm water disposal systems should be designed and operated to terminate in close proximity to, or within project property boundaries, to facilitate groundwater recharge.

Polluted Runoff Control

TE-37. Water Quality Criteria.

The waters of Guam shall meet all applicable GEPA water quality regulations and meet generally accepted aesthetic qualifications, be capable of supporting desirable aquatic life, and be free from substances, conditions or combinations thereof attributable to domestic, commercial and industrial discharges or agricultural, construction and land-use practices or other human activities that: (1) cause visible floating materials, debris, oils, grease, scum, foam, or other floating matter which degrades water quality or use; (2) produce visible turbidity, settle to form deposits or otherwise adversely affect aquatic life; (3) produce objectionable color, odor or taste, directly or by chemical or biological action; (4) injure or are toxic or harmful to humans, animals, plants or aquatic life; or (5) induce the growth of undesirable aquatic life.

TE-38. Development Discharges and Best Management Practices.

All point and nonpoint source discharges from development shall comply with GEPA water quality requirements. Construction and post-construction best management practices shall be required, consistent with the GEPA requirements and the CNMI and Guam Stormwater Management Manual and supplemental materials as applicable. All stormwater runoff generated from new development shall be adequately treated prior to discharging into jurisdictional wetlands or inland and coastal waters of Guam.

TE-39. Green Infrastructure.

Promote and prioritize the use of Low Impact Development (LID) strategies, Best Management Practices (BMPs), and on-site infiltration to create green infrastructure for treating and reducing stormwater runoff. Use green infrastructure projects for natural

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restoration purposes and provision of buffer areas to allow for natural erosion, evolution of natural drainage flows, and sediment transport balance.

TE-40. Hydrology and Water Quality Restoration.

Encourage and implement opportunities to restore wetlands, riparian corridors, and other habitats that provide stormwater retention and storage, carbon sequestration, remediation for degraded water quality, and groundwater recharge. Support and prioritize restoration projects that provide multiple benefits to coastal resources and improve ecosystem functionality and resiliency.

TE-41. Habitat Protection from Runoff.

In areas in or adjacent to sensitive habitats plan, site, and design development to prevent significant disruption of habitat values from the discharge of stormwater or dry-weather runoff flows. Stormwater discharges to critical areas with sensitive resources (e.g., coral reefs, swimming beaches, wellhead protection areas, designated sensitive ecosystems) will be subject to additional performance criteria, and will need to use or restrict certain BMPs.

TE-42. Stormwater Management.

Reduce impacts from erosion and water quality degradation by managing development project runoff stormwater discharge rates and implementing hydromodification management measures. Update storm event standards and precipitation models with best available science on climate change as necessary.

TE-43. Siting and Design.

Site and design development consistent with recommended practices of the CNMI Guam Stormwater Management Manual as applicable, including to achieve (1) preservation of natural features and conservation design;(2) reduction of impervious cover; and (3) utilization of natural features and source control for stormwater management.Avoid adverse impacts to coastal waters by incorporating measures designed to achieve the following:

a. Protect, restore, and enhance areas that provide important water quality benefits, areas necessary to maintain riparian and aquatic biota and/or that are susceptible to erosion and sediment loss;

b. Limit increases of impervious surfaces, especially impervious surfaces directly connected to the storm drain system;

c. Minimize the transport of pollutants from development into runoff and coastal waters;

d. Limit land disturbance activities such as clearing and grading, and cut-and-fill to reduce erosion and sediment loss; and

e. Preserve, restore, and enhance natural watercourses and vegetation.

TE-44. Land Division Design.

All land divisions shall be designed such that the location of and grading required for building pads and access roads minimizes erosion and sedimentation. Ensure that new subdivisions are sized and designed to provide adequate space for necessary runoff and drainage controls. Prohibit land divisions that would result in building pads, access roads, or driveways located on slopes over 30 percent, or result in grading on slopes over 30 percent.

TE-45. Steep Slopes.

Steep slopes shall be protected from erosion by avoiding development on steep slope areas and minimizing grading and flattening of hills and ridges. Development shall be limited in areas of 15% or greater slope and limiting clearing of these areas or, where grading is unavoidable, by providing special techniques to prevent upland runoff from flowing down a steep slope and through immediate stabilization to prevent gullying. A steep slope is defined as any slope over 15% (6.67:1) in grade over a length of 50 feet.

TE-46. Construction Best Management Practices (BMPs).

To prevent adverse impacts from construction site runoff, general performance standards for construction stormwater treatment (designated as erosion and sediment control standards or E&SC Standards) for all new development and redevelopment construction sites are described in the CNMI Guam Stormwater Management Manual, Volume 1, Chapter 2. The performance criteria shall be applied to the maximum extent practicable. Require new development proposals as appropriate to include construction phase erosion control and polluted runoff control plans. These plans shall specify BMPs that will be implemented to minimize erosion and sedimentation, provide adequate sanitary and waste disposal facilities and prevent contamination of runoff by construction chemicals and materials. Minimize unnecessary clearing and grading from all construction sites. Clearing and grading shall only be performed within areas needed to build the project, including structures, utilities, roads, recreational amenities, post-construction stormwater management facilities, and related infrastructure. Clearing should only be scheduled during the dry season if possible. Mass clearing during the wet season should be avoided.

TE-47. Drainage and Runoff Control Plans.

Require new development proposals to include post-construction phase drainage and polluted runoff control plans. Such plans shall: a) Specify site design, source control and treatment control BMPs that will be implemented to minimize post-construction polluted runoff, and shall include the monitoring and maintenance plans for these BMPs; b) Ensure that post-construction structural BMPs (or suites of BMPs) are designed and sized to treat, infiltrate, or filter the amount of stormwater runoff as specified in the CNMI and Guam Stormwater Management Manual and applicable updates; c) Ensure dry weather runoff does not exceed the pre-development baseline flow rate to receiving water bodies; d) Complement and utilize existing drainage patterns and systems where

they are in proper functioning condition, conveying drainage from the developed area of the site in a non-erosive manner that avoids downstream cumulative impacts; and e) Restore disturbed or degraded natural drainage systems where feasible, except where there are geologic or public safety concerns.

TE-48. Minimize Impervious Surface.

Site designers shall strive to reduce the generation of stormwater runoff and utilize pervious areas for stormwater treatment. For development sites over 1 acre, impervious cover shall not exceed 70% of the total site area. Impervious areas are hard surfaces that prevent water infiltrating into the ground and include paved and coral surfaces such as roads, driveways, parking lots, and yards, as well as rooftops.

TE-49. BMP Maintenance.

Require structural BMPs to be inspected, cleaned, and repaired as necessary to ensure proper functioning for the life of the development.

TE-50. Erosion from Infrastructure.

Ensure that new infrastructure such as roads, bridges, and culverts shall not cause or contribute to watercourse or hillside erosion, or watercourse or wetland siltation and shall include BMPs to minimize impacts to water quality, including construction phase erosion and pollution runoff control plans, and soil stabilization practices. Where space is available, dispersal of sheet flow from roads into vegetated areas or other on-site infiltration practices shall be incorporated into road and bridge design.

TE-51. Construction Timing and Phasing.

Construction should be scheduled to minimize soil exposure in the rainy season (July 1st–Nov. 30th) and during periods of coral spawning. Whenever practicable and feasible, construction shall be phased to limit disturbance to only one area of active construction at a time. Future phases shall not be disturbed until construction of prior phases is complete and the land area is stabilized. Disturbed areas shall be stabilized as soon as feasible after construction is completed within a designated construction area, and in no case longer than 14 days after completion of active construction.

TE-52. Sediment Control.

Erosion and sediment control practices shall be aggressively maintained throughout all phases of construction. All erosion and sediment control plans shall have an enforceable operation and maintenance agreement to ensure that practices are maintained during the construction process. Perimeter sediment controls shall be applied to retain or filter concentrated runoff from disturbed areas to trap or retain sediment before it leaves a construction site. Upland runoff should be diverted around excavations where possible. Sediment trapping and settling devices shall be employed to trap and/or retain suspended sediments and allow time for them to settle out in cases where perimeter sediment controls (e.g., silt fence) are deemed to be ineffective in trapping suspended sediments on-site.

TE-53. Site Management Training.

All construction site managers (or superintendents) shall provide documentation that they have received adequate training in the application and maintenance of erosion and sediment control practices. All construction site managers must participate in a pre-construction meeting with the applicable authority to review the provisions of the erosion and sediment control plan and make any field adjustment necessary to implement the intent of the plan to minimize erosion and maximize sediment retention on-site throughout the construction process.

TE-54. Groundwater Recharge.

Pre-development annual groundwater recharge rates and runoff rates to coastal waters shall be maintained by promoting infiltration through the use of structural and non-structural methods.

TE-55. Post Development Standards.

For new development, structural stormwater best management practices (BMPs) shall be designed to remove 80% of the average annual post development total suspended solids (TSS) load and match or exceed pre development infiltration rates, as possible. It is presumed that a BMP complies with this performance standard if it is: 1. sized to capture the prescribed water quality volume (WQv), 2. designed to match or exceed pre-development infiltration rates, 3. designed according to the specific performance criteria outlined in this Design Manual, 4. constructed properly, and 5. maintained regularly. The post-development peak discharge rate frequency shall not exceed the pre-development peak discharge rate for the 25-year frequency storm event.

TE-56. Redevelopment Standards.

Redevelopment projects are governed by special stormwater sizing criteria depending on the amount of increase or decrease in impervious areas created by the redevelopment. Redevelopment projects that reduce impervious cover (from existing conditions) by at least 40% are deemed to meet both the recharge and water quality requirements. Where site conditions prevent the reduction in impervious cover, stormwater management practices shall be implemented to provide stormwater controls for at least 40% of the site's impervious area. When a combination of impervious area reduction and stormwater management practice implementation is used for redevelopment projects, the combination of impervious area reduction and the area controlled by a stormwater management practice shall equal or exceed 40%.

TE-57. Infill Development.

Infill development project stormwater management requirements will be the same as other new development projects except that requirements may be met either on-site or at an approved off-site location and the 70% impervious cover requirement may be waived. The applicant must also demonstrate that there are no downstream drainage or flooding impacts as a result of not providing on-site management. The intent of this

provision is to allow flexibility to meet the goals of improved water quality and channel protection to receiving waters while still promoting infill development.

TE-58. Industrial Sites.

Certain industrial sites are required to prepare and implement a stormwater pollution prevention plan. All sites with disturbance over 1.0 acre are required to prepare and implement a SWPPP in accordance with the NPDES Phase II Stormwater Program.

TE-59. Hotspot Controls.

Stormwater discharges from land uses or activities with higher potential pollutant loadings, defined as hotspots, are required to use specific structural BMPs and pollution prevention practices. In addition, stormwater from a hotspot land use may not be recharged to groundwater without pretreatment of 100% of the water quality volume (WQv) or the recharge volume (Rev), whichever is greater.

TE-60. New Stormwater Outfalls.

Prioritize the use of green infrastructure instead of new stormwater outfalls when feasible. Otherwise ensure that new stormwater outfalls are sited and designed to minimize impacts from sea level rise and to coastal resources. Consolidate new and existing outfalls where appropriate.

TE-61. Oil and Hazardous Substance Spills.

Protection against the spillage of crude oil, gas, petroleum products, or hazardous substances shall be provided in relation to any development or transportation of such materials. Effective containment and cleanup facilities and procedures shall be provided for accidental spills that do occur.

Rivers and Streams

TE-62. Protection of Riparian Areas.

Channelizations, dams, or other substantial alterations of rivers and streams shall incorporate the best mitigation measures feasible, and be limited to (1) necessary water supply projects, (2) flood control projects where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public safety or to protect existing development, or (3) developments where the primary function is the improvement of fish and wildlife habitat. Any alterations permitted for one of these three purposes shall: adhere to the performance standards listed for permitted uses within riparian corridors in Policy xxx; minimize adverse impacts to coastal resources, including the depletion of groundwater and changes in water flow speed and volume; and include maximum feasible mitigation measures to mitigate unavoidable impacts. Green infrastructure shall be preferred for flood protection, erosion, and sedimentation control over “hard” solutions such as concrete or riprap channels. Any permitted watercourse alterations shall include BMPs for hydromodification activities.

TE-63. Riparian Buffer Requirements.

Development shall be setback at least 100 feet from rivers, streams, and other riparian drainages. Buffers may be reduced to 50 feet, or increased, if supported by a technical assessment and buffer study justifying the reduced or increased buffer. Buffers shall provide for natural stream flows for the life of the development, without the need for bank stabilization or other erosion control.

TE-64. Riparian Impact Mitigation.

Development projects with unavoidable impacts to riparian areas shall incorporate best available feasible mitigations, including offsite restoration at a 2:1 ratio. Protection of existing functional riparian areas is not an acceptable mitigation.

TE-65. Riparian Corridors Definition.

Riparian corridors are defined on the ground by an association of native, and in some cases non-native, plant and animal species within or adjacent to a watercourse that contribute to the function or distinction of the riparian habitat. Boundaries of riparian corridors are determined by the limit of riparian vegetation or top of bank, or other confining topography, whichever is greater. The limit of riparian vegetation is determined by the drip line of riparian canopy trees or the limit of riparian shrubs or herbaceous vegetation.

TE-66. Permitted Uses in Riparian Corridors.

Permit only the following uses within riparian corridors:

a. Education and research activities;

b. Consumptive uses as provided for in the xxx;

c. Habitat restoration and fish and wildlife management activities; and

d. Necessary water supply projects.

Where no feasible alternative exists, permit the following uses:

e. Stream-dependent aquaculture, provided that any non-stream-dependent facilities are located outside of the corridor;

f. Flood, sedimentation, or erosion control projects where no other method for protecting existing structures in the floodplain is feasible and where such protection is necessary for public safety or to protect existing development;

g. Bridges providing an important public transportation or resource- dependent function where supports do not significantly impact the riparian corridor or its resources, such as free-span designs;

h. Pipelines and stormwater runoff facilities;

i. Repair, maintenance, or incidental improvement of roadways or road crossings that do not increase the capacity of the roadway;

j. Existing agricultural uses; and

k. New agricultural uses, including agricultural irrigation conveyance systems, provided no riparian vegetation is removed and no soil, nutrients, waste, or other material is allowed to enter stream channels.

TE-67. Standards in Riparian Corridors.

Require new development permitted in riparian corridors to adhere to the following standards:

a. Minimize removal of native vegetation;

b. Minimize land exposure during construction and use temporary vegetation or mulching to protect critical areas;

c. Minimize erosion, sedimentation, and runoff by appropriately grading and replanting modified areas with native species;

d. Use only native plant species when replanting, and monitor replanted species and replace as necessary to ensure establishment;

e. Provide sufficient upstream and downstream habitat conditions for native fish as may be specified by Guam Department of Agriculture and the National Marine Fisheries Service;

f. Minimize adverse effects of waste water discharges and entrainment;

g. Prevent depletion of groundwater supplies and substantial interference with surface and subsurface water flows;

h. Encourage wastewater reclamation;

i. Maintain natural vegetation buffer areas that protect riparian habitats;

j. Minimize alteration of natural streams;

k. Conform with Plan policies for minimizing risks and avoiding contribution to flood and erosion hazards;

l. Maintain hydrologic function and sediment transport function of drainages; and

m. Provide mitigation and long-term monitoring and reporting for any adverse impacts incurred upstream or downstream as a result of permitted development.

Wetlands

TE-68. Protection of Wetlands.

Development shall avoid wetland areas to the maximum extent practicable to preserve their ecological functions and values.

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TE-69. Wetland Definition.

Wetlands are areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs and similar areas.

TE-70. Delineation.

Development on parcels containing wetlands shall delineate their full extent according to established procedures of GEPA. The USFWS National Wetland Inventory Map shall constitute rebuttable evidence, though not exclusively, of the presence of wetlands and shall, in addition to the policies of this plan, be used by all Government of Guam agencies as applicable.

TE-71. Prohibition of Development in Wetlands.

Filling or development within wetlands is limited to the following uses where there is no feasible less- environmentally-damaging alternative and where feasible mitigation measures have been provided to minimize adverse environmental effects:

a. New or expanded port, energy, and coastal-dependent industrial facilities, including any needed fishing facilities.

b. Maintaining existing, or restoring previously dredged, depths in existing navigational channels, turning basins, vessel berthing and mooring areas, and boat launching ramps.

c. In open coastal waters, other than wetlands, including streams, estuaries, and lakes, new or expanded boating facilities and the placement of structural pilings for public recreational piers that provide public access and recreational opportunities.

d. Incidental public service purposes, including, but not limited to, burying cables and pipes or inspection of piers and maintenance of existing intake and outfall lines.

e. Mineral extraction, including sand for restoring beaches, except in environmentally sensitive areas.

f. Restoration purposes.

g. Nature study, aquaculture, or similar resource-dependent activities.

TE-72. Wetland Rating System.

Wetlands shall be classified as necessary based on their ecological significance, functions and values, consistent with GEPA regulations.

TE-73. Wetland Buffer Requirements.

Development shall be setback at least 100 feet from delineated wetlands. Buffers may be reduced to 25 feet for lower value wetlands or increased for higher values, if

supported by a technical wetlands buffer study justifying the reduced or increased buffer.

TE-74. No Net Loss – Wetland Impact Mitigation.
Development projects with unavoidable impacts to wetlands shall assure no net loss of wetlands. Acceptable mitigation includes construction of a wetland designed to replace the wetland functions destroyed, altered or impaired, and restoration or enhancement of an existing degraded wetland. Direct impacts shall be mitigated at 4:1 ratio for wetland creation and 8:1 for restoration or enhancement of existing degraded wetlands. Protection of an existing functional wetland is not acceptable mitigation for destruction of a wetland, however, as part of a mitigation plan, certification conditions may require protection of on-site wetlands through establishment of deed restrictions or easements. Mitigation conditions may also require long term biological monitoring. The feasibility and general acceptability of a given investigation scheme cannot be used to justify permitted alterations.

TE-75. Additional Mitigation, Restoration Measures, and Incentives.
Additional mitigation or restoration measures as recommended by a qualified biologist shall be required for any permitted activities within wetlands or their buffers. The Bureau of Statistics and Plans, in coordination with Guam EPA, shall consider and develop as feasble landowner incentive programs to protect wetlands, such as conservation easements and carbon credits.

5.4. Sensitive Habitats and Species

Guam's terrestrial habitats are vital to the island's ecological health, cultural identity, and economic stability. The island's limestone forests, savannas, wetlands, and coastal environments support a diverse array of native and endemic species, many of which are threatened by habitat loss, invasive species, and climate change. These natural landscapes not only provide essential ecosystem services—such as clean air and water, soil stabilization, and carbon sequestration—but also serve as critical wildlife habitats and hold deep significance in the island's Chamorro heritage. Community input gathered through the Guahan 2050 Community Workshops and interviews have emphasized the value of these ecosystems; mayors and residents across Guam have expressed that important environmental assets in their villages include coral reefs, mangroves, and freshwater rivers among others–vital systems that support biodiversity, fisheries, cultural practices, and climate resilience. However, increasing development pressures and environmental challenges necessitate a comprehensive and integrated approach to land use planning that prioritizes conservation while supporting responsible growth, drawing upon scientific data, local knowledge, and cultural values.

The Guåhan 2050 Sustainability Land Use Plan aligns with the United Nations Sustainable Development Goals (SDGs) by integrating habitat protection into broader sustainability and resilience strategies. In particular, SDG 15 (Life on Land) calls for the preservation of

biodiversity and sustainable management of forests, while SDG 13 (Climate Action) emphasizes the need for proactive environmental policies that address the effects of climate change. Recognizing the importance of these global priorities, Guam's terrestrial habitat policies presented at the end of this section are designed to prevent habitat degradation, restore critical ecosystems, and promote sustainable land use practices. Through conservation designations, habitat overlay zones, and mitigation strategies, the plan ensures that sensitive environments are protected while allowing for balanced development that meets the needs of Guam's growing population. The following discussion and policies outline a path forward, safeguarding Guam's terrestrial habitats for future generations while fostering a sustainable and resilient island community.

5.4.1. Guam's Terrestrial Ecology

Guam's terrestrial vegetation is an essential component of the island's ecological integrity, cultural heritage, and environmental resilience. The vegetation across the island varies significantly, from dense primary limestone forests to open savannas, wetlands, and coastal strand ecosystems, each supporting unique flora and fauna. The composition and distribution of these vegetation types have been shaped by natural factors such as climate, soil composition, and topography, as well as human activities including land clearing, agriculture, urban development, and the introduction of non-native species. Understanding the characteristics and ecological functions of these plant communities is critical for effective conservation, habitat restoration, and sustainable land-use planning.

Scientific studies of Guam's vegetation date back to Fosberg (1960), with subsequent updates from Stone (1970) and Mueller-Dombois and Fosberg (1998), which collectively document the island's rich biodiversity, including a high rate of plant endemism—approximately 21% of native vascular plants are endemic to the Mariana Islands. A forest inventory by Donnegan et al. (2004) estimated that about 48% of the island remains forested, comprising 44,404 acres (17,970 hectares) of limestone forest, primarily in northern Guam, and 19,129 acres (7,741 hectares) of volcanic forest, mostly in the south. Other vegetation types include 44,455 acres (17,991 hectares) of savanna and 23,956 acres (9,695 hectares) of urban land.

The following sections describe the major vegetation communities found on Guam, their defining characteristics, and their ecological significance. Figure 5.1 shows the most recently mapped distribution of specific vegetation communities and ecosystem types on the island (ICF and Guam Department of Agriculture 2023). Figure 5.2 shows the relative acreage of each.

Primary Limestone Forest

Primary limestone forest is a relatively undisturbed plant community dominated by native species, never having been completely cleared. These forests are among the most floristically diverse habitats on Guam, supporting a range of native and endemic plants adapted to the shallow, well-drained limestone soils. Structurally, the primary limestone forest has a stratified

canopy with distinct vegetation layers, including large canopy trees, mid-sized understory trees, shrubs, ferns, herbaceous plants, and a leaf litter layer. The canopy can reach heights of 30–45 feet (9–14 meters). Dominant tree species include Artocarpus, Ficus, Mammea, Cordia, Merrilliodendron, Pandanus, Aglaia, Neisosperma, Premna, Tristiropsis, and Elaeocarpus. The understory is composed of species such as pai pai (*Guamia mariannae*), micronesica (*Cycas circinalis*), Indian mulberry, and limeberry. This ecosystem is essential for biodiversity conservation, providing habitat for many native species.

Disturbed Limestone Forest

Disturbed limestone forest, sometimes referred to as degraded or secondary limestone forest, is a successional stage following human-induced disturbances such as land clearing and urban development. Unlike primary limestone forest, these areas lack large native canopy trees and are instead dominated by shorter, fast-growing species, many of which are non-native. The canopy, often open, allows more sunlight to penetrate, promoting the growth of invasive plant species. Common species found in disturbed limestone forests include tangantangan (*Leucaena leucocephala*), limeberry (*Triphasia trifolia*), papaya (*Carica papaya*), and African tulip tree (*Spathodea campanulata*). These forests have lower biodiversity value but can serve as transitional habitats in ecological restoration efforts.

Halophytic/Xerophytic Scrub

This unique plant community is found on limestone terraces and cliff edges, where vegetation is exposed to strong winds, salt spray, and dry conditions. Species in this habitat are highly adapted to harsh environmental factors, leading to stunted, wind-pruned growth. The plant community varies in complexity, with some areas supporting a rich diversity of species, while others are more sparsely vegetated. Common species include nigas (*Pemphis acidula*), chopak (*Mammea odorata*), hunik (*Tournefortia argentea*), lodugao (*Clerodendrum inerme*), pago (*Hibiscus tiliaceus*), and gasoso (*Colubrina asiatica*). These plants provide critical erosion control and serve as protective buffers for coastal ecosystems.

Shrub/Grasslands (Scrub Forest)

Scrub forests are secondary growth forests that have resulted from long-term human disturbance, often occurring on argillaceous limestone soils. These communities contain a mix of native and non-native species, with a canopy that reaches up to 10 meters. Although degraded, scrub forests still provide habitat for a variety of species and play a role in the ecological transition back to more mature forest types. In northern Guam, scrub habitats are often dominated by vitex (*Vitex parviflora*), which sheds its canopy during the dry season, creating conditions favorable for invasive grasses and other non-native species.

Tangantangan Forest

This plant community is dominated by the introduced small tree, tangantangan (*Leucaena leucocephala*), which forms dense stands that prevent the establishment of an understory. These forests are often found in areas previously cleared for agriculture or development. While tangantangan forests provide some ecosystem benefits, such as soil stabilization, their low biodiversity and dominance by a single species make them less ecologically valuable than native forests.

Strand Vegetation

Strand plant communities occur along Guam's coastlines, particularly within Naval Base Guam and the Naval Computer and Telecommunications Station (NCTS Finegayan). These communities are adapted to sandy, well-drained soils and frequent saltwater exposure. Common overstory species include coconut (*Cocos nucifera*), ironwood (*Casuarina equisetifolia*), and da'ok (*Calophyllum inophyllum*). Shrubs such as *Tournefortia argentea* and *Hibiscus tiliaceus* are also found here. These habitats provide crucial stabilization for coastal dunes and serve as a buffer against storm surges.

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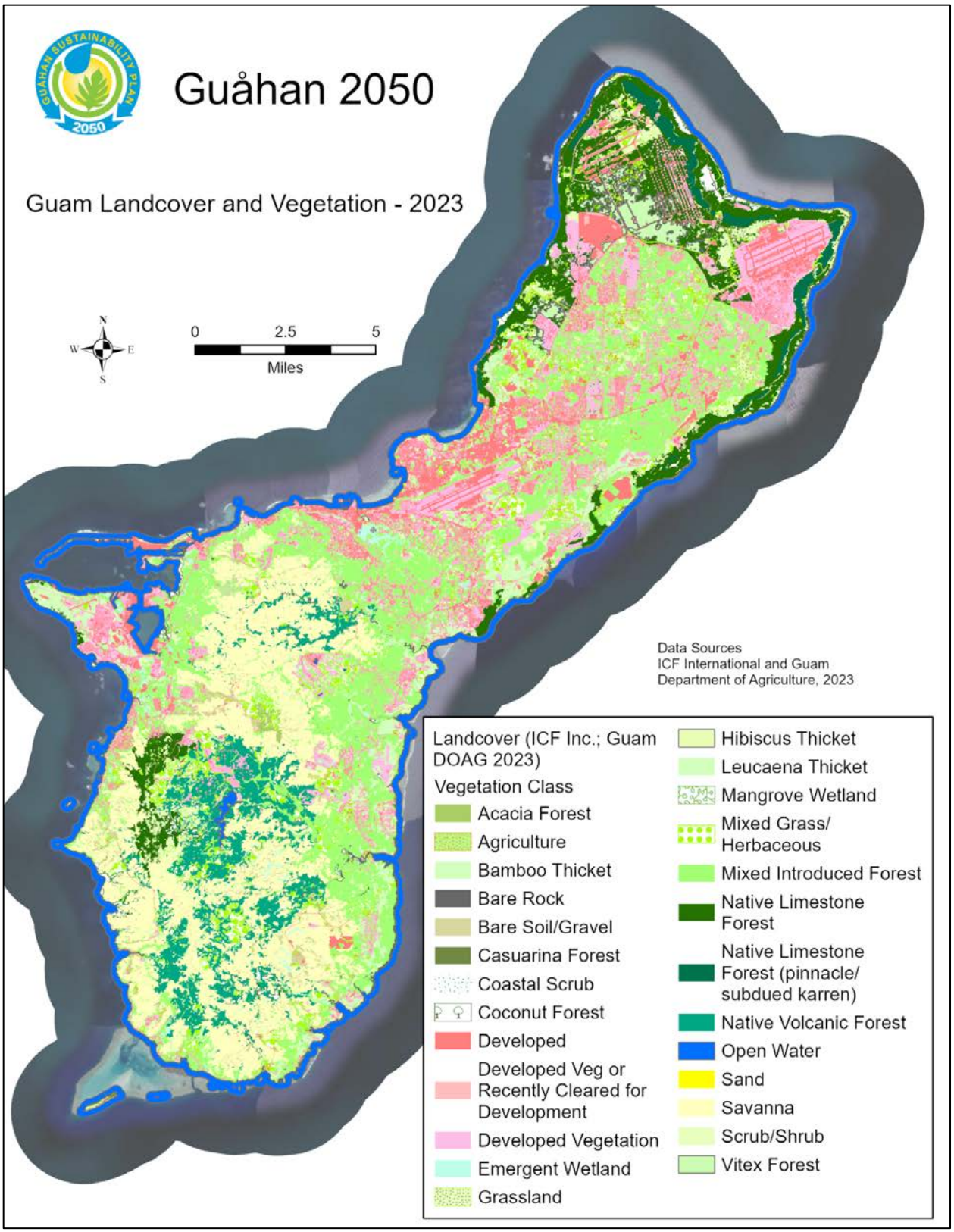

Figure 5-9. Map of Guam Vegetation and Landcover.

Ravine Forest

Ravine forests are located in valleys and along riverbanks, primarily in southern Guam. These forests are often found on volcanic soils and vary widely in plant composition based on soil moisture levels. Common species include hibiscus, pandanus, fig, chosga (*Glochidion mariannensis*), and breadfruit. Due to their proximity to freshwater, ravine forests support a mix of native and cultivated species. Disturbed ravine forests are similar to disturbed limestone forests, often dominated by non-native species and exhibiting a more open canopy.

Coconut Grove

Coconut groves are planted landscapes that occur within limestone, ravine, and strand communities. These groves consist primarily of *Cocos nucifera* and may be associated with other introduced species.

Casuarina Forest

Casuarina forests, dominated by ironwood (*Casuarina equisetifolia*), thrive in dry, exposed areas. These trees are highly tolerant of salty and nutrient-poor soils, making them well-suited for Guam's coastal and savanna habitats.

Savanna

Savanna ecosystems, found primarily in southern Guam, consist of grasslands interspersed with scattered trees. These areas are maintained by periodic fires and are characterized by species such as Pacific Island silvergrass (*Miscanthus floridulus*), *Dimeria chloridiformis*, and *Phragmites karka*. While these habitats support unique plant communities, they are vulnerable to erosion and degradation due to fire and soil instability.

In addition to these vegetation communities, Guam has four general types of wetlands, discussed in the previous section: freshwater swamps, freshwater marshes, estuarine/mangrove wetlands, and river valley floodplains. Finally, Guam has significant land areas classified as developed. Overall, Guam's diverse terrestrial vegetation communities are integral to the island's ecological balance, supporting biodiversity, protecting watersheds, and contributing to climate resilience. Effective management and conservation efforts are crucial to preserving these habitats for future generations.

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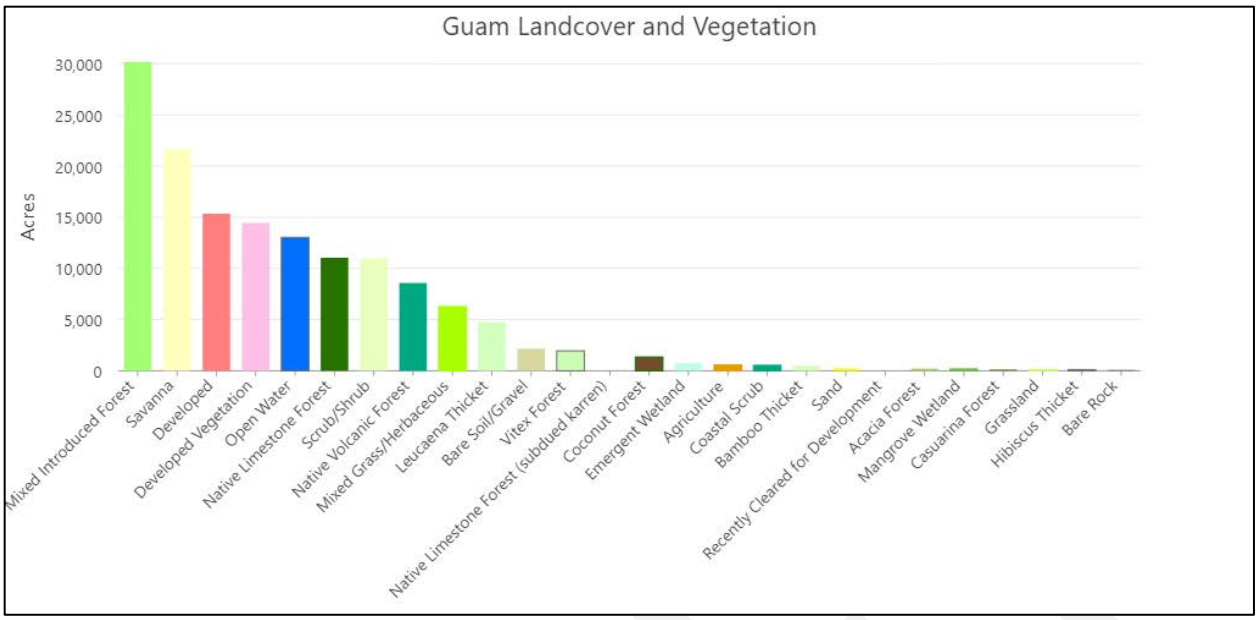

Figure 5-10. Guam Land Cover Composition by Acreage, as mapped by ICF International Inc. and Guam Department of Agriculture (2023).

5.4.2. Development, Landscape Change, and Impacts

Like many island communities, Guam has seen a steady loss in natural habitats and vegetation communities due to development – there is a consistent trend of landscape change from natural habitat to disturbed and more developed lands. As described in the Guam Department of Agriculture 2019 Wildlife Action Plan (GDoAG, 2019):

> *Over the last 50 years Guam has experienced tremendous domestic growth and suffered significant environmental degradation island-wide. Guam's native flora and fauna have been impacted by numerous insidious threats, such as the introduction of invasive species, poor land management practices, and overexploitation. These anthropogenic threats are exacerbated by the frequency with which the island is impacted by typhoons, and more recently, the effects of climate change. In the last two decades, Guam has been hit directly by four storms with sustained winds greater than 150 miles per hour and suffered high wave and winds from large systems passing near Guam (Guard et al. 2003). Many of the terrestrial and aquatic species that may be of abundance now face environmental and man-made threats that could easily reduce or decimate populations. The cognizance of the many threats assailing Guam's native flora and fauna makes all species listed in the Species of Greatest Conservation Need (SOGCN) legitimately a high priority for conservation actions. The various resource agencies of the Government of Guam and their partners continue to address these issues, knowing that economic prosperity and preservation of the Chamorro culture are dependent on the successful recovery and sustainable use of the island's natural resources.*

These landscape changes and threats present a shared challenge to plan for sustainable land uses and the right balance between growth and environmental conservation. Development and growth of residential areas, military activities, and new infrastructure generate direct shifts from vegetated spaces to cleared areas and impermeable land cover (Figure 5.3), while also disturbing previously intact habitat patches and corridors.

As shown in the figure, landscape disturbances are easily observable in the north and central regions of the Island, including significant increases over the groundwater protection zone. Increases in impervious surface may also present even greater disruptions to historically intact more rural areas in the southern villages and watersheds. The change is compounded by periodic, climate-driven events such as tropical cyclones and drought-enhanced wildfires. Post-disturbance landscapes then provide greater opportunity for the spread of invasive and non-native species and erosion of bare soil.

Serianthes nelsonii, known as håyun lågu on Guåhan and tronkon guåfi on Luta, is one of the largest trees in the Mariana Islands (USFWS 1994). These CHamoru names give us important insight into the nature of the tree. Håyun lågu means “foreign tree”, illustrating the CHamoru's understanding of its distant origin (Demeulenaere 2021). Indeed, biogeographical data revealed the tree is closely related to other *Serianthes* species from New Caledonia (Demeulenaere and Bone 2023). The CHamoru word “guåfi” means “fire”, referring to the beautiful fire-looking flowers. This iconic tree is listed as endangered under the ESA. Before *S. nelsonii*'s listing in 1987, military construction projects in the 70s and 80s after World War II destroyed several trees (Demeulenaere and Ickert-Bond 2023). Following its ESA listing, the USFWS identified habitat loss, ungulate browsing, herbivorous insect infestations, and inbreeding as the primary perils to the species in their Recovery Plan (USFWS 1994). There is only one adult seed-producing tree on Guåhan and less than 40 such trees on Luta remaining. The species is (once more) threatened by military expansion, as the largest range of the Live-Fire Training Range Complex (LFTRC) is under construction next to the last wild population of *S. nelsonii*. When Typhoon Mawar hit Guåhan in May 2023, major branches of the last mature seed-producing håyun lågu tree broke off, making sustained seed-production uncertain (Demeulenaere and Ickert-Bond 2023).

The unique biodiversity found within Guam forests supports traditional practices such as agroforestry, the collection of plant materials for medicines, the harvesting of timber for seafaring, and wood carving practices. In addition to these significant cultural and intrinsic values, Guam’s forests provide critical ecosystem services, and habitats for native, endemic, and endangered species.

Guam faces a variety of present and future challenges to terrestrial habitat. The availability of suitable habitat poses significant challenges for the recovery of Guam’s native species (NFWF 2024). Habitat loss or degradation has long term and lasting effects on terrestrial species. As areas are disturbed, native plant communities are displaced leaving degraded, or secondary

communities, that are often dominated by the non-native trees such as Vitex. The community shift threatens overall biodiversity as well as ecosystem and watershed functions.

Major factors exacerbating habitat loss are land development, introduction of invasive plant and animal species, the increased frequency of climate-driven natural disasters such as typhoons, and the ecological modification of factors that affect recovery from natural events (Commonwealth of the Northern Mariana Islands Division of Fish and Wildlife 2005; Guam Division of Aquatic and Wildlife Resources 2006).

An increase in land development is largely associated with the expansion of the U.S. Marine Corps, Navy, Army and Air Force on the island (Guam Forest Action Plan 2021). The population of military personnel is expected to grow by over 15,000 by 2037. This expansion puts native habitats on Guam at risk, either through direct land use change, or through secondary impacts.

Invasive species jeopardize worldwide biodiversity (Chornesky and Randall 2003), economies (Pimentel et al. 2005), and human health (Duraiappah et al. 2005) and cost trillions of dollars annually in ecological damages, economic losses, and management efforts (Pimental et al. 2001). Guam faces many invasive species threats, such as ungulates (wild pigs and deer), Vitex, as well as the brown tree snake (BTS). The BTS has had a devastating impact on any island where it is not native because it is a generalist species and its populations are not controlled by predators, diseases, or competitors. The BTS arrived in Guam via ships in the 1950's and since then has been responsible for the extinction of nine (9) forest bird species and three (3) species of lizard (Hawaii Invasive Species Council 2024).

The impacts of climate change and sea level rise will be felt acutely by the biodiversity on small, low-lying islands surrounded by open ocean (Taylor & Kumar 2016). High-elevation ecosystems such as cloud montane forests are projected to disappear entirely by the year 2100, with corresponding global losses of their endemic biodiversity. Sea level rise threatens restricted range species on small low-lying atolls. Shifts in distribution may be possible for generalist species, but range shifts will be difficult for species with small distributions, specialized habitat requirements, slow dispersal rates, and species at high elevation (MITT EIS 2015). Island species may be limited in their ability to adapt to climate change due to a range of characteristics, including smaller geographic ranges, limited genetic variation, small colonizing populations, reduced species richness, and poor adaptations to avoid predation (Jupiter, Mangubai & Kingsford 2014). Endemic island plant species with restricted ranges are less able to migrate to suitable habitats than plants inhabiting larger islands, thus posing a barrier to successful migration. As much of the northern half of Guam is characterized by flat limestone plateau (Defense Technical Information Center 2010), the low dispersal ability of many species will also hinder migration.

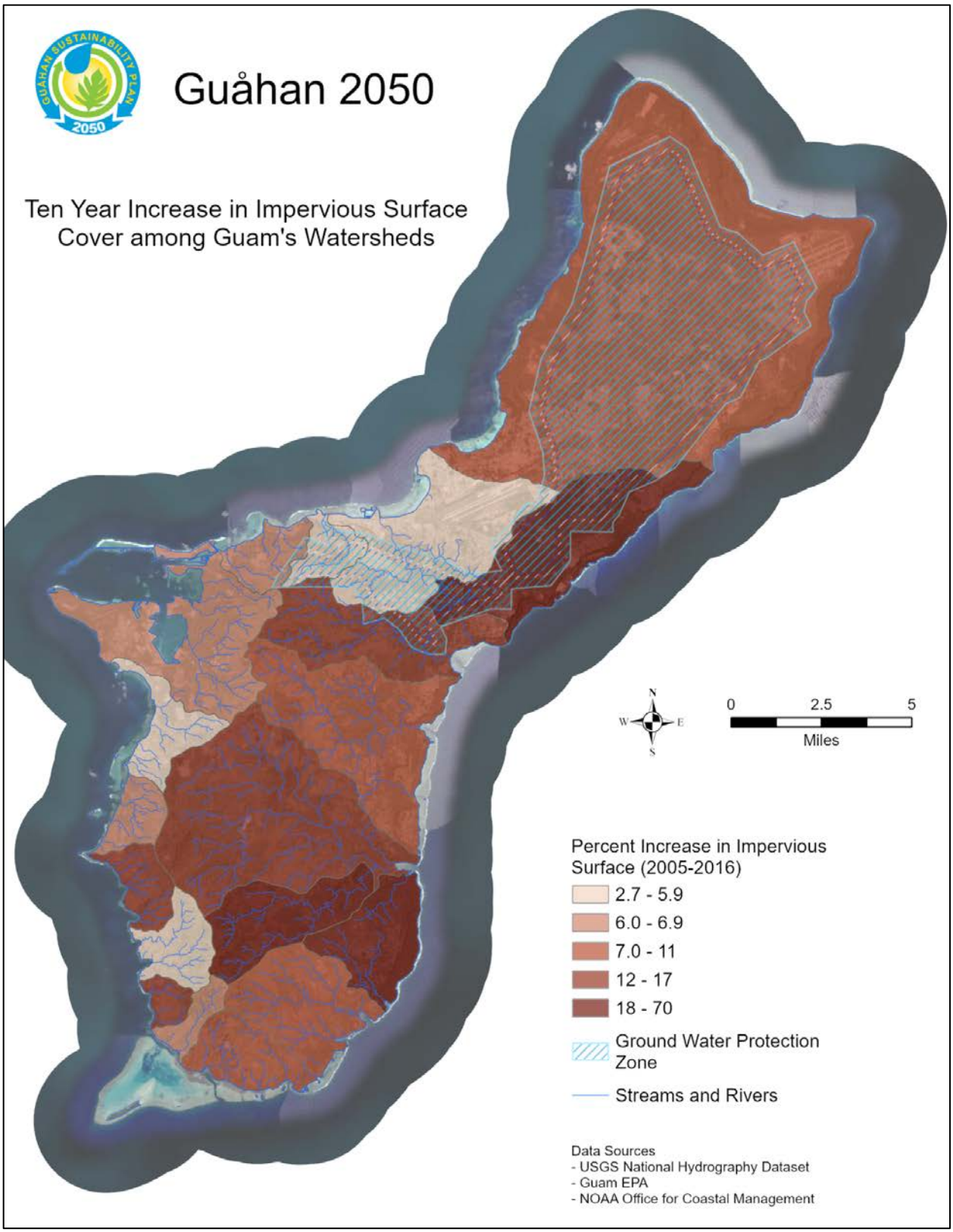

Figure 5-11. A Decade of Increases in Impervious Surface Cover in Guam's Watersheds from 2005-2016.

5.4.3. Threatened & Endangered Species (terrestrial)

The terrestrial environments on Guam support a diverse range of flora and fauna species, some of which are listed under the Endangered Species Act (ESA). Listed species are identified by the United States Fish and Wildlife Service (USFWS) as threatened, endangered, or proposed as such. Candidates are plant or animal species for which USFWS has sufficient information on file regarding biological vulnerability and threats to support a proposal that would list them as endangered or threatened under the ESA, based on the most recent candidate review (USFWS 2008c). As of 2025, there were 30[17] federally listed threatened or endangered species (terrestrial) found on Guam (Table 5.1).

In addition to listings under the ESA, in 2019 the Guam Division of Aquatic and Wildlife Resources (DAWR) identified 76 species—including 42 terrestrial, 7 freshwater, and 27 marine species—as in need of conservation (see call-out box below). These species are at risk due a multitude of factors including loss of habitat and presence of invasive and non-native species. It requires a concerted effort and significant financial contributions to potentially save species. For example, the Guam rail, *ko'ko'* in Chamorro, is the national bird of Guam and it was nearly pushed to extinction by the invasive brown tree snake (BTS). In 2019 a successful reintroduction of the rail into the wild through a breeding program changed the rail's listing from extinct in the wild to critically endangered.

Table 5-1. ESA-listed threatened or endangered terrestrial species found in Guam.

Scientific Name	Common Name	ESA Listing Status
BIRDS		
Aerodramus bartschi	Mariana swiftlet	Endangered
Gallinula chloropus guami	Mariana common moorhen (pulattat)	Endangered
Gallirallus owstoni	Guam rail	Endangered
Gallirallus owstoni	Guam rail	Experimental Population, Non-Essential (Rota)
Phoebastria (=Diomedea) albatrus	Short-tailed albatross	Endangered

[17] This total includes two sea turtles (Green sea turtle Central South Pacific DPS and Central West Pacific DPS and Hawksbill sea turtle).

Scientific Name	Common Name	ESA Listing Status
Todiramphus cinnamominus	Guam kingfisher	Endangered
CONIFERS and CYCADS		
Cycas micronesica	Fadang	Threatened
FLOWERING PLANTS		
Bulbophyllum guamense	Cebello halumtano	Threatened
Dendrobium guamense	No common name	Threatened
Eugenia bryanii	No common name	Endangered
Hedyotis megalantha	Paudedo	Endangered
Heritiera longipetiolata	Ufa-halomtano	Endangered
Maesa walkeri	No common name	Threatened
Nervilia jacksoniae	No common name	Threatened
Phyllanthus saffordii	No common name	Endangered
Psychotria malaspinae	Aplokating-palaoan	Endangered
Serianthes nelsonii	Hayun lagu (=(Guam), Tronkon guafi (Rota))	Endangered
Solanum guamense	Berenghenas halomtano	Endangered
Tabernaemontana rotensis	No common name	Threatened
Tinospora homosepala	No common name	Endangered
Tuberolabium guamense	No common name	Threatened
INSECTS		
Hypolimnas octocula marianensis	Mariana eight-spot butterfly	Endangered
Vagrans egistina	Mariana wandering butterfly	Endangered
Hypolimnas octocula marianensis	Mariana eight-spot butterfly	Endangered
TERRESTRIAL MAMMALS		
Pteropus mariannus mariannus	Mariana fruit Bat (=Mariana flying fox)	Threatened
REPTILES		
Chelonia mydas	Green sea turtle (Central South Pacific DPS)	Endangered

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Scientific Name	Common Name	ESA Listing Status
Chelonia mydas	Green sea turtle (Central West Pacific DPS)	Endangered
Emoia slevini	Slevin's skink	Endangered
Eretmochelys imbricata	Hawksbill sea turtle	Endangered
SNAILS		
Partula gibba	Humped tree snail	Endangered
Partula radiolata	Guam tree snail	Endangered
Samoana fragilis	Fragile tree snail	Endangered

5.4.4. Protecting Sensitive Terrestrial Habitats

Sensitive habitats and species are often addressed through the lens of “critical habitat” under the ESA. Critical habitat generally refers to areas that are considered essential to species conservation or may require special management consideration.

Guam has had numerous instances of critical habitat circumstances in recent decades. In 1991, the USFWS first issued a proposal for critical habitat designation in Guam for the Mariana fruit bat, Mariana crow, and Guam Micronesian kingfisher (USFWS 1991a). In 1993, the Guam National Wildlife Refuge (NWR) was established by a Memorandum of Understanding with USFWS, Navy, Air Force, and Government of Guam (GovGuam) (GovGuam et al. 1993). In 1994, Cooperative Agreements were signed between the Navy, Air Force, and USFWS to establish the Guam NWR into three units; The Ritidian Unit (open to the public), the Andersen Air Force Overlay Unit, and the Navy Overlay Unit (Figure 5.4; Air Force and USFWS 1994, Navy and USFWS 1994). The 1994 Cooperative Agreements provide a commitment by the Navy, Air Force, and USFWS for a coordinated program centered on the protection of endangered and threatened species.

In October 2002, USFWS again proposed critical habitat for the Mariana crow, Guam Micronesian kingfisher, and Mariana fruit bat (USFWS 2002). The areas proposed as critical habitat were primarily on Overlay Refuge lands but included additional areas as well. The approximately 21,690 acres (8,778 hectares) of the Guam Overlay Refuge (Andersen Air Force Overlay Unit and the Navy Overlay Unit) are on lands owned or controlled by the U.S. Department of Defense. Therefore, those lands (in northern and southern Guam) were excluded from critical habitat designation. Air Force lands were excluded under section 4(a)(3) of the ESA, based on the Air Force’s Integrated Natural Resources Management Plan (INRMP) for Andersen Air Force Base (AFB). Navy lands were excluded under section 4(b)(2) because the benefits of excluding these lands, including benefits to national security and existing management plans and conservation efforts, outweighed the benefits of designating them as critical habitat.

On October 28, 2004, the USFWS designated 376 acres (152 hectares) of land as critical habitat for the Guam Micronesian kingfisher, Mariana crow, and Mariana fruit bat on the Ritidian Unit of the Guam NWR in northern Guam (Figure 5.4).

In addition to these early habitat conservation efforts, Guam has multiple agencies and programs addressing sensitive habitats and species.

The Guam Invasive Species Council (GISC)

The Guam Invasive Species Act of 2011 (Public Law 31-43) established the The Guam Invasive Species Council (GISC) as Guam's lead entity in coordinating with local, regional and international jurisdictions in the control and elimination of invasive species through policy direction, coordination and planning for the prevention, control, monitoring and eradication. The GISC is composed of 14 groups with nine voting members and five non-voting members. Together, the groups created the Guam Invasive Species Management Interim Plan 2017-2019 which outlines Guam's strategic response to the increasing threat of invasive species on the island. The introduction highlights the long history of invasive species on Guam, from early human settlements to colonial trade routes and modern economic activities. It details the environmental and economic consequences of species such as the brown tree snake (BTS), little fire ant (LFA), coconut rhinoceros beetle (CRB), and Asian cycad scale, which have contributed to biodiversity loss, economic damages, and public health risks.

The plan also identifies key goals and strategies including appointing a Territorial Invasive Species Coordinator, strengthening prevention through enhanced biosecurity measures at ports of entry, enforcing deterrence policies such as penalties for introducing invasive species, and increasing public education and outreach to encourage local participation in invasive species control. Additionally, the plan emphasizes the importance of a Rapid Response Plan for early detection and containment of new invasive species, aiming to prevent outbreaks before they cause irreparable damage. The document also aligns Guam's efforts with regional and national initiatives, incorporating recommendations from the Regional Biosecurity Plan for Micronesia and Hawaii (RBP) and the National Invasive Species Council's Management Plan.

A significant portion of the plan discusses the economic, environmental, and human health costs of invasive species. The brown tree snake, for example, has led to power outages costing over $1 million annually, while the coconut rhinoceros beetle has devastated Guam's coconut palm population, affecting tourism and local livelihoods. The report highlights the urgency of securing funding and resources for effective invasive species management, including investments in research, biocontrol solutions, and inter-agency collaboration. By implementing the outlined strategies, the GISC aims to mitigate the impact of invasive species and protect Guam's unique environment for future generations.

Government of Guam Department of Agriculture (DOAG)

The Government of Guam Department of Agriculture (DOAG) has primary responsibility for conservation management of the 21 protected terrestrial and marine areas, as well as local government conservation lands. The Forestry and Soil Resources Division (Guam Forestry) is the central agency of the Department that is responsible for protecting and restoring forest ecosystems and soil resources in Guam. The mission of Guam Forestry is "to conserve, protect and enhance Guam's vegetative environment and sustain the natural resources which are dependent on healthy forests." The agency works with stakeholders to promote healthy and productive forests in both rural and urban areas throughout the island in partnership with non-governmental organizations, the USDA Forest Service, and other government agencies.

The DOAG recently led the completion of the 2022 Guam Forest System Plan, adopted in late 2024 (P.L. 37-143 Bill No. 363-37). The plan outlines the framework for land use management, conservation, and sustainable development of Guam's forests. Land use issues primarily stem from threats like urban development, invasive species, wildfires, and poor land management practices. The plan emphasizes that forested areas, including limestone and ravine forests, are critical to biodiversity, water quality, and local cultural heritage. The Guam Forest Legacy Act of 2012 mandates the protection of these areas through sustainable land use policies and conservation efforts.

Key land use challenges identified in the plan include balancing conservation with public access and economic development. The plan categorizes lands within the Guam Forest System for multiple uses, such as scientific research, recreation, agriculture, and conservation. Inappropriate activities like off-road driving, unregulated hunting, and unplanned urban expansion contribute to habitat degradation and increased wildfire risks. The document stresses the importance of public and private land cooperation, especially for identifying and protecting suitable lands.

To address various habitat conservation challenges, the Guam Forest System Plan proposes several strategies:

1. **Reforestation and Habitat Protection** – Expanding native forest coverage, managing watersheds to prevent erosion, and controlling invasive species.
2. **Wildfire Prevention and Management** – Establishing firebreaks, enhancing fire suppression capabilities, and conducting community education programs.
3. **Sustainable Economic Use** – Encouraging eco-tourism, regulated timber harvesting, and conservation partnerships with private stakeholders.
4. **Public Engagement and Access** – Developing designated trails, educational programs, and recreational zones while ensuring environmental integrity.

The plan also includes mechanisms for land identification, permitting, and enforcement. Lands are categorized based on their ecological significance and legal status, ensuring that only

compatible activities are allowed in designated conservation areas. The plan notes that partnerships with local government agencies, NGOs, and community organizations will enhance enforcement and sustainability efforts. Overall, the Guam Forest System Plan aims to create a resilient, well-managed landscape that protects natural resources while allowing for responsible public and economic use. The policies and land use designations of the GSP2050 build on the recommendations of the Forest System Plan and other work. For example, in 2019, the DoAG

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Division of Aquatic and Wildlife Resources updated the Wildlife Action Plan, including to identify key threats and land use strategies for habitat protection (see call-out).

Guam Division of Aquatic and Wildlife Resources

Wildlife Action Plan (2019) – Land Use Issues and Strategies

Guam's wildlife and ecosystems face critical threats from habitat destruction, invasive species, climate change, and unsustainable land use. The Guam Wildlife Action Plan (GWAP) identifies 76 species—including 42 terrestrial, 7 freshwater, and 27 marine species—as in need of conservation.

KEY CHALLENGES & THREATS

- **Habitat Loss & Fragmentation:** Urban expansion, military activities, and agriculture reduce native forests and wetlands.
- **Invasive Species:** Feral pigs, coconut rhinoceros beetles, and aggressive non-native plants threaten native biodiversity.
- **Wildfires & Watershed Degradation:** Human-induced fires accelerate erosion, harming rivers and coral reefs.
- **Climate Change:** Rising sea levels, shifting weather patterns, and coral bleaching disrupt ecosystems.

STRATEGIES FOR SUSTAINABLE LAND USE

☑ **Habitat Protection & Restoration**
  - Expand protected conservation areas and enforce land-use regulations.
  - Restore native forests by removing invasive species, replanting, and fire prevention.

☑ **Sustainable Resource & Land Management**
  - Implement a Guam Invasive Species Plan to improve biosecurity and rapid response.
  - Strengthen enforcement of land conservation laws to prevent illegal clearing.

☑ **Community Engagement & Climate Resilience**
  - Increase public awareness programs on conservation and responsible land use.
  - Develop a Climate Vulnerability Plan to safeguard coastal and forested habitats.

By integrating these strategies, Guam can **balance development with environmental sustainability**, ensuring a thriving future for its people and ecosystems.

Guam Habitat Conservation Plan and Reserve Network

In an effort to streamline land use decision-making processes and establish a cohesive framework for mitigating environmental impacts to threatened or endangered species, DOAG and a network of local and federal stakeholders have developed a Habitat Conservation Plan (HCP) (*pending adoption)* (referred to hereafter as the Plan). The Plan serves as a resource to ensure a centralized, consistent approach to offsetting impacts to listed terrestrial species in areas where a proposed land use overlaps with species presence. The Plan designates mitigation ratios for different types of threatened and endangered (T&E) habitat, with key ecosystem types warranting greater offsets. Offsets in the form of fees fund conservation strategies in the HCP network, meeting conservation targets that are commensurate with the scale of impact or incidental take. Notably, the Plan replaces the fragmented process of generating individual HCPs on a project-specific basis, which can lead to high costs, development delays, and inconsistent application of regulations.

A key component of the Plan development was the identification of species-specific habitat and ecosystem associations, and delineation of these areas throughout Guam. Habitat associations were delineated using a combination of criteria, including primary vegetation type and landcover, as well as secondary vegetation and soil associations. For example, while the Mariana eight-Spot butterfly is almost exclusively associated with native limestone forest, the distribution of *Phyllanthus saffordii*, a focal shrub species in the Guam Plant Extinction Prevention Program, has a more complex distribution ranging from slopeless savanna on volcanic soil to the very steep, clay-dominated slopes of the Akina-Badland area. Table 5.2 highlights the main ecosystem associations for federal and local T&E species.

Table 5-2. Ecosystem associations for threatened and endangered species on Guam.

Covered Species	Primary Ecosystem Type Association(s)
Haggan (green sea turtle, *Chelonia mydas*)	Sandy Beach (within 100 feet of the shoreline)
Haggan karai (hawksbill turtle, *Eretmochelys imbricata*)	Sandy Beach (within 100 feet of the shoreline)
Slevin's skink (*Emoia slevini*)	Native limestone forests, native volcanic forest, casuarina forest, coconut forest
Fanihi (Mariana fruit bat, *Pteropus mariannus mariannus*)	Coastal scrub, native limestone forest, native volcanic forest
Mariana eight-spot butterfly (*Hypolimnas octocula marianensis*)	Native limestone forest
Siboyas hålom tåno' (*Bulbophyllum guamense*)	Coastal scrub, native limestone forest, native volcanic forest; hibiscus thicket; riparian corridor

Covered Species	Primary Ecosystem Type Association(s)
Fadang *(Cycas micronesica*)	Coastal scrub, native limestone forest, native volcanic forest
Dendrobium guamense	Native limestone forests; native volcanic forest; coastal scrub, riparian corridor
Phyllanthus saffordii	Savanna on volcanic soil that occurs on slope less terrain not described under secondary, outside of the Anderson Air Force Base-Frontal Pacific Ocean Watershed
Tabernaemontana rotensis	Native limestone forest
Tuberolabium guamense	Coastal scrub, native limestone forest, native volcanic forest, scrub/shrub, riparian corridor

These ecosystems are unevenly distributed throughout the Island, with a high concentration of critical habitat constrained along the limestone bluffs and forested terraces on the northern and eastern coastlines, and a wider spread throughout the southern and central interior uplands. This broader distribution encompasses much of the savanna, riparian corridors, and patches of native forest found in the southern half of the Island, and overlaps with most of the Guam Forest System boundaries among the southern villages. Figure 5.5 depicts the geographic spread of all key HCP ecosystems. These areas constitute one of the primary inputs for the designation of a formal 'conservation' land use in this plan. The HCP also will continue to provide authoritative science and coordination for implementing the land use policies of the GSP2050.

Protected Conservation Lands

Local and federal conservation lands cover about 20% of Guam's total land area and marine preserves cover about 10% of Guam's coastline (Figure 5.4, NOAA PIRO 2023). The Anao, Bolanos, and Cotal Conservation areas are Government of Guam properties that encompass various terrestrial habitat types and aim to recover and support native species. The Anao conservation area includes four large properties of unclear management authority: Pagat (192 ac), Lujuna (404 ac) and Lujuna (377 ac), and Janum (205 ac), most of which is limestone forest habitat. The Bolanos conservation area covers 2,854 acres in southern Guam and mostly supports savanna complex/grassland habitat (47%) and ravine forest habitat (50.2%). The Cotal conservation area covers 662 acres in central Guam, 74% of which is savanna complex habitat.

Federal conservation lands on Guam include the Guam National Wildlife Refuge, which covers about 24,000 acres. Established in 1993, the Refuge supports a wide range of native and endemic species including nesting sea turtles and the last remaining populations of the endangered Mariana fruit bat, Mariana crow, and the *Serianthes nelsonii* tree (USFWS n.d.). The Refuge aims to protect Guam's cultural resources in addition to its natural resources. The Ritidian Unit, the only publicly-accessible Unit on the Refuge, encompasses a former Native

Chamorro (Chamoru) village and an ancient cave decorated with pictographs, pottery, and stones (USFWS n.d.). Other Federal conservation lands on Guam include two Naval Ecological Reserve Areas, both of which lie on the coast and complement other protected marine areas.

Five permanent marine preserves were established when Public Law 24-21 was passed in 1997: Tumon Bay, Piti Bomb Holes, Sasa Bay, Achang Reef Flat, and Pati Point (Figure 5.4). The preserves encompass coral reef habitat, important fish nursery areas, and sea turtle nesting habitat. While the preserves allow fishing, the timing and type is controlled to protect habitat and fish. Tumon Bay and Pati Point Marine Preserves allow limited rod and reef fishing year-round. The Pati Point Marine Preserve allows shoreline rod and reel fishing for all species, while the Tumon Bay Marine Preserve allows shoreline rod and reel fishing for only rabbitfish, convict tang, and juvenile jacks. Boat-based bottom fishing is allowed to begin at the 100-foot contour at the Tumon Bay marine preserve. Boat-based bottom fishing is allowed only beyond the 600-foot contour at the Pati Point Marine Preserve, the Achang Bay Marine Preserve, and the Piti Bomb Holes Marine Preserve. The Tumon Bay 100-foot contour, however, is regularly fished by commercial bottom fishing charter boats from the Agana boat basin. Fishing activity is restricted in the preserves with limited cultural take permitted in three of the five areas. The preserves are complemented by the War in the Pacific National Historical Park; Ritidian NWR; the two Naval Ecological Reserve Areas, Orote and Haputo; and the Guam Territorial Seashore Park.

While the five marine preserves are enforced, the other areas currently have limited management and enforcement (DOA GMC 2020, NOAA CORIS 2018). To aid in the protection and proper use of these spaces, the Government of Guam has empowered the public to report environmental violations through a mobile app (TOKA App). This will allow DOAG Conservation officers more eyes on the ground and reports will aid in response and investigation of incidents.

The protected terrestrial and marine spaces on Guam help accomplish many conservation goals, such as the Micronesia Challenge, G3, and others (described above in section 2.2.3). These spaces aid in the conservation of resources as well as promote sustainability on the Island. A key component is the promotion of sustainable fisheries within Guam. The Sea Grant Aquaculture and Aquaponics project promotes the use of recirculating aquaculture systems (RAS), or backyard aquaponics, throughout communities on the island. This system allows for the growth of various types of fish and plants, helping reduce the stress put on marine resources.

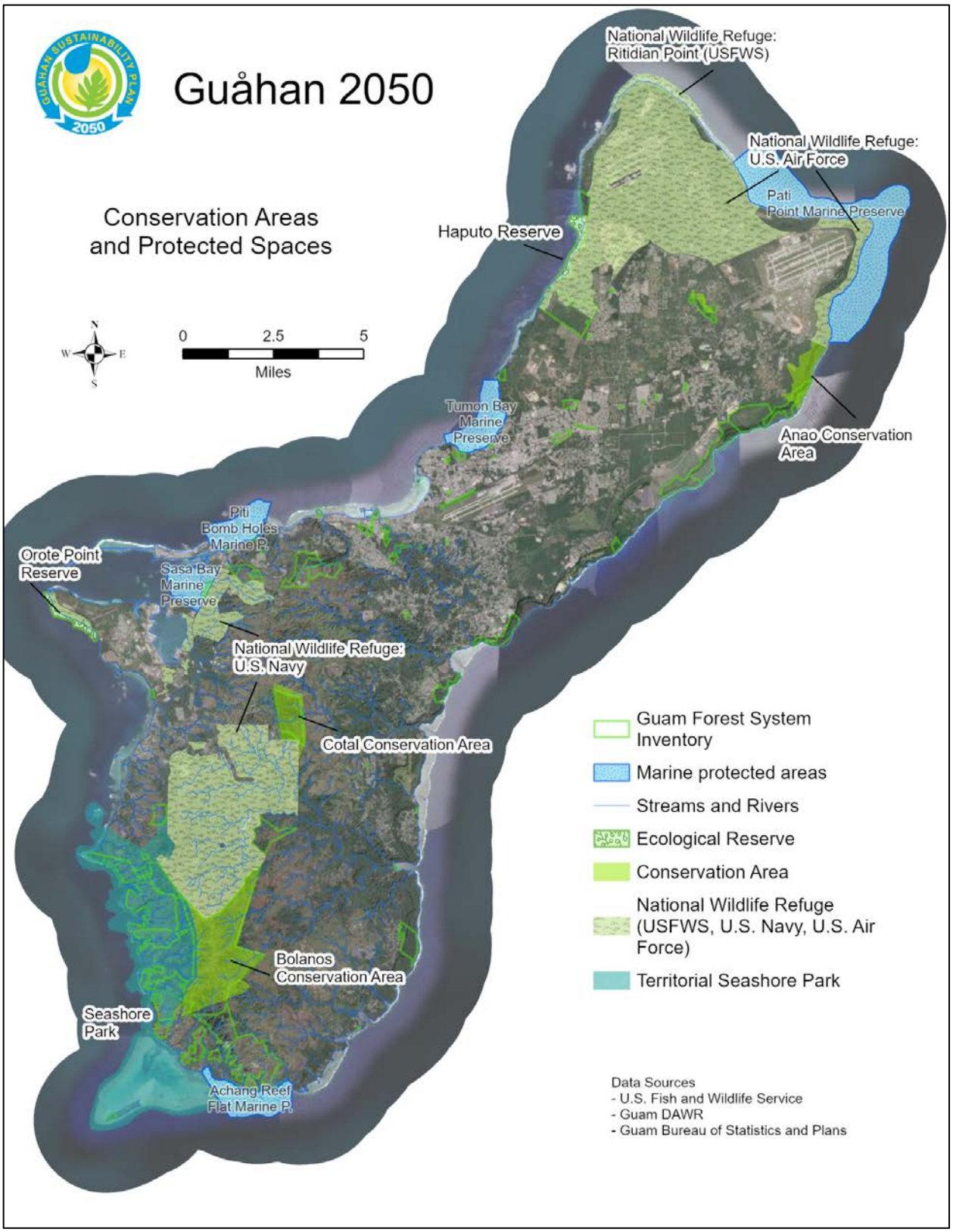

Figure 5-12. Map of Protected Spaces and Conservation Areas.

Other Habitat Conservation Programs

Guam Green Growth Initiative. The Guam Green Growth (G3) Initiative is a public-private partnership that develops tangible solutions to sustainability challenges and contributes to a green economy for the island region. In September 2019, Governor Lourdes A. Leon Guerrero and Lt. Governor Joshua F. Tenorio promulgated Executive Order 2019-23, creating a 97-member Working Group of government, academia, private sector, non-profit, and youth partners to transition Guam toward a sustainable future. The executive order assigned the facilitation of the Working Group to the University of Guam Center for Island Sustainability.

The G3 was created with the objective to support public-private partnerships (connected to the Local2030 Islands Network) and to scale and accelerate locally and culturally relevant sustainability solutions. As such, the G3 Action Framework was created to meet the 17 Sustainable Development Goals (SDG) set by the United Nations (UN) and expand public participation, awareness, and education of the goals.

To help implement the G3 Action Framework, the G3 Conservation Corps was created in 2021 as a paid workforce development program. The Corps members execute sustainability projects in island beautification, agriculture, aquaculture, circular economy and recycling, invasive species removal, and energy efficiency. This program serves a dual purpose in accomplishing sustainability goals as well as public involvement and education.

The Climate Change Resiliency Commission. The Climate Change Resiliency Commission was created under Executive Order 2019-19, signed by Gov. Leon Guerrero in August 2019. The objective of the Climate Change Resiliency Commission is to develop an integrated strategy to build resiliency against the adverse effects of climate change and to reduce contributing factors such as greenhouse gas emissions. The Commission aims to develop and coordinate an effective, data-based response to climate change focusing on eight key climate change outcomes: energy, water resources, ocean and land resources, infrastructure and community resiliency, development planning, food security, public health and safety, and greenhouse gas emissions and carbon footprint.

The Micronesia Challenge. The Micronesia Challenge (MC) is a multijurisdictional commitment, signed by leaders from Palau, Guam, FSM, CNMI and the Republic of Marshall Islands (RMI) in 2006. The original goals were to effectively manage 20 percent of terrestrial resources and 30 percent of nearshore marine resources by 2020. In 2019, those goals were updated and increased to managing 30 percent terrestrial and 50 percent marine resources with a target date of 2030. A monitoring protocol for the terrestrial environment was developed which includes streams, groundwater in atolls, trees (including mangrove species), and birds. While several terrestrial measures have yet to be monitored, data from USDA Forest Service Forest Inventory

Analysis (FIA) program has been used to describe terrestrial measures of trees and mangroves (Dendy et al. 2020).

Guam Island-wide Habitat Conservation Plan (Guam HCP)

The Guam Department of Agriculture is developing an HCP in collaboration with the University of Guam Center for Island Sustainability to protect Guam's native habitats and sensitive species.

What is the Guam HCP?

A planning document required for an Incidental Take Permit (ITP) under the U.S. Endangered Species Act (ESA) while supporting compliance with the Guam Endangered Species Act (Guam ESA) to prevent harm to listed species and their habitats, including 7 plant species, 1 butterfly species, 3 reptile species, 2 snail species, and 1 mammal species.

Provides a coordinated and comprehensive approach to balancing conservation and development efforts.

Goals of the Guam HCP

- Protect and restore critical habitats for endangered species.
- Support conservation of limestone forests, watersheds, and wildlife corridors.
- Facilitate sustainable development while ensuring compliance with environmental laws.
- Enhance public awareness and promote stewardship of Guam's natural resources.
- Improve freshwater and marine water quality by conserving watersheds and controlling erosion.

The HCP allows for planned development and infrastructure projects while ensuring conservation commitments. Benefits of the Guam HCP include:

For Landowners

- Simplifies and streamlines the local permitting process.
- Creates a new market for conservation land purchases or easements.

For the Environment

- Protects, enhances, and restores native habitats.
- Ensures connected and well-managed conservation areas rather than fragmented, project-by-project efforts.

For Developers

- Provides a faster and more predictable path to obtaining ESA compliance.
- Reduces costs associated with endangered species permitting.
- Eliminates the need for direct negotiations with the U.S. Fish and Wildlife Service.

The Guam HCP offers a proactive and balanced approach to environmental conservation and economic development, ensuring a sustainable future for Guam's unique ecosystems and communities.

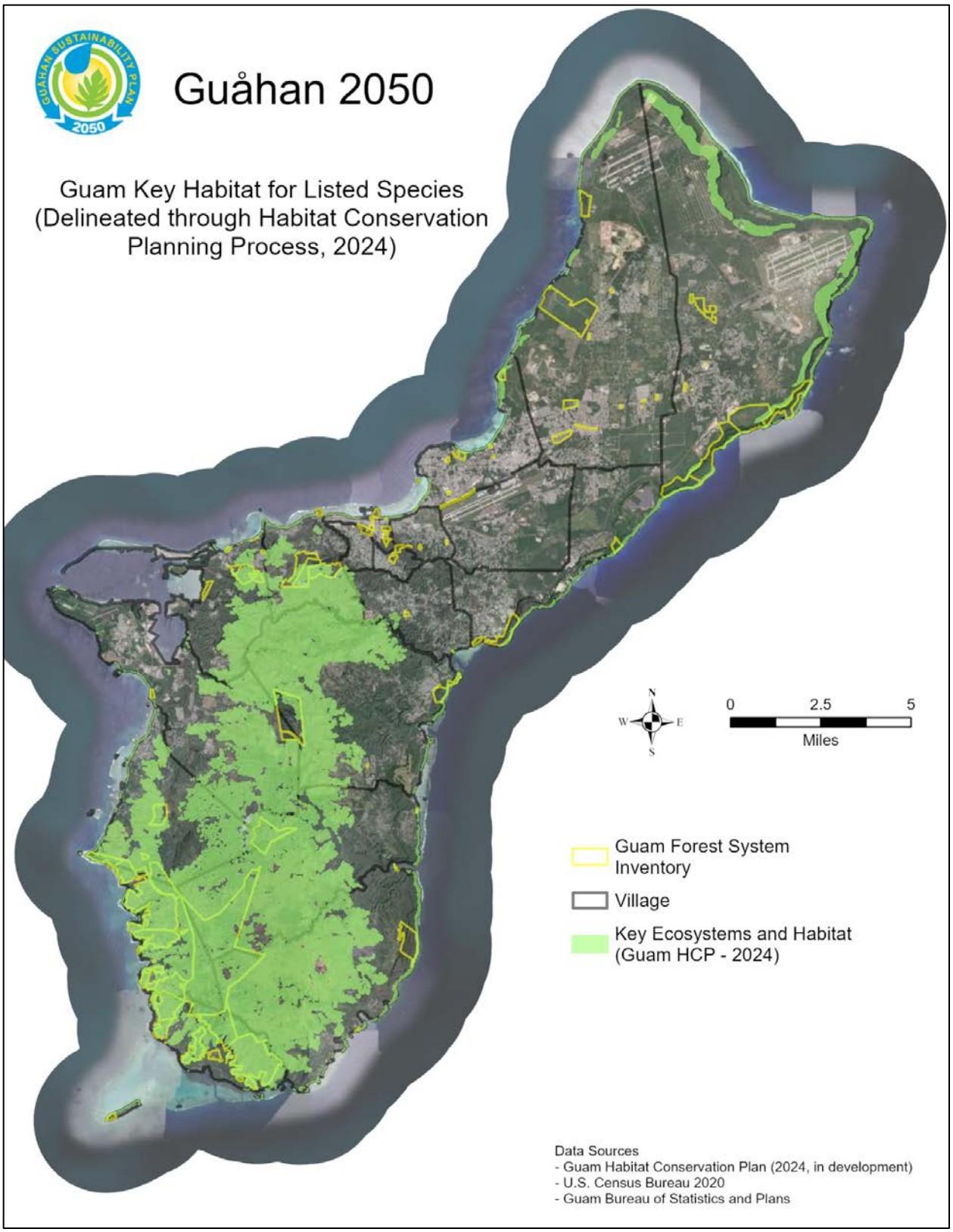

Figure 5-13. Map of key HCP ecosystems and habitat.

5.4.5. Habitat Protection and Sustainability

The habitat protection policies of the GSP2050 align closely with several United Nations Sustainable Development Goals (SDGs), particularly SDG 14 (Life Below Water) and SDG 15 (Life on Land), which emphasize the conservation of marine and terrestrial ecosystems. These policies reflect a strong commitment to sustainable development by ensuring the protection and enhancement of Guam's sensitive habitats, mitigating development impacts, and incorporating climate resilience measures. Targets and indicators include:

- 14.1. By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution
- 14.2. By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans
- 14.3. Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels
- 14.4. By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics
- 14.5. By 2020, conserve at least 10 percent of coastal and marine areas, consistent with national and international law and based on the best available scientific information
- 14.7. By 2030, increase the economic benefits to small island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

The "Forest and Terrestrial Habitat Conservation" policy, along with the "Conservation of Sensitive Habitat" initiative, directly supports SDG 15, which calls for the protection, restoration, and sustainable use of terrestrial ecosystems. By designating conservation areas and implementing a Sensitive Habitat Overlay Zone, these policies help prevent habitat fragmentation and protect biodiversity, including endangered and threatened species native to Guam. This aligns with Target 15.5 of SDG 15, which aims to halt biodiversity loss and protect ecosystems that are crucial for sustaining life on the island. Targets and indicators include:

- 15.1. By 2020, ensure the conservation, restoration and sustainable use of terrestrial and inland freshwater ecosystems and their services, in particular forests, wetlands, mountains and drylands, in line with obligations under international agreements.
- 15.2. By 2020, promote the implementation of sustainable management of all types of forests, halt deforestation, restore degraded forests and substantially increase afforestation and reforestation globally.
- 15.3. By 2030, combat desertification, restore degraded land and soil, including land affected by desertification, drought and floods, and strive to achieve a land degradation-neutral world.
- 15.4. By 2030, ensure the conservation of mountain ecosystems, including their biodiversity, in order to enhance their capacity to provide benefits that are essential for sustainable development.
- 15.A. Mobilize and significantly increase financial resources from all sources to conserve and sustainably use biodiversity and ecosystems.

The Conservation of Natural Resources – Overall Policy (CZM) acknowledges the ecological, cultural, and economic value of Guam's natural resources, reinforcing SDG 6 (Clean Water and Sanitation) by protecting the island's major drinking water sources. By prioritizing conservation and sustainable development practices, this policy ensures that future generations will continue to benefit from healthy forests, wetlands, and riparian areas. Targets and indicators include:

- 6.1. By 2030, achieve universal and equitable access to safe and affordable drinking water for all
- 6.2. By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations
- 6.3. By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally
- 6.4. By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity
- 6.5. By 2030, implement integrated water resources management at all levels, including through transboundary cooperation as appropriate
- 6.6. By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes

The CZM policy also aligns with SDG 13 (Climate Action) by incorporating climate change science into habitat protection efforts. The requirement to use the best available science to monitor habitat changes and vulnerabilities ensures that conservation strategies remain adaptive and responsive to climate risks, reinforcing Target 13.2, which promotes integrating climate change measures into national policies. Targets and indicators include:

- 13.1. Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
- 13.2. Integrate climate change measures into national policies, strategies and planning
- 13.a. Implement the commitment undertaken by developed-country parties to the United Nations Framework Convention on Climate Change to a goal of mobilizing jointly $100 billion annually by 2020 from all sources to address the needs of developing countries in the context of meaningful mitigation actions and transparency on implementation and fully operationalize the Green Climate Fund through its capitalization as soon as possible
- 13.b. Promote mechanisms for raising capacity for effective climate change-related planning and management in least developed countries and small island developing States, including focusing on women, youth and local and marginalized communities

Furthermore, the policies promote sustainable land use planning by requiring the identification and delineation of sensitive habitat areas before approving new development. This preemptive approach aligns with SDG 11 (Sustainable Cities and Communities), particularly Target 11.4, which emphasizes the protection of natural and cultural heritage. The incorporation of buffers and impact mitigation strategies ensures that development is done in a way that minimizes disruption to sensitive ecosystems. The commitment to requiring a minimum 100-foot buffer around sensitive habitats, unless scientifically justified otherwise, demonstrates a precautionary approach to environmental planning that supports both ecological integrity and community resilience.

Finally, the policy's embrace of the Habitat Conservation Plan aligns with SDG 17 (Partnerships for the Goals) by integrating Guam's conservation efforts with broader regional and global initiatives. The coordination with Guam's Habitat Conservation Plan ensures that conservation policies are implemented effectively in alignment with international best practices and biodiversity protection frameworks.

Overall, the GSP2050 habitat protection policies reflect a holistic approach to environmental stewardship that is deeply aligned with the UN SDGs. By integrating scientific research, climate adaptation, and sustainable land use strategies, Guam is taking proactive steps to safeguard its unique ecosystems while fostering long-term environmental resilience.

5.4.6. Habitat Protection Land Use Plan Policies

Conservation of Sensitive Habitat

TE-76. Conservation of Natural Resources - Overall Policy (CZM).

The value of Guam's natural resources as recreational areas, critical marine and wildlife habitats, the major source of drinking water, and the foundation of the island's economy, shall be protected through policies and programs affecting such resources.

TE-77. Sensitive Habitat Protection.

Development shall protect and enhance Guam's sensitive terrestrial habitats and species.

TE-78. Conservation Designation.

Lands consisting predominantly of sensitive terrestrial habitat as defined in Policy xxx and/or wetland and riparian areas shall be designated for conservation. Apply conservation policies and programs to these areas.

TE-79. Sensitive Habitat Overlay Zone.

Lands not designated for conservation but containing significant habitat areas may be protected with a habitat conservation overlay zone.

TE-80. Habitat Conservation Plan.

Sensitive habitat policies of the G2050SP shall be implemented in coordination with the requirements and programs of the Guam Habitat Conservation Plan.

Identification of Sensitive Habitat Areas

TE-81. Habitat Identification Application Requirement.

Require the identification and delineation of sensitive habitat areas and species potentially impacted by new development prior to filing an application for a development land use approval.

TE-82. Sensitive Terrestrial Habitat Definition.

Guam's sensitive terrestrial habitats are areas in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in Guam's ecosystem and cultural heritage, and which could be easily disturbed or degraded by human activities and developments and climate change. These include areas supporting listed or potentially-listed endangered and threatened species and significant occurrences of limestone forest, native volcanic forest, savanna, coastal scrub, and sandy beach.

TE-83. Climate Change and Best Available Science.

Use best available science to monitor habitat changes and identify climate change vulnerabilities. Create a comprehensive, user-friendly data portal on social and ecological vulnerability and climate change to support decision-makers, non-profits, and community leaders in addressing habitat conservation and social vulnerability at the village level.

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Protection of Sensitive Habitat Areas

TE-84. Habitat Avoidance.

Locate new development outside of sensitive habitat areas to the maximum extent feasible. Within habitat areas, allow only development dependent on the resource, such as restoration work, or low-intensity, passive recreation and nature study.

TE-85. Sensitive Habitat Buffers.

Require buffers between development and sensitive habitat areas, taking into account the intensity of the development and the sensitivity of the habitat. Require a minimum 100 foot buffer unless infeasible or a biological assessment supports a finding that a reduced buffer would not significantly disrupt the habitat.

TE-86. Habitat Impact Mitigation.

Unavoidable sensitive habitat impacts shall be mitigated through off site restoration of comparable habitat types at a 3:1 ratio or the permanent protection of privately-held high quality habitat areas at a 2:1 ratio or higher ratios for lower quality but restorable habitat areas.

5.5. Coastal and Marine Habitats

With few if any exceptions, the GSP2050 doesn't directly plan, regulate, or manage the coastal and marine waters of Guam. However, there are many vital and important connections between Guam's land use and the sustainability of the coastal and marine environment. This section gives an overview of the issues related to protection of Guam's shoreline areas and applicable land use policy strategies.

5.5.1. Lagoon, Reef, and Adjacent Waters

Guam possesses fringing reefs, patch reefs, submerged reefs, offshore banks, and barrier reefs that surround Cocos Lagoon in southern Guam. Guam's coral reefs are essential to the island's culture and continued existence of its people. Guam has over 400 species of stony coral, and 1,000 species of fish (Waddell, 2005)). Coral reefs provide a variety of ecosystem services. They act as natural breakwaters to protect coastlines, support commercial and subsistence fisheries, provide local cultural and recreational opportunities, and serve as key attractions for a thriving tourism industry.

Guam's coral reefs were ranked as being in fair condition in the 2018 NOAA Coral Reef Condition: A Status Report. However, they are under stress and continue to be degraded from natural and anthropogenic causes. According to the 2019 Guam Coral Reef Resilience Strategy, around one-fifth of the island's coral reefs have already been lost and over one quarter of surviving reefs are in danger of imminent decline. The study found that local population growth and increasing tourism have increased the strain on Guam's coral reef resources, which are subject to impacts from pollution and runoff, fishing pressure, coastal development, and

recreational activities (Guam Coral Reef Initiative. 2019). Guam's coral reefs have also been impacted by climate change and ocean acidification. While Guam's reefs experienced minimal to moderate seasonal bleaching with high rates of recovery between 1998 and 2013, the Guam Coral Bleaching Response Plan (2017) reported that severe and widespread coral bleaching due to ocean warming occurred in 2013, 2014, 2016 and 2017 and resulted in devastating coral loss throughout the island. Coral bleaching weakens the colonies and makes it difficult for them to recover after high wave events or typhoons.

The Guam Coral Reef Resilience Strategy (GRRS) was developed collaboratively by the Guam Coral Reef Initiative, which includes partners from local and federal agencies, research institutions, non-profit organizations, and the private sector. The goal of the GRRS is to enhance the resilience of Guam's coral reef ecosystems and human communities to the impacts of climate change by 2025. The GRRS is a tool for adaptive, strategic management; an opportunity to engage and inform key stakeholders; a mechanism to increase the effectiveness of coral reef management; and a guide for funding projects designed to reach a common goal. The GRRS is intended to be a living document and thus frequently updated.

The GRRS has four primary objectives:

1. Reframe Guam's coral reef management efforts and priorities in the context of coral reef resilience;
2. Increase cooperation among local and federal agencies, decision makers, educational institutions, non-governmental organizations, resource users, communities, and business groups;
3. Prioritize implementation of coral reef management interventions; and
4. Shift from reactive efforts to proactive, adaptive coral reef management.

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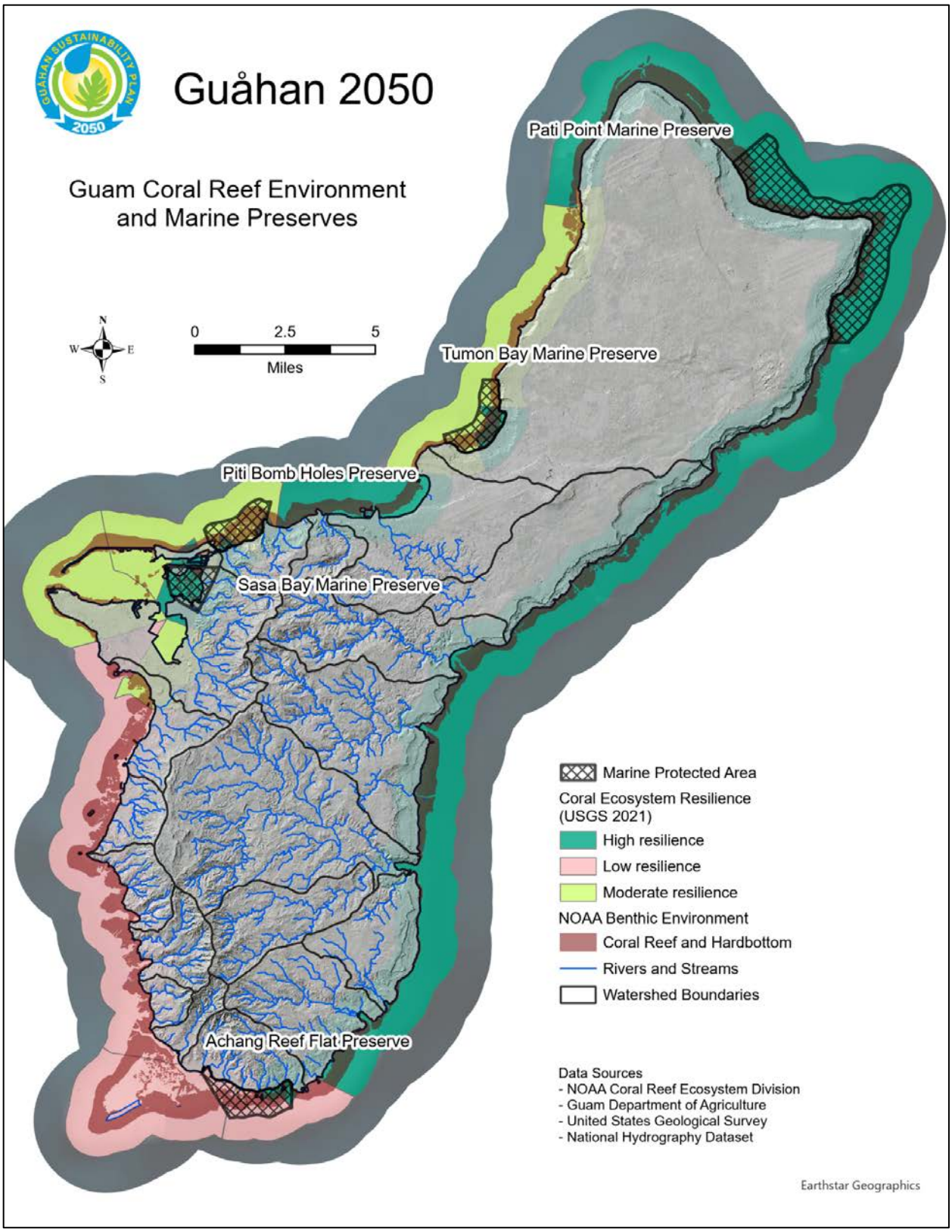

Figure 5-14. Map of Guam's Marine Preserves and Coral Environment.

The Guam Coral Reef Resilience Strategy recommends several land use planning and regulatory strategies, incorporated into the GSP2050, to mitigate environmental threats and enhance coral reef resilience. Key strategies focus on reducing land-based sources of pollution (LBSP) by promoting best management practices such as green infrastructure in commercial and residential developments. Updates to Guam's Building Code are encouraged to integrate sustainable construction criteria, and incentives are proposed for the adoption and maintenance of stormwater management systems. Additionally, watershed restoration efforts are emphasized, including fire mitigation plans to control land degradation and reduce sediment runoff. The strategy also calls for improved enforcement of stormwater regulations and the establishment of a Stormwater Management Master Plan.

To enhance sustainable tourism and recreational use, the strategy advocates for the implementation and enforcement of existing statutes, such as the Guam Territorial Seashore Protection Act and the Marine Preserve Eco-permit law. A sustainable financing mechanism, such as a visitor "green fee," is suggested to support conservation and enforcement efforts. Public engagement programs are also recommended to educate stakeholders about sustainable recreational practices and responsible tourism. Additionally, the strategy underscores the importance of alternative livelihoods, such as aquaculture and cultural tourism, to reduce economic dependency on unsustainable fishing and land use practices (GRRS, 2019).

5.5.2. Sensitive Coastal/Marine Habitat and Species

Guam is home to one of the most species-rich marine ecosystems, with over 5,100 marine species in its coastal waters. This includes more than 1,000 nearshore fish species and over 400 species of hard corals (Paulay 2003; Porter et al. 2005). Guam's corals benefit from the proximity to the Indo-Pacific center of coral reef biodiversity (Veron 2000). There are a total of 14 federally listed threatened, endangered, or candidate marine species on and around Guam (Table 5-3, below).

Table 5-3. ESA-listed threatened or endangered marine species found in Guam.

Scientific Name	Common Name	ESA Listing Status
CORALS		
Acropora globiceps	No common name	Threatened
CLAMS		
Tridacna derasa	Giant clam	Candidate
Tridacna squamosa	Giant clam	Candidate
Tridacna gigas	Giant clam	Candidate

Scientific Name	Common Name	ESA Listing Status
MARINE MAMMALS		
Balaenoptera musculus	Blue whale	Endangered
Balaenoptera physalus	Fin whale	Endangered
Megaptera novaeangliae	Western North Pacific Humpback whale	Endangered
Balaenoptera borealis	Sei whale	Endangered
Physeter macrocephalus	Sperm whale	Endangered
FISH		
Sphyrna lewini	Indo-West Pacific Scalloped Hammerhead Shark	Threatened
Manta birostris	Giant Manta Ray	Threatened
Carcharhinus longimanus	Oceanic Whitetip Shark	Threatened

In Guam, critical habitat, discussed above, is proposed for two marine species: the green sea turtle and pacific coral (Table X).

Table 5-4.

Common Name	Scientific Name	NOAA-NMFS Status	USFWS Status
Green Turtle	*Chelonia mydas*	Proposed	Proposed
No Common Name	*Acropora globiceps*	Proposed	N/A

Green Sea Turtle Central West Pacific Distinct Population Segment — Mariana Archipelago. The green sea turtle, known as haggan in CHamoru, is listed as endangered in the Central West Pacific Distinct Population Segment (DPS) under the Endangered Species Act (ESA). Designation of critical habitat will help focus federal, territorial or commonwealth, and local conservation efforts to manage and protect green sea turtles where they nest. Approximately eight percent of the proposed critical habitat overlaps with existing critical habitat for other species. On Guam, approximately 125 acres of federal, territorial, private, and uncategorized lands are proposed as critical habitat for nesting haggan (USFWS 2023).

Pacific Coral. On November 27, 2020, NOAA issued a proposed rule to designate critical habitat for seven threatened corals in U.S. waters in the Indo-Pacific (*Acropora globiceps, Acropora jacquelineae, Acropora retusa, Acropora speciosa, Euphyllia paradivisa, Isopora crateriformis,* and *Seriatopora aculeata*) pursuant to section 4 of the Endangered Species Act (ESA; NOAA-NMFS 2020). Comments on the proposed rule were received by January 26, 2021. Based on public

comments and new information regarding the interpretation of the records of the listed corals and application to critical habitat, NOAA withdrew the 2020 proposed rule and published a new proposed rule (NOAA-NMFS 2023). The new proposed rule would designate critical habitat for five of the seven coral species that were addressed in the 2020 proposed rule: *Acropora globiceps*, *Acropora retusa*, *Acropora speciosa*, *Euphyllia paradivisa* and *Isopora crateriformis* and includes select locations in the waters around 16 island units in American Samoa, Commonwealth of the Northern Marianas Islands, Guam, Northwestern Hawaiian Islands and Pacific Remote Island Area. Apra Harbor is excluded from critical habitat and considered ineligible for designation. Comments on the proposed rule were received by February 28, 2024. Based on current records of listed corals, there is only one listed coral in Guam: *A. globiceps* (See Appendix A: Records of ESA-listed Coral Species in U.S.; NOAA PIRO 2023).

5.5.3. Guam Coastal Management Program: An Overview

The Guam Coastal Management Program (GCMP) is a vital part of Guam's current land use planning and implementation framework. Established in 1979, the GCMP operates under the Bureau of Statistics and Plans in partnership with the National Oceanic and Atmospheric Administration (NOAA). The program's goal is to create the responsible and balanced use of Guam's coastal resources through improving management and policy systems, optimizing planning, creating awareness, and improving the administration and enforcement of natural resource-related laws and regulations.

Program Objectives:

- Effective administration of natural resource-related laws, programs, and policies;
- Effective enforcement of natural resource-related laws, programs, and policies;
- Increased public awareness of the values and responsibilities associated with coastal resource development and protection; and
- Implementation of a management program that encourages prudent development.

These efforts seek to ensure that both public and private interests are aligned with sustainable development goals. The GCMP focuses on several key areas:

Land Use Planning

- Develops comprehensive land-use policies to guide sustainable development.
- Implements land-use districting systems, including urban, rural, agricultural, and conservation zones.
- Designates Areas of Particular Concern (APCs) to protect sensitive coastal regions.

Federal Consistency

- Ensures that federal actions affecting Guam's coastal zone align with local policies.
- Provides a framework for reviewing federal activities, licenses, permits, and financial assistance to maintain consistency with GCMP objectives.

Coastal Outreach

- Engages the community through educational programs and public participation initiatives.
- Publishes resources like the "Man, Land & Sea" newsletter to inform residents about coastal management efforts.

Natural Resource Projects

- Implements projects aimed at conserving and restoring coastal ecosystems.
- Collaborates with local and federal agencies to address environmental challenges such as erosion, habitat loss, and water quality degradation.

Over the years, the GCMP has achieved significant milestones, including the development of comprehensive plans, such as the North and Central Land Use Plan to guide sustainable development in key regions. It has implemented Federal Consistency procedures by establishing guidelines to ensure federal activities comply with Guam's coastal management policies, many of which are incorporated into the GSP2050. It has also sponsored public engagement initiatives like the Assembly of Planners Symposium to foster collaboration among stakeholders. It has also been a leading government agency in resource conservation efforts, executing projects targeting the preservation of coral reefs, wetlands, and other vital habitats.

5.5.4. The Guam Seashore Protection Commission

The Guam Seashore Protection Commission (GSPC) is responsible for overseeing the Guam Seashore Reserve, which is “a distinct and valuable natural resource belonging to all the people of Guam” (21 GCA Ch. 63). This reserve includes land and water extending seaward to the ten-fathom contour and inland to either 10 meters (32.8 feet) from the mean high-water mark or the inland edge of the nearest public right-of-way. The GSPC ensures that development within this area aligns with the Territorial Seashore Protection Act, aiming to protect natural coastal environments, maintain public access, and prevent environmental degradation.

To conduct any development within the seashore reserve, an applicant must obtain a Seashore Clearance Permit from the GSPC. This permit application process includes demonstrating that the project will not have substantial adverse environmental effects and that it aligns with the objectives of the Seashore Protection Act. Specific requirements include ensuring public access to beaches and recreation areas, maintaining visual clearance between coastal highways and the sea, reserving wildlife preserves, and implementing proper solid and liquid waste management measures. Additionally, developments must be designed to minimize risks of flooding, erosion, and landslides.

The permit application process is rigorous, requiring the submission of multiple copies of the application, along with detailed maps outlining vicinity, lot lines, zoning, existing and proposed structures, environmental impact considerations, and nearby infrastructure. Once submitted, the Application Review Committee (ARC) evaluates the proposal before scheduling a public hearing.

The GSPC then makes a final decision based on ARC recommendations, public input, and other regulatory considerations.

Ultimately, the Guam Seashore Protection Commission plays a crucial role in balancing development and environmental conservation along the island's coast. It ensures that any construction within the seashore reserve aligns with sustainable practices and public interest, safeguarding Guam's coastal resources for both present and future generations. Where applicable, the policies and responsibilities of the GSPC are incorporated into the GSP2050.

5.5.5. Shorelines and Floodplains

Shorelines are where the marine environment meets the terrestrial island ecosystem. The transitional shoreline and near-shore areas provide a variety of ecosystem services to the wildlife and people of Guam. In particular, Guam's coral reefs carry immense value culturally, economically, and ecologically. Functioning vegetated shorelines and near-shore areas trap sediment and excess nutrients from entering deeper waters and affecting more sensitive habitats like reefs. Mangrove forests have also been documented providing superior storm event protection compared to bulkheads or other human made structures (NOAA 2015). Additionally, natural shorelines provide an important source and sink for sediment in a cycle of movement across the coast. When this cycle is disrupted by human impact, sediment erosion and deposition can get out of balance, which can result in loss of shore, damage to habitat or structures, and/or disruption of morphodynamic processes (NOAA 2015 & Ruggiero 2010).

Floodplains are areas prone to flooding typically from overflow of rivers/other large bodies of water or rain events. The term "flood hazard area" can be defined as "*any land area subject to flood-conditions or susceptible to inundation, including wetlands, and areas subject to a one percent or greater chance of flooding in any given year (100-year flood)*" (Government of Guam 1997). Due to the island's heavy rainfall during the rainy season, some areas prone to flooding are a result of human development and stormwater accumulation (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994). The hazards dimension of floodplains is discussed in Chapter 3 of the GSP2050, but floodplains also generally support high levels of biodiversity and can be some of the most productive ecosystems on earth. Additionally, intact floodplains protect infrastructure and agricultural land from flood damage by sequestering water away from these resources (Opperman et al. 2010).

5.5.5.1. Guam's Shorelines & Floodplains

The four main types of shorelines present in Guam are rocky coastlines, sandy beaches, mangrove mudflats, and river estuaries. Much of Guam's shoreline is rocky coastline, which consists of low exposed beach rock, limestone terraces and/or benches, steep slopes, and cliffs (McMakin 1977). The sandy beaches are gently sloping, and the substrate is comprised of mainly calcareous organic remains and detrital volcanic minerals (Emery 1962). Mangrove mudflats are located primarily in two areas: the inner shores of Apra Harbor on the central western coast and between Malesso' and Inarajan on the southern coastline. These mudflats

are in excellent condition and experience little to no shoreline erosion; they are experiencing shore buildup from deposited sediment (McMakin 1977). Approximately 33 of the 40 rivers in Guam have mouths that meet the ocean at the shoreline, and nine of these mouths make up sizable riverine estuaries. These large, braided mouths are often relatively flat, and abundant with wildlife (McMakin 1977).

Floodplains in Guam are primarily associated with river valleys, the Fena Lake basin, and urbanized watersheds. Some of the primary river floodplains are associated with the following river mouths (FEMA 2024):

- Hagatna River
- Asmafines/Sella River
- Laelae River
- Agfayan River
- Ugum River
- Atantano River
- Cetti River
- Dante River
- Inarajan River
- Asalonso River
- Namo River
- La Sa Fua River
- Ajayan River
- Tinago River
- Pago River

The majority of river or lake-associated floodplains are located in the southern portion of the island, due to its geology, land use, and topography. Low areas in the north portion of the island with high impervious surface coverage may experience flood risk as well during heavy rainfall (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994).

5.5.5.2. Issues

The greatest challenges shorelines face are the impacts of fill/dredge operations, pollution, and shoreline development. Due to increased land development, many shorelines have been altered by dredging or filling. The excavation or deposition of sand for fill material, swimming areas, marinas, navigation, or to enhance beach fronts has occurred in near-shore areas, particularly around Tumon Bay, Agana, and Piti (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994 & McMakin 1977). Sediment dredging is known to result in increased turbidity, decreased biodiversity, alteration of near-shore currents, disruption of natural marine ecological systems, and increased beach erosion (McMakin 1977 & USACE n.d.). The resulting degradation of water quality has severe adverse impacts upon coral reefs, mangrove mudflats, and seagrass beds (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994).

Pollution entering the near-shore environment is prolific in Guam. In 2005, the Guam EPA monitored 9.60 miles of the shoreline to evaluate water quality and found that only 0.23 miles of that study area met water quality standards (Bureau of Statistics and Plans – Government of Guam 2009). The polluted runoff, created by impervious surfaces and urban land use, carries excess nutrients, organisms, and heavy metals downgradient across the landscape and eventually into marine waters, negatively impacting marine ecosystems such as coral reefs. The runoff may therefore pose additional economic risks to the recreation and fishing industries (Guam Coastal Management Program 1996). Most recently, the GEPA reports that Guam's

marine water quality is generally good, though some water bodies have been impaired and many have not been assessed (GEPA, 2019).

Similar issues are found in the floodplains of Guam. Due to the flat nature of most floodplains, they have been viewed as ideal for development and have been converted to urban uses or to agriculture in many areas of the island (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994). This loss of floodwater storage area upgradient of the shoreline results in amplified volumes of, usually polluted, flood and stormwater flushing onto beaches. Recurrent flooding at the Umatac and Inarajan water treatment facilities often results in untreated or partially treated effluent being carried downgradient to marine waters (W.B. Flores & Associates/Strategic Planning Group, Inc. 1994).

On the federal level, the primary regulations addressing shorelines are the Coastal Zone Management Act (CZMA) and the Coral Reef Conservation Act. These acts were put in place to encourage coastal states/territories to develop and implement coastal zone management plans, and to provide financial resources to assist in the preservation of corals. The federal Clean Water Act also regulates water quality of navigable waters, including shorelines and the near-shore environment. The Guam EPA manages applicable regulations included in this act, particularly the regulation of fill/dredge in marine and/or other navigable waters of the United States. The Rivers and Harbors Act of 1899 also regulates the alteration or obstruction of navigable waters of the United States, including shorelines and marine waters at the federal level.

The Guam EPA also enforces the Clean Water Act. These regulations require that existing water sources and water quality should be retained, and that the function of waters already impaired by pollution should be improved. This is done by regulating the amount and quality effluent entering waterways, removing point source discharges along the shorelines, preventing dredge/fill of near-shore areas under almost all circumstances, etc. The Bureau of Statistics and Plans manages the Guam Coastal Management Program and the Guam Coral Reef Conservation Program to facilitate responsible and sustainable use of coastal resources and preservation of corals (NOAA 2024). The Guam Territorial Seashore Protection Commission is responsible for managing the Territorial Seashore Act of 1974, which established the Guam Seashore Reserve. This reserve includes the entire coastline of Guam plus all the surrounding Islands within Guam's jurisdiction. Guam's Department of Agriculture and Division of Aquatic and Wildlife Services manages the Guam Marine Conservation Plan as well, a plan with objectives of marine resource assessment, management guidelines, and educational outreach.

Guam regulates floodplains through the Guam Administrative Rules and Regulations and the Guam Floodplain Management Ordinance to meet the standards established by the National Flood Insurance Program (NFIP) and the Guam EPA. The Guam EPA and NFIP requires that all proposed development within floodplains comply with erosion, water quality, and pollution standards. No floodplain mitigation is currently required within Guam for proposed impacts.

5.5.6. Coastal and Marine Policies and Sustainability

The policies outlined in the Guam Sustainability Plan align closely with multiple United Nations Sustainable Development Goals (SDGs) and their associated targets. Specifically, the General Marine Resources Policy and Resource Protection and Enhancement efforts align with SDG 14: Life Below Water, which emphasizes the conservation and sustainable use of marine resources. By preventing overharvesting of marine life, ensuring sustainable fisheries, and protecting biologically significant areas, Guam is directly supporting Target 14.2, which calls for the sustainable management and protection of marine and coastal ecosystems. The emphasis on maintaining biological productivity and mitigating human-induced pollution also supports Target 14.1, which seeks to reduce marine pollution from land-based activities. Furthermore, the focus on restoring degraded marine environments ties into Target 14.5, which promotes the conservation of at least 10% of coastal and marine areas.

The Coral Reef Protection policies strongly support SDG 13: Climate Action and SDG 15: Life on Land by addressing land-based sources of pollution, sediment control, and fire mitigation. These policies aim to enhance the resilience of coral reef ecosystems by reducing sediment and nutrient runoff, implementing green infrastructure, and updating building codes to require sustainable practices. By improving watershed restoration and promoting land conservation, these policies also align with Target 15.1, which focuses on sustainable management of terrestrial and freshwater ecosystems. Additionally, efforts to reduce agricultural impacts by promoting sustainable farming and preventing harmful pesticide use contribute to Target 2.4 of SDG 2: Zero Hunger, which advocates for resilient agricultural practices that enhance ecosystem health.

The policies under Education, Enforcement, and Funding are crucial in supporting SDG 16: Peace, Justice, and Strong Institutions, which includes Target 16.6, focused on developing effective, accountable, and transparent institutions. By enhancing enforcement through increased conservation officers, volunteer programs, and cooperative partnerships, Guam is strengthening governance over its natural resources. Additionally, outreach and education initiatives align with Target 4.7 of SDG 4: Quality Education, which promotes awareness and education for sustainable development. The policy's emphasis on securing funding for conservation and marine management also ties into SDG 17: Partnerships for the Goals, particularly Target 17.3, which encourages financial mobilization for sustainable development.

The Territorial Seashore and Allowable Uses policies align with SDG 11: Sustainable Cities and Communities by ensuring sustainable land use along the seashore, maintaining public access, and enforcing responsible development standards. The emphasis on marine water quality

protection and the restriction of certain shoreline developments aligns with Target 11.4, which aims to protect the world's natural and cultural heritage. Similarly, policies regarding exterior lighting and climate resilience funding contribute to SDG 13: Climate Action, particularly Target 13.1, which calls for strengthening resilience and adaptive capacity to climate-related hazards. By integrating sustainable development principles into land use planning and hazard mitigation strategies, Guam is working toward a future that balances ecological preservation with responsible development.

5.5.7. Coastal and Marine Waters Land Use Policies

General Marine Resources Policy

TE-87. Living Marine Resources (CZM).

All living resources within the territorial waters of Guam, particularly corals and fish, shall be protected from over harvesting and, in the case of marine mammals, from any taking whatsoever.

TE-88. Shore Area Development (CZM).

Only those uses shall be located within the Seashore Reserve that: (1) enhance, are compatible with or do not generally detract from the surrounding coastal area's aesthetic and environmental quality and beach accessibility; or (2) can demonstrate dependence on such a location and the lack of feasible alternative sites.

TE-89. Resource Protection and Enhancement.

Marine resources shall be maintained, enhanced, and, where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.

TE-90. Biological Productivity.

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of aquatic organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface water flow, encouraging wastewater reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.

Coral Reef Protection

TE-91. Decreased Land-based Sources of Pollution (LBSP).
Enhance the resilience of Guam's coral reef ecosystems by reducing the introduction of sediment, nutrients, and pollution from coastal development, fires, land-based recreational users, and agriculture in Guam's watersheds.

TE-92. Best Management Practices.
Require use of best management practices, including stormwater management, erosion control and green infrastructure technology, at commercial and residential sites, consistent with the G2050SP.

TE-93. Building Code Update.
Update Guam's Building Code to include green infrastructure requirements for new development

TE-94. Sediment Control.
Install sediment catchment systems in appropriate areas with consideration of future climate change impacts, including changing precipitation and storm patterns.

TE-95. Watershed Restoration.
Implement watershed restoration in priority watersheds.

TE-96. Land Protection.
Promote land conservation through acquisitions and conservation easements.

TE-97. Fire Mitigation Plans.
Develop plans to restore watersheds with native and fire resistant vegetation and fire breaks at the Wildland-Urban Interface (WUI).

TE-98. Reduce Agricultural Impacts.
Reduce the impacts of agriculture by promoting organic farming, appropriate farming methods on steep hillsides, preventing burning for land clearance, and controlling adverse pesticide use.

TE-99. Sustainable Recreational Use.
Use maximum and conspicuous signage to promote coral reef protection and resilience through sustainable recreational practices.

TE-100. Adaptive Management and Hazard Mitigation.
Implement adaptive management interventions based on the best available science and reduce local pressure and increase coral reef resilience to climate change.

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Education, Enforcement, and Funding

TE-101. Monitoring and Enforcement.

Create a volunteer conservation officer program to aid with monitoring activities in Conservation and hire additional Conservation officers. The presence of officers may reduce poaching, and can educate visitors/the public on relevant laws and policies. Maintain existing volunteer programs, such as the Haggan Watch program which supports sea turtle conservation and monitoring efforts. Implement protective measures for sea turtle nests, such as predator control/exclusion, respond to strandings in a timely manner, and establish standardized protocols for nest surveys/monitoring.

TE-102. Outreach and Education.

Conduct outreach and education to convey the importance of sea turtle and marine mammal conservation to commercial and non-commercial fishermen and the general public. Develop and promote a volunteer reporting program for fishing and recreation vessels for marine mammal sightings. The Division of Aquatic and Wildlife Resources should continue to promote education and awareness of protected areas and natural resource laws by improving signage in visitor areas, improving accessibility of Conservation Areas, providing outreach programs and materials to the public, and teaming up with non–profits and non-governmental organizations, such as the Guam Coral Reef Initiative Coordinating Committee.

TE-103. Partnerships.

Develop and strengthen cooperative agreements with the USFWS, Department of Defense, and University of Guam for monitoring and protection of sea turtles, sea turtle nesting sites, and marine mammals.

TE-104. Enforcement of Laws and Policies.

The Guam Department of Agriculture's Division of Aquatic and Wildlife Resources should work with the Department of Law Enforcement and, for Federal lands, the U.S. Fish and Wildlife Service, to implement stronger enforcement and education of fishing and hunting laws within protected conservation areas.

TE-105. Secure Funding.

The Division of Aquatic and Wildlife Resources should regularly attempt to secure additional funding for fish and wildlife management. As described in the Guam Comprehensive Wildlife Conservation Strategy, sources include, but are not limited to, the Sport Fish and Wildlife Restoration Act, US ESA Section 6, Coral Reef Initiative, Western Pacific Fisheries Council (WesPacFIN), Coastal Zone Management (CZM), Clean Water Act Section 319, National Marine Fisheries Service (NMFS) Sea Turtle Recovery, Safe Harbor Agreements, Department of Defense Legacy Funding, the South

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Pacific Regional Environmental Programme (SPREP), Government of Guam Local Appropriations, Land Acquisition Grants (Federal), and more.

Territorial Seashore

TE-106. Seashore Protection.

Maintain, restore, and enhance the quality of Guam's seashore reserve to the maximum extent feasible including its amenities and aesthetic values.

TE-107. Living Organisms.

Protect the continued existence of optimum populations of endemic and non-invasive species of living organisms in Guam's territorial seashore.

TE-108. Public Access.

Provide maximum public access for maximum visual and physical use and enjoyment of the seashore reserve by the public.

Allowable Uses in the Coastal and Marine Environment

TE-109. Marine water quality.

Protect marine water quality through appropriate shoreline area land use designations and development standards such as discouraging construction below the mean high tide mark, including sea or retaining walls, allowing natural beach development processes to prevail, controlling erosion from shoreline development and ensuring that wastewater infrastructure is appropriately set back from marine waters.

TE-110. Permitted Uses in Marine Environment.

The following uses may be permitted in the marine environment: a. Resource-dependent uses permitted by Policy xxx; b. Restoration projects, including sand nourishment; c. Public beach accessways; d. Temporary lifeguard towers/stations; e. Coastal dependent recreation activities; and f. Shoreline protective devices as permitted by other plan policies.

TE-111. Standards in the Marine Environment.

Require any development or structure permitted within the marine environment to adhere to the following standards: a. Comply with the terrestrial habitat standards as applicable; b. Minimize impacts on coastal access and recreation; c. Avoid sensitive beach species habitat and use; Design so as not to involve any permanent structures and be the minimum size necessary; and e. Provide any necessary mitigation.

TE-112. Exterior Lighting.

Ensure that exterior night lighting is minimized, restricted to low intensity fixtures, shielded, and directed away from beach habitats in order to minimize impacts on wildlife. Prohibit high intensity lighting for recreational facilities along the shoreline. Limit the use of lighting directed over marine waters.

TE-113. Planning Updates.

Require periodic updates to hazard maps and land use plans based on the latest climate data and projections.

TE-114. Funding for Climate Resilience.

Allocate funding for research and pilot projects that test innovative climate resilience strategies.

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Chapter 6. **Vibrant Culture**

Guam's cultural heritage and traditional ways of life are fundamental to the island's identity, resilience, and sense of place. Looking ahead to 2050, preserving and celebrating this vibrant culture must be a core pillar of the G50SP. The island's landscapes, from limestone forests and coastal villages to ancient latte sites and pre-war architecture, are living testaments to CHamoru history and identity. Guam is also a welcoming, multi-cultural place, and land use should provide for the expression of this multiculturalism. Land use planning is not simply a tool for managing development—it is a means to honor ancestral connections to land, support intergenerational knowledge transfer, and safeguard the practices that have sustained communities for generations. The Guåhan 2050 Sustainability Plan commits to a future where heritage and progress walk hand in hand, and where traditional knowledge continues to shape how we live, grow, and thrive.

To achieve this, the G50SP land use policies must integrate the protection of cultural and historic resources into every phase of development and community planning. Designating culturally significant areas through zoning and conservation districts will ensure that places of value are not lost to unchecked growth. By conducting comprehensive surveys and mapping of heritage sites, implementing buffer zones, and promoting adaptive reuse of historic structures, the character of Guam's villages can be maintained, and sacred spaces may be protected from encroachment. Collaboration with village communities, cultural organizations, and institutions like the Guam Historic Preservation Office is essential to fostering a sense of stewardship. Through thoughtful design, cultural tourism, and education initiatives, Guam's built and natural environments can be places of learning, reverence, and pride—supporting not only a vibrant culture but a stronger, more united community.

Goal: *Preserve and celebrate Guam's cultural heritage and enhance the well-being of its people through equitable land use and community design.*

Land Use Objectives:

- Protect and manage historic and cultural sites through development reviews and overlays.
- Support spaces for cultural expression and continuation of traditional practices.
- Require equitable access to community health, open space, and recreation facilities.
- Promote development designs that reflect CHamoru and Pacific architectural styles.

6.1. Guam's Cultural Land Use Context

Guam's land use and cultural context is deeply rooted in its long and dynamic history, shaped by thousands of years of CHamoru[18] settlement, colonial encounters, and modern development. The earliest CHamoru communities, dating back over 4,000 years, developed a deep spiritual and practical relationship with the land and sea. Land was not just a resource but a vital part of identity, ancestry, and survival. Villages were strategically located near fresh water sources and marine environments, and land was organized through clan systems that guided farming, fishing, and social relationships. Latte stones, unique to the Marianas, stood as both spiritual markers and structural foundations of ancestral homes, symbolizing the enduring presence of CHamoru culture across the island's landscape.

Spanish colonization in the 17th century marked a major turning point in Guam's land use history. The Spanish forcibly relocated CHamoru communities into centralized villages known as reducciones, disrupting traditional land tenure systems and disconnecting many people from their ancestral lands. Churches and military fortifications were established on elevated or strategic sites, changing the spatial and cultural organization of the island. Over the next 200 years, the Spanish colonial regime imposed new forms of land ownership, taxation, and agriculture, introducing cattle ranching and cash crops that transformed the island's ecology and subsistence patterns. Despite these pressures, CHamorus continued to preserve their cultural practices, often adapting them to fit within new colonial frameworks.

The American era, beginning in 1898, introduced another layer of transformation. The U.S. Navy administration imposed Western-style zoning, land registration, and infrastructure development that prioritized military and administrative needs over indigenous land claims. World War II further altered Guam's cultural landscape, as the island was devastated by conflict and later

[18] The CHamoru Heritage Act of 2016, which established the current Kumisión i Fino' CHamoru yan Fina'nå'guen i Historia yan i Lina'la' i Taotao Tåno', codified the spelling of CHamoru (as opposed to "Chamorro") in the enabling legislation. See, Kumisión i Fino' CHamoru, 2024, p. 23.

rebuilt with a focus on modernization and strategic military use. The United States leveled the largest villages of the island and repeatedly removed and forcibly relocated CHamoru families from their homelands. At one point following the post–WWII era, the military had seized control over all of the island. Many CHamoru families still await the return of land taken by the United States during this era in Guam history. The postwar period saw rapid population growth, urbanization, and the expansion of U.S. federal programs, which led to the construction of highways, subdivisions, and commercial centers—often at the expense of traditional village layouts and historic sites.

The Guam Organic Act of 1950 established Guam as an unincorporated territory of the United States, providing a framework for civil government but also solidifying federal control over significant portions of the island. Despite this, the indigenous population continued to advocate for the return of their lands and greater autonomy. The CHamoru Land Trust Act, enacted in 1975, aimed to return lands taken by the United States and held by the Government of Guam to the CHamoru people. However, its implementation faced delays and challenges, reflecting the ongoing complexities surrounding land ownership and stewardship on the island. In many cases, CHamoru landowners have lost access to ancestral lands due to eminent domain, unclear land titles, or limited resources to challenge dispossession.

Today, the cultural context of land use in Guam is shaped by efforts to reclaim, protect, and revitalize CHamoru heritage within the framework of modern development. Land remains a core issue in discussions about sovereignty, justice, and sustainability. Movements to preserve historic sites, promote traditional practices, and support indigenous land claims are of great importance to the community. Guam's land use planning must reckon with this complex history and seek a balance that uplifts cultural heritage while guiding sustainable growth. Integrating CHamoru perspectives, promoting inclusive decision-making, and honoring the deep connections between the CHamoru people and this place are essential steps toward a future where development supports—not erases—the cultural landscape of Guam.

6.2. Cultural Heritage and Indigenous Connections

6.2.1. CHamoru Culture and Lands

The CHamoru people, indigenous to the Mariana Islands, have inhabited Guam for over 4,000 years, cultivating a profound connection to their land and sea. Identifying themselves as "taotao tano'," or "people of the land," this bond is integral to their cultural identity. In ancient CHamoru society, land was communally owned, with clans utilizing it for the collective benefit. The

highest-ranking male, the maga'låhi, oversaw land use, and inheritance followed matrilineal lines, passing through the mother's family (Guampedia, 2025).

This deep-seated relationship with the land is reflected in CHamoru customs and beliefs. Their worldview emphasizes living in harmony with nature, taking only what is necessary, and ensuring resources remain for others. Such practices highlight the CHamoru's role as stewards of their environment, embodying a philosophy that the land and sea are vital, life-giving elements intertwined with their cultural heritage.

As discussed in Chapter 2, Guam is increasingly multicultural, though the CHamoru culture continues to play a central role in Guam's cultural heritage. According to the 2020 U.S. Census, Guam's population is 32.7% CHamoru, 29.1% Filipino, 13.2% other Pacific Islander, 6.8% White, 6.7 % Chuukese, and much smaller proportions of Chinese, Korean and other races. The census also showed that 27.5% of Guam's population (5 years and older) reported speaking the CHamoru language at home (U.S. Census Bureau, 2025).

Culture and Community Cohesion

An essential element of village development is the promotion of community cohesion and cultural preservation. Key landmarks such as Camel Rock, the Asan Bay Overlook, and the historic Fonte Bridge are widely recognized for their significance in representing village identity and resilience. Preservation efforts for these sites reflect a broader commitment to safeguarding cultural heritage and fostering community pride.

Public sentiment supports initiatives aimed at maintaining these landmarks and enhancing village spirit. According to input gathered from community engagement sessions, residents have expressed strong support for preserving historic sites and improving access to essential services, including water infrastructure connected to the Fonte Bridge area. In addition, residents generally responded positively to mayoral initiatives that emphasize safety, cultural identity, and collective well-being (see below). While participation in community planning events varied in this project, engagement did reveal that residents prioritize safety and relevant quality-of-life issues. Continued public engagement will be important in shaping policies that reflect the community's values while reinforcing a shared sense of unity and cultural pride.

6.2.2. Land Use and Cultural Heritage

As with the other sectors of this sustainability plan, the Guam Land Use Commission plays an important role in establishing local development conditions that may protect and uplift Guam's cultural heritage (see Chapter 8). But several Government of Guam entities have been established specifically to preserve and manage the just use of CHamoru lands and resources.

CHamoru Land Trust Commission (CLTC)

The CHamoru Land Trust Commission (CLTC), enacted in 1975, is responsible for the disposition of public lands designated as CHamoru Homelands to advance the social, cultural and economic development and well-being of the CHamoru people. It does this through land leases for residential, agricultural and commercial uses and through economic assistance programs (21 GCA, Ch. 75A; P.L. 22-18, P.L. 23-38 as amended; P.L.35-112).[19]

The CLTC administers more than 11,000 acres of public land. As of the 2021-22 fiscal year, the CLTC had leased a combined total acreage of 3,048 acres consisting of 2,911 Residential and Agriculture leases (CLTC 2022). Most of the CLTC's land is in the northern and central parts of Guam, though there are significant tracts in the south (Figure xxx). The lands in the north, much of which is not registered, may present significant opportunities to consider land use programs and mechanisms to meet both the objectives of the CLTC and the growth management, agricultural, and aquifer protection concerns addressed in Chapters 3 and 5.

CHamoru Land Trust Vision Statement

CHamorro Land Trust properties are comprised of:

Clean, safe and thriving neighborhoods, where neighbors practice inafa'maolek and all live with dignity; and

Productive agricultural tracts of land that are nurtured with best management practices and lead the island's agriculture market; and

Sensitive ecological and culturally significant lands that are protected and preserved for future generations; and

Sound commercial enterprise that enhance the livelihood and well being of the eligible beneficiaries.

CLTC, 2021

The G50SP proposes considering the development and implementation of a transferable development program to link implementation of the CLTC mandate with other important land

[19] In 2020 the Government of Guam reached a settlement with the U.S. government that "underscores the CLTC program's role as a land restoration program that addresses the restoration of CHamoru homelands taken by the federal government between 1989 to 1968." This agreement expands the program's eligible beneficiaries to include individuals and their descendants who owned land or ranched, farmed, or otherwise occupied the land taken, which, in effect, has made any lease application not processed and approved before January 1, 2021, required to comply with the new eligibility requirements (Guam OPA, 2022).

use objectives. This would need to be accomplished in the context of on-going challenges facing the CLTC, such as concerns with the leasing process raised by a 2018 Attorney General opinion about the allocation of leases (Guam AG, 2018), commercial leasing issues, and agency capacity to address the important infrastructure matters related to existing and new leases.

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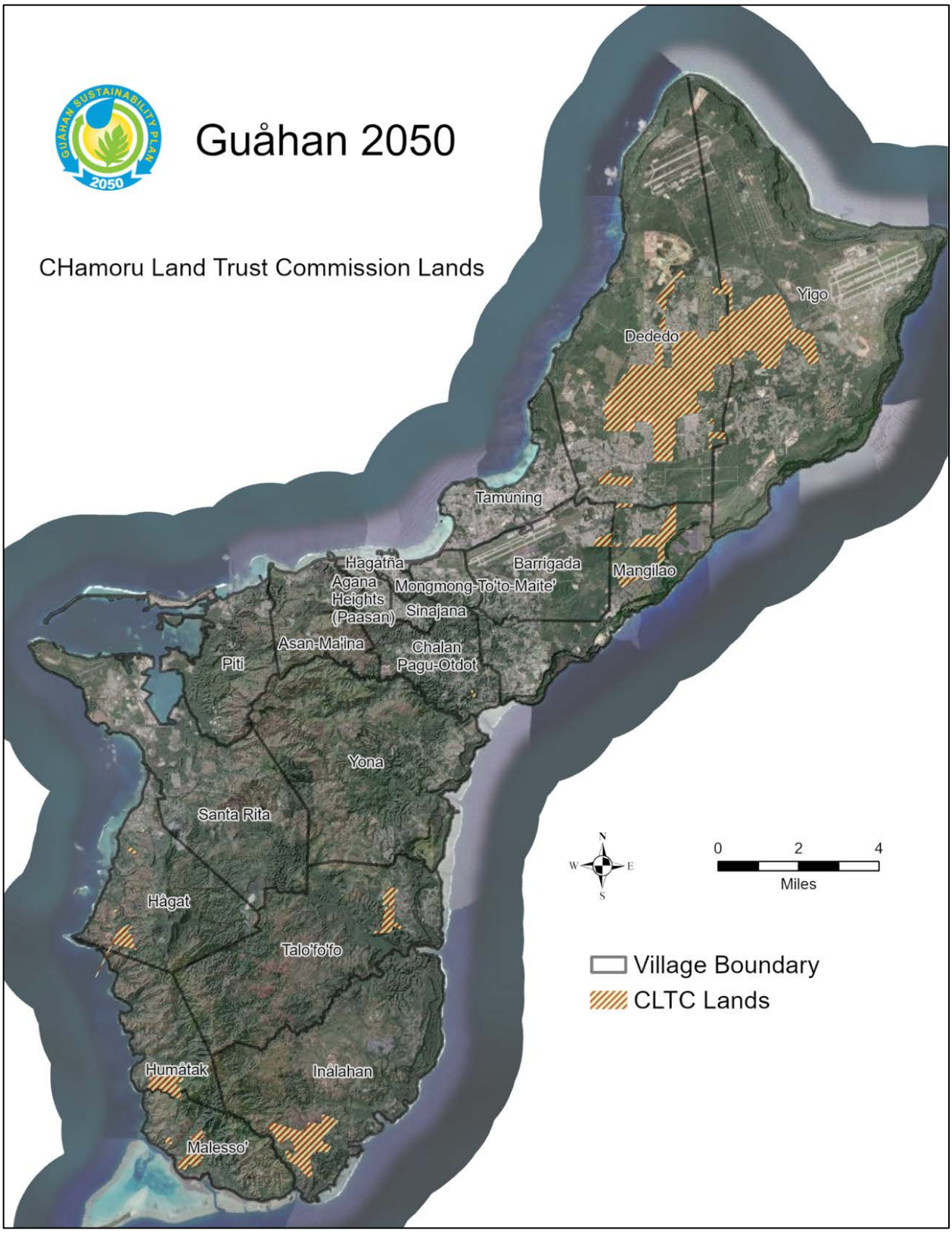

Figure 6-1. CHamoru Land Trust Commission Lands.

Guam Ancestral Lands Commission

The Guåhan Ancestral Lands Commission (Kumision I Tano Saina-ta Guåhan Ancestral Lands Commission (GALC)) is part of the Guam Department of Land Management. The U.S. government enacted the Guam Excess Lands Act (Public Law 103–339; 108 Stat. 3116) in 1994 to transfer certain “excess” federal lands back to the Government of Guam for public benefit.The statute identified 22 parcels totaling 3,213 acres of land to be transferred. Subsequently, the GALC was established in 1999 through Guam Public Law 25-45 with a mandate to facilitate the return of excess federal and government-held lands to the original landowners and to administer a Land Bank Trust for lands that could not be returned.

Since the creation of the GALC, approximately 7,687 acres of terrestrial land and approximately 15,170 acres of submerged land has been returned by the Federal government to the Government of Guam. Of the terrestrial lands, 1,491 acres were transferred to various government of Guam agencies, with most going to the Guam International Airport Authority (1,417 acres) and 74 acres to other agencies. The remaining 6,196 acres of terrestrial lands, comprising 528 lots, were transferred to the GALC for return to the original landowners or to be held in the GALC Land Bank Inventory to benefit those original landowners who will never realize the return of their ancestral lands. Of these lands, approximately 1,888 acres were identified as non-ancestral or Crown lands to be retained in the Commission's Land Bank Inventory. By July 2023, about 2,648 acres comprising 336 lots of the remaining 4,308 acres had been returned by the GALC, leaving approximately 1,660 acres in the inventory for future return (Burch, 2023). About 77 acres of non-ancestral lands in the Commission's Land Bank Inventory have been leased or licensed to several private entities and a few agencies. Figure xx shows the lands currently identified as GALC lands, both transferred and currently held.

One of the primary issues GALC continues to encounter is the inaccessibility or unusability of returned lands. Parcels in areas like Piti and Barrigada have sometimes been returned without legal access or appropriate zoning, making them difficult to develop or lease. Additionally, GALC’s efforts to generate lease revenue from retained lands through the Land Bank Trust have been delayed due to the absence of finalized rules and regulations. These challenges are compounded by administrative resource constraints and the lack of integrated land use planning that accounts for ancestral claims and traditional land tenure.

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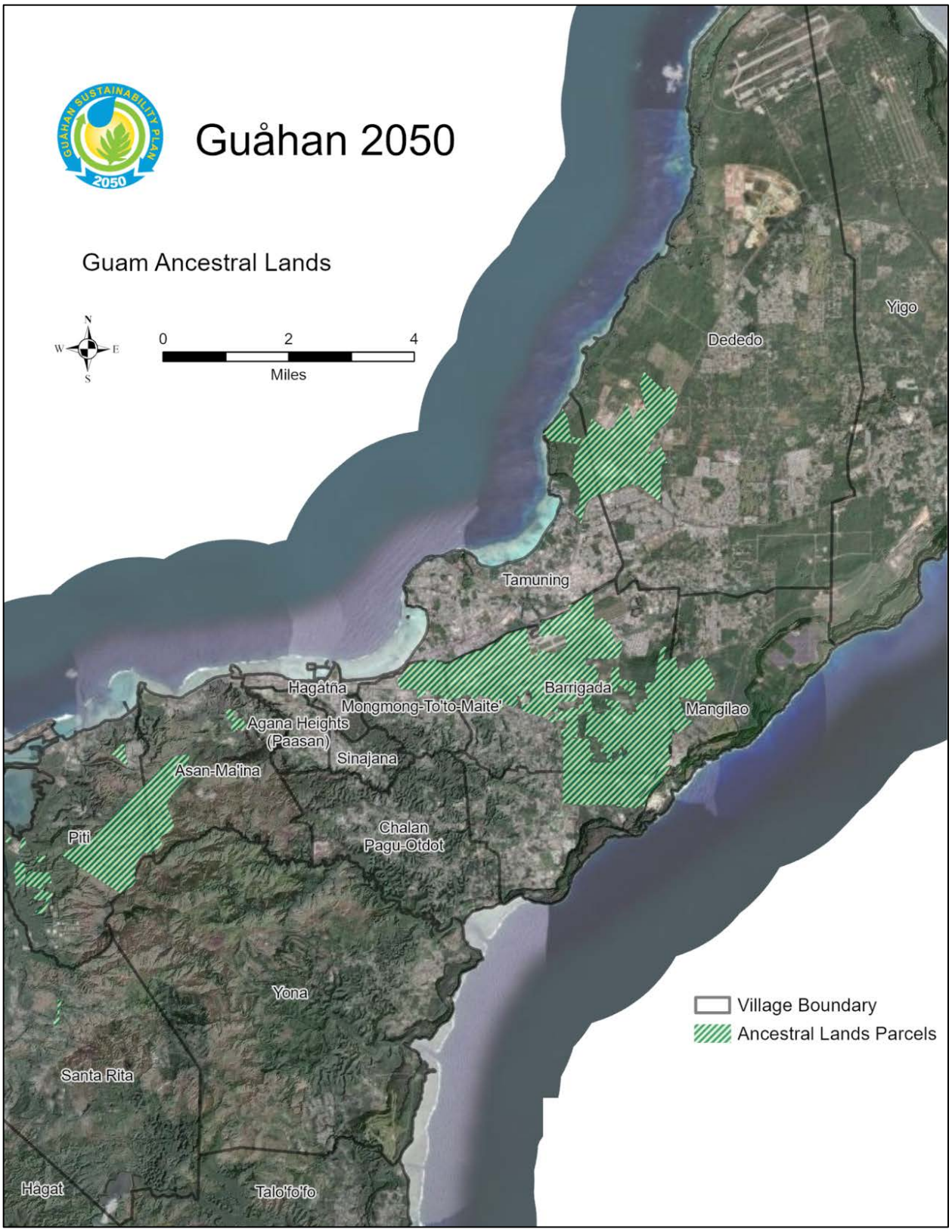

Figure 6-2. Ancestral Lands Commission Lands.

Department of CHamoru Affairs

The Department of CHamoru Affairs (DCA) is a government agency in Guam dedicated to the preservation, promotion, and advancement of CHamoru language, culture, and heritage. Established to serve as a cultural steward for the CHamoru people, the DCA works to ensure that the island's indigenous identity remains central to public life, education, governance, and development. Its mission encompasses both cultural revitalization and the protection of historical and ancestral resources, emphasizing the importance of intergenerational knowledge and community engagement.

One of the DCA's key responsibilities is overseeing cultural institutions such as the Guam Museum, the CHamoru Language Commission, and the Council on the Arts and Humanities. Through these entities, the department supports public education initiatives, archives and interprets historical materials, and encourages the use of the CHamoru language in schools and public spaces. These activities are vital for reinforcing cultural continuity, particularly in the face of globalization and external political influences.

Department of CHamoru Affairs

The purpose and authorized activities of the Corporation are to assist in the implementation of an integrated program for the preservation, development and promotion of the Chamorro Heritage of Guam, for the public benefit and to provide specific services to the Chamorro people. It is intended that this Corporation be a catalyst in the preservation, development and promotion of language, arts, humanities, historic and cultural preservation, research, restoration, presentation, museum activities and support programs significant to Guam's history and culture, and to enhance the future of the Chamorro people of Guam. It is a further purpose of this Chapter to enable the Corporation to aid private enterprise without unfairly competing with it in the expansion of cultural and historical resources for Guam.

Public Law 25-69, Chapter 89, Section 87103.

In the context of land use and sustainability, the DCA plays a supportive but important role. While it does not directly manage land like the CHamoru Land Trust Commission or Ancestral Lands Commission, it actively engages in ensuring that land development and policy decisions respect cultural practices, traditional knowledge, and historical land connections. For example, the DCA may collaborate with other agencies to assess the cultural significance of sites prior to development or advocate for the preservation of ancient village locations, sacred places, or areas of ecological importance with cultural ties. In doing so, the department contributes to more holistic, place-based sustainability planning—linking land stewardship to CHamoru values of respect (ináfa'maolek), environmental harmony, and ancestral responsibility.

The DCA's broader engagement with land-related issues also includes participation in cultural impact assessments, public consultations, and educational campaigns about the importance of

protecting Guam's heritage landscapes. As Guam continues to face pressures from military expansion, tourism, and urban development, the DCA serves as a cultural compass, helping to ensure that decisions about the island's future honor its indigenous roots and support long-term sustainability for the CHamoru people.

Guam Preservation Trust

The Guam Preservation Trust (GPT) is a nonprofit public corporation established by the Government of Guam in 1990 to preserve and protect the island's historic and cultural resources. Its mission is to support activities that identify, conserve, and promote Guam's architectural, archaeological, and cultural heritage for the benefit of current and future generations. Through grantmaking, public education, and technical assistance, GPT plays a central role in safeguarding the physical and intangible elements of Guam's history.

Guam Preservation Trust Strategic Plan 2023–2027

Preserving the Past, Sustaining the Future

Grounded in the principle that historic preservation is a shared public responsibility, the Guam Preservation Trust's Strategic Plan is built around the *Appreciative Inquiry* approach—focusing on community strengths to envision and implement a future where heritage preservation is deeply woven into everyday life.

The plan's key program areas reflect this integrated vision, including: ethnography and oral history; restoration of historic buildings; archaeological research; public interpretation and education; documentation and register nominations; archival research; and architectural history. **Through these, the Trust aims to deepen knowledge of Guam's past while supporting sustainable, culturally rooted development**.

The Trust's project goals include the restoration of landmark buildings, village revitalization plans, the development of heritage trails, and the integration of preservation with land use and planning regulations. The Trust also prioritizes support for CHamoru traditional knowledge, youth education, and community-based archaeology—ensuring future generations inherit not only sites but the stories and cultural values they embody.

GPT's work spans a wide range of initiatives, including the restoration of historic buildings, documentation of ancient CHamoru sites, and the development of educational materials on heritage preservation. It collaborates with local communities, cultural practitioners, scholars, and government agencies to ensure that preservation efforts are community-driven and culturally grounded. A key part of GPT's strategy is raising public awareness about the importance of heritage conservation—not only as a cultural obligation but also as a foundation for a more sustainable and resilient future.

In relation to land use and sustainability, the Guam Preservation Trust often serves as a bridge between development and conservation. It advocates for responsible planning and land management practices that consider the historical and cultural significance of sites before construction or expansion projects proceed. GPT may also contribute to cultural resource assessments, ensuring that land use decisions comply with preservation laws and reflect CHamoru values and historical context. This is particularly important in areas under pressure from military buildup, tourism infrastructure, or commercial development.

Furthermore, GPT's emphasis on preservation aligns with broader sustainability goals, especially in recognizing the importance of traditional knowledge systems and practices tied to the land. Protecting historic structures and landscapes helps maintain the cultural identity of Guam's communities, fosters a sense of place, and can support sustainable economic development through heritage tourism. In this way, the GPT plays a vital role in ensuring that Guam's future growth is rooted in respect for its past.

6.2.3. Vibrant Culture Through Land Use Planning and Policy

Guam's land use future cannot be charted without reckoning with its colonial past. The dual mandates of the CLTC and the GALC represent enduring efforts to return land, dignity, and opportunity to those whose ancestral ties to the land have been disrupted by war, militarization, and systemic dispossession. Yet despite decades of legal authorization, both agencies continue to face implementation barriers—from legal constraints and underdeveloped land inventories to access, infrastructure, and zoning issues that hinder land use.

At the heart of these challenges is a disconnect between land restitution and land readiness. For CLTC, inadequate infrastructure and encumbered lands have delayed thousands of leases from being utilized. For GALC, lands returned to families are often landlocked or lack zoning alignment, while unreturned lands remain inaccessible due to federal jurisdiction. These obstacles have been further compounded by under-resourced agencies and a planning framework that has historically treated land return as somewhat peripheral rather than integral to Guam's development strategy.

Integrating CLTC and GALC into Guam's comprehensive land use framework presents a powerful opportunity to align sustainability with land justice. This also requires recognizing the cultural dimensions of land—not just as property, but as identity, inheritance, and continuity. Here, the work of the Department of CHamoru Affairs (DCA) and the Guam Preservation Trust (GPT) is central. DCA promotes cultural revitalization and CHamoru self-determination, while GPT protects sites of historical, cultural, and architectural significance. Both are critical partners in ensuring that returned and trust lands are developed in ways that preserve heritage, support language and cultural practices, and serve as spaces for education, ceremony, and community resilience.

Looking ahead to 2050, Guam must embrace a land use paradigm grounded in restorative justice, cultural sovereignty, and sustainability. A modernized, integrated approach—linking

CLTC, GALC, DCA, GPT, and land management agencies—can build a future where land is not only returned, but also ready, accessible, and alive with purpose. This supports a land use policy framework addressing the following components:

1. Integrated Land Inventory and Suitability Mapping. Mandate a comprehensive, GIS-based land inventory that includes CLTC, GALC, and public lands, with cultural and historic overlays contributed by DCA and GPT. This system would identify usable lands, cultural and historic sites, encumbrances, and development potential in a single, cross-agency system, so that planning decisions are informed by cultural and historical knowledge as well as infrastructure and zoning constraints.

2. Prioritized Infrastructure Investment on CLTC and GALC Lands. Prioritize CLTC and GALC parcels in the capital improvement plan (CIP), and incorporate site significance data from GPT to avoid conflict with heritage assets, consistent with other land use objectives of the G50SP. The purpose would be to develop essential infrastructure without compromising culturally sensitive or historic areas. Trust and ancestral lands must be supported with infrastructure if appropriate for development, or protected where other land use objectives dictate.

3. Land Access, Zoning, and Cultural Alignment. Establish a "Land Access and Readiness" overlay zone that accelerates rezoning and right-of-way planning for trust and ancestral lands, while preserving cultural integrity. This would unlock development while ensuring land use remains consistent with CHamoru values and cultural protections, consistent with rationale that development must be culturally grounded, especially when it involves ancestral sites or traditional uses.

4. Cross-Agency Land Justice and Cultural Planning Task Force. Create a permanent interagency task force including CLTC, GALC, Department of Land Management, Public Works, DCA, and GPT. The task force could coordinate on land readiness, cultural preservation, and beneficiary needs; and resolve conflicts in land use and development. It would help overcome

the current agency fragmentation that can undermine progress; integrating cultural and land planning expertise will produce more just and culturally appropriate outcomes.

5. Legal Readiness and Beneficiary Protections. Incorporate legal support, rulemaking assistance, and constitutional review mechanisms into land use planning for both commissions to help finalize long-delayed rules (especially for GALC's Land Bank Trust), clarify eligibility, and defend against legal challenges. Legal uncertainty has long delayed trust implementation and beneficiary access to land and lease dividends.

6. Community-Led, Culturally-Informed Development Frameworks. Facilitate community design charrettes and planning workshops on CLTC and GALC lands, in collaboration with DCA and GPT to ensure developments reflect CHamoru cultural values, traditional knowledge, and sustainability principles. Ground-up planning builds legitimacy, protects cultural landscapes, and aligns with sustainability goals.

6.2.4. Guam's Historic Sites

Guam faces a range of land use issues related to the protection of its historic and cultural resources, rooted in the island's unique colonial history, indigenous CHamoru heritage, and strategic geopolitical significance. The island is home to a wealth of historic sites, from ancient latte stone villages and Spanish colonial structures to World War II-era fortifications. However, rapid development, population growth, and U.S. military expansion have placed increasing pressure on these sites, often creating tensions between preservation and progress. Land use planning must navigate complex jurisdictional boundaries and the competing interests of private landowners, developers, the Government of Guam, and federal agencies.

6.2.5. Protecting Historic Resources

A major challenge in protection of historic resources is the limited integration of historic preservation goals into broader land use and development frameworks. Guam's zoning laws and permitting processes do not always prioritize or adequately protect historic resources, which can lead to the disturbance of culturally significant sites. To address these gaps, the Guam Historic Preservation Office (GHPO) plays a central role in overseeing the identification, documentation, and protection of historic and archaeological resources. GHPO administers programs under the National Historic Preservation Act, including Section 106 reviews, and works to ensure that federal and local undertakings consider impacts on heritage sites. It also maintains the Guam Historic Properties Inventory, coordinates archaeological surveys, and provides technical assistance to agencies, developers, and landowners.

Guam's historic and cultural resources include both tangible and intangible assets. Physical resources include archaeological sites, burial sites, historic buildings, and more. Non-tangible resources may include traditional stories, chants, traditional knowledge, community values, and religious practices. Cultural knowledge and practices have been passed down for many generations and continue to help influence and define the cultural identity of Guam (GSHPO 2022). Organizations such as the Micronesian Archaeological Research Services continue to study and preserve indigenous island cultures of the western Pacific, including Guam.

There are currently 134 sites on Guam that are on the National Register of Historic Places, including one National Historical Park: War in the Pacific National Historical Park. The National Register of Historic Places which was established under the National Historic Preservation Act. The 134 historic sites are spread across 17 of the 19 villages of Guam. The oldest archaeological sites on Guam date back hundreds of years before western contact first occurred in 1521 (Dept. of the Navy 2010). Guam's historic resources also reflect its former status under Spanish rule, occupation by Japan, and two American territorial periods (Dept. of the Navy 2010).

A Timeline of Guam's Historical Periods

(Summarized in the Guam State Historic Preservation Office 2023-2027 Plan)

1500 – 1000 B.C.E., Early Pre-Latte Period
1000 – 500 B.C.E., Middle Pre-Latte Period
500 B.C.E. – 500 C.E., Late Pre-Latte Period
500 – 800 C.E., Transitional
800 – 1100 C.E., Early-Latte Period
1100 – 1350 C.E., Mid-Latte Period
1350 – 1521 C.E., Late Latte Period
1521 – 1668 C.E., Pre-Colonial European Trade Period
1668 – 1700 C.E., Spanish Missionization Period / CHamoru Spanish Wars
1700 – 1898 C.E., Spanish Colonial Period
1898 – 1941 C.E., First American Territorial Period
1941 – 1944 C.E., World War II - Japanese Military Occupation
1944 – 1950 C.E., Post-World War II / Second American Territorial Period
1950 – Present, Political and Economic Development Period

Despite its critical role, GHPO faces staffing and funding limitations that constrain its ability to proactively manage historic resources across the island. With a small team, it must respond to a high volume of development proposals and land use changes that may affect historic sites. The office also works to support education and public outreach through training workshops, preservation awareness events, and partnerships with schools and community organizations. These programs aim to increase local understanding of Guam's heritage and to build support for preservation efforts, particularly among younger generations.

Land ownership and access remain complex and politically sensitive issues that further complicate preservation. As discussed above, a significant portion of Guam's land is held by the U.S. military, including areas with known or potential archaeological resources. Many CHamoru communities continue to call for the return of ancestral lands and stronger protections for sacred sites, often located within or near military installations. GHPO participates in consultations related to military development projects, reviewing environmental and cultural impact assessments to identify and mitigate risks to cultural heritage. However, some advocates argue that these reviews need to be more transparent and inclusive of indigenous voices.

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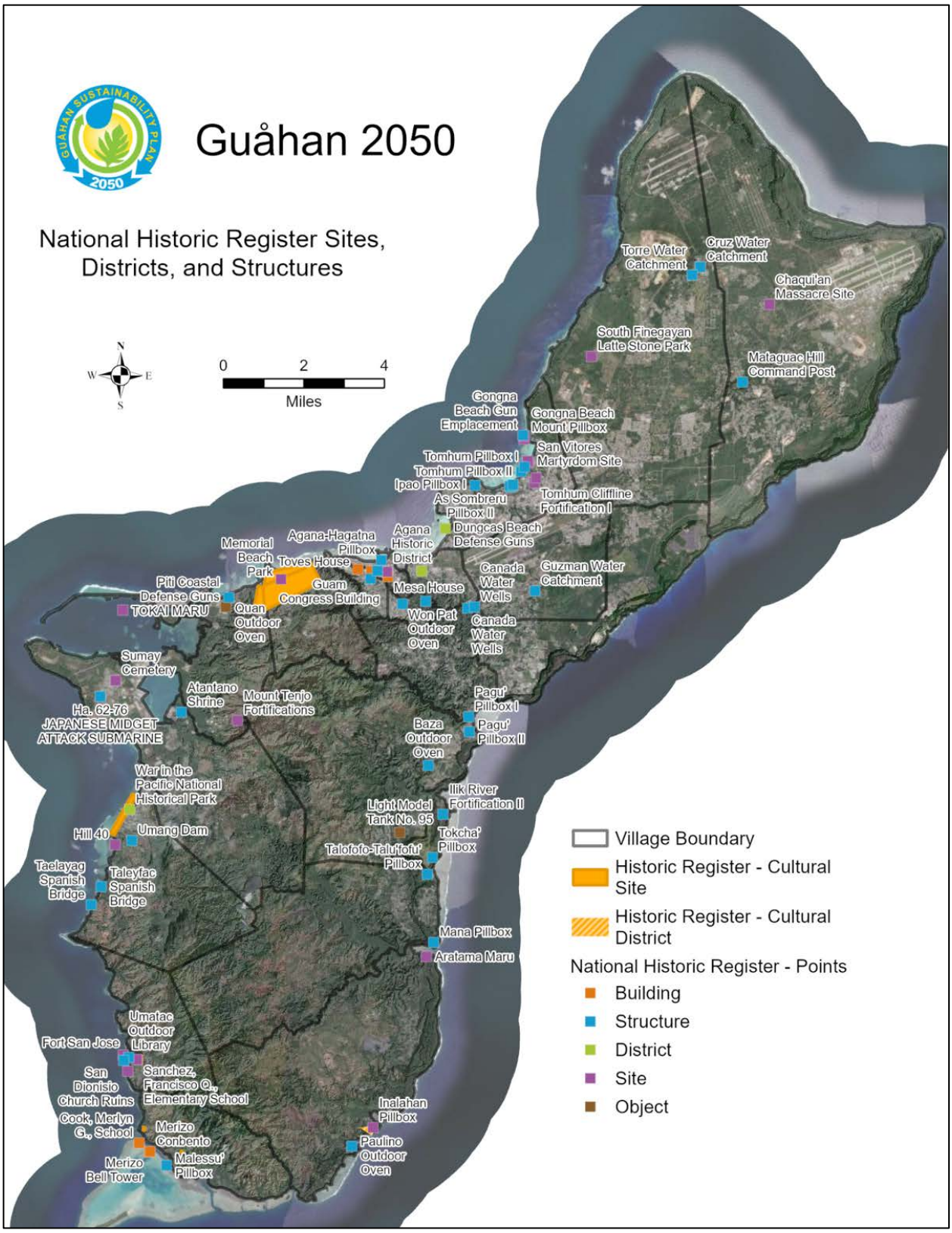

Figure 6-3. National Historic Register Sites, Districts and Structures

Looking ahead, improving land use outcomes for historic resource protection will require sustained investment in GHPO's capacity, closer collaboration between government agencies and CHamoru stakeholders, and greater integration of cultural resource management into land use planning. A recent audit of the Guam State Historic Preservation Office (GSHPO) and the Guam Historic Resources Division (GHRD) highlighted important areas for improving the island's approach to protecting historic and cultural resources through land use planning (Guam OPA, 2025). The audit found that while GSHPO plays a central role in reviewing development projects for potential impacts to historic sites, many of its current practices are not fully aligned with Guam's existing laws, which were mostly written decades ago. Clarifying GSHPO's authority, responsibilities, and relationship to other agencies through legislative updates would help streamline operations and reduce confusion in the permitting process.

The audit also identified the need for a comprehensive, island-wide inventory of historic and archaeological sites. Although GSHPO maintains internal records, the absence of a complete and publicly accessible mapping system creates challenges for developers, landowners, and planners seeking to understand where cultural resources may be present. Enhancing and sharing this data would support more informed land use decisions, reduce permitting delays, and better protect Guam's rich heritage.

Improvements to internal procedures—such as standardizing permit reviews, formalizing rules and regulations, and ensuring that application documentation is complete and properly tracked—will also support more consistent and efficient decision-making. As part of Guam's broader sustainability goals, strengthening GSHPO's capacity and integrating cultural resource protection into land use planning policies can help balance responsible development with long-term preservation of the island's unique historical and cultural identity. Updating local

legislation, expanding community education efforts, and ensuring early and meaningful consultation on development projects are essential steps toward safeguarding Guam's diverse and irreplaceable historic legacy.

6.2.6. Cultural and Historic Preservation and Sustainability

The Guåhan Sustainability Plan's cultural heritage and indigenous connections policies align closely with multiple United Nations Sustainable Development Goals (SDGs), particularly SDG 11 (Sustainable Cities and Communities), SDG 4 (Quality Education), SDG 8 (Decent Work and Economic Growth), SDG 16 (Peace, Justice and Strong Institutions), and SDG 17 (Partnerships for the Goals). By emphasizing the preservation of historic sites, cultural landscapes, and traditional practices, plan policies reflect the targets under SDG 11.4, which focuses on strengthening efforts to protect and safeguard the world's cultural and natural heritage. The proposed overlay zones, GIS mapping, and integrated planning tools also support inclusive and sustainable urban planning (SDG 11.3), ensuring that development is compatible with Guam's cultural identity.

Other policies that prioritize community engagement, education, and intergenerational learning align with SDG 4.7, emphasizing education for sustainable development and appreciation of cultural diversity. These initiatives promote community stewardship of heritage resources while fostering a deeper understanding of indigenous knowledge among younger generations. The incorporation of cultural heritage into curricula and the promotion of oral histories directly support lifelong learning and cultural awareness.

The plan's focus on cultural tourism, adaptive reuse of historic structures, and infrastructure investments on culturally significant lands contributes to sustainable economic growth under SDG 8.9, which calls for policies that promote sustainable tourism and local culture. Furthermore, the establishment of strong partnerships, legal frameworks, and interagency coordination demonstrates commitment to SDG 16.6 and 17.17 by promoting accountable institutions, transparent governance, and cross-sector collaboration in cultural conservation and land use planning.

Finally, the G50SP supports the principle of balancing conservation with development and enhancing access to cultural heritage, echoing SDG 10.2 and 11.7 goals around inclusivity and equitable access to public spaces. By integrating cultural values into building design, land use zoning, and planning frameworks, the policies advance an overarching vision of sustainable

development rooted in Guam's unique identity, reinforcing resilience and equity across generations.

6.2.7. Cultural and Historic Resource Protection Land Use Policies

Cultural Heritage and Indigenous Connections

VC-1. Preservation of Historic Sites and Heritage.
Designate and protect culturally and historically significant areas through zoning ordinances and conservation districts to ensure Guam's cultural heritage is preserved and not adversely impacted by new growth and development. Consider establishing a "Land Access and Readiness" overlay zone that accelerates rezoning and right-of-way planning for trust and ancestral lands, while preserving cultural integrity.

VC-2. Historic and Cultural Properties, Sites, and Resources.
Conduct comprehensive surveys and mapping of Guam's cultural and historic resources to ensure their inclusion in land use planning. Identify, preserve, and protect historic/cultural properties. Establish buffer zones around historic/cultural sites to prevent encroachment from incompatible land uses.

VC-3. Integrated Historic and Cultural Resource GIS System.
Create a comprehensive, GIS-based land inventory that includes CLTC, GALC, and public lands, with cultural and historic overlays contributed by DCA and GPT.

VC-4. Preserve Traditional Practices and Knowledge.
Designate areas for the continuation of traditional CHamoru cultural practices, such as farming, fishing, and weaving. Support cultural festivals, educational programs, and workshops that preserve and celebrate Guam's heritage.

VC-5. Strong Partnerships.
Establish strong partnerships between the Guam Historic Preservation Office, village communities, the Guam Preservation Trust, and other interest community members and organizations to support preservation of Guam's cultural heritage

VC-6. Cross-Agency Land Justice and Cultural Planning Task Force.
Create a permanent interagency task force including CLTC, GALC, Department of Land Management, Public Works, DCA, GPT, and BSP. The task force shall coordinate on land readiness for meeting land transfer and heritage preservation goals, potential beneficiary needs; and resolving conflicts in land use and development, including meeting other objectives of the G50SP.

Community Involvement and Engagement

VC-7. Collaboration.

Facilitate collaboration with the village communities in identifying, preserving, and managing cultural heritage sites.

VC-8. Awareness.

Promote public awareness programs to educate residents and visitors about Guam's cultural heritage.

Regulation of Development Activities

VC-9. Impact Assessment.

Require cultural and historical impact assessments for all major development projects.

VC-10. Protecting Historic Sites.

Implement strict regulations to prevent the destruction or alteration of historic sites, including penalties for violations.

VC-11. Prioritize Infrastructure Investment on CLTC and GALC Lands.

Prioritize CLTC and GALC parcels in capital improvement planning, and incorporate site significance data from GPT to avoid conflict with heritage assets, consistent with other land use objectives of the G50SP.

Promote Adaptive Reuse of Historic Structures

VC-12. Reuse Historic Buildings.

Encourage the rehabilitation and adaptive reuse of historic buildings for modern purposes while maintaining their cultural integrity. Provide incentives such as grants or tax breaks for property owners who preserve and restore historic structures.

Sustainable Tourism Practices

VC-13. Cultural Tourism.

Encourage tourism activities that respect and highlight Guam's cultural heritage without causing degradation to historical sites, natural areas, and Guam’s inherent beauty.

VC-14. Enhancing Cultural Experiences.

Develop heritage trails and cultural centers to enhance visitor experiences while protecting sensitive areas.

Integration into Land Use Planning

VC-15. Cultural Landscapes, Sites, and Practices.

Ensure that land use plans incorporate measures to protect cultural landscapes, archaeological sites, and traditional CHamoru practices.

VC-16. Designate Cultural Preservation Sites.

Prioritize the preservation of cultural sites in land use designations and infrastructure development.

VC-17. Building Design and Construction.

Encourage building construction and design guidelines that help create 'people places' based on architectural designs from pre-war era Guam and other Pacific nations, while encouraging innovation and design excellence. Design public buildings consistent with village character, cultural context, and public function.

Partnership with Cultural Organizations

VC-18. Strengthen Partnerships.

Strengthen partnerships with institutions like the Guam Preservation Trust and the Department of CHamoru Affairs and other local museums and artifact repositories, to support conservation efforts. Secure funding and technical expertise to maintain and restore cultural heritage assets.

VC-19. Balance Development and Conservation.

Protect and enhance natural landscapes for recreation and cultural activities while preserving ecological integrity. Foster sustainable growth that respects the cultural and historical fabric of Guam by aligning development projects with heritage conservation goals. Develop urban design guidelines that reflect and honor the island's cultural identity.

VC-20. Enhance Accessibility to Cultural Heritage.

Improve infrastructure to provide safe and sustainable access to cultural and historic sites for both residents and tourists. Utilize technology, such as virtual tours and augmented reality, to share Guam's history while reducing physical strain on sensitive sites.

VC-21. Strengthen Legal Frameworks.

Update and enforce laws related to the protection of cultural heritage, ensuring alignment with international standards such as UNESCO guidelines. Empower local authorities with the legal tools to intervene and prevent activities that threaten cultural resources.

VC-22. Promote Intergenerational Learning.

Foster programs that connect younger generations with elders to learn about the island's history, language, and traditions. Incorporate Guam's cultural heritage into school curriculums to ensure continuity of knowledge.

VC-23. Support Research and Documentation.

Encourage and promote academic research and community-based projects that document Guam's history, oral traditions, and archaeological findings, such as the Guam

Cultural Repository (*Sagan Fandipositon Kotturåt Guåhan*) at the University of Guam. Develop an accessible digital archive for historical and cultural records.

6.3. Community Mental Health, Physical Health and Well-being

Community well-being is the foundation of a vibrant and resilient culture. On Guam, where the health of both people and land are deeply interconnected, the built environment—including how land is used, developed, and preserved—plays a critical role in supporting physical and mental health. The Guåhan Sustainability Plan recognizes that sustainable land use planning can reduce health disparities, promote active lifestyles, and ensure equitable access to services and green space for all residents.

6.3.1. Integrating Health Priorities into Land Use Planning

The Guam Department of Public Health and Social Services (DPHSS) identifies key community health indicators including obesity, tobacco and alcohol use, infant mortality, and traffic fatalities. Cardiovascular disease remains the island's leading cause of death, followed closely by cancer. These non-communicable diseases (NCDs), which are influenced by lifestyle factors such as diet and physical activity, can be addressed through thoughtful design of the spaces where residents live, work, and play.

The 2019–2023 NCD Strategic Plan set goals to increase physical activity and fruit and vegetable consumption across Guam. Despite challenges—including increasing youth inactivity—the plan prioritizes policies to expand opportunities for movement and access to nutritious local food. Key strategies include creating active spaces in schools, community centers, and workplaces, and promoting community gardens and healthy food environments. Enforcement of Public Laws 31-141 (Healthy Vending Machine Policy) and 32-085 (Healthy Food Establishments), along with a proposed tax on sugar-sweetened beverages, complement these land-based interventions.

Land use policies in the G50SP can reinforce these objectives by:

- Requiring pedestrian infrastructure and bike paths in new developments
- Ensuring access to recreational spaces and gardens within walking distance of homes
- Encouraging mixed-use zoning that brings food, services, and wellness opportunities closer to residents

In short, land planning is health planning—and investing in walkable, green, and connected communities directly supports physical health.

6.3.2. Expanding Access to Health Services

Equitable access to essential services is another core aspect of well-being. Guam faces persistent challenges in health care delivery due to its geographic isolation, small population,

and limited medical infrastructure. These barriers disproportionately affect rural and underserved areas, where health clinics and emergency services may be absent or outdated.

The Sustainability Plan addresses these gaps by supporting policies that prioritize health facilities in development approvals. Policies call for expanded investment in health infrastructure, especially in areas where access is currently limited. This includes culturally competent clinics, emergency response stations, and wellness centers designed to serve diverse and multilingual populations. The land use plan also recognizes the current effort to site work toward potentially developing a new hospital and has assigned a property designation accordingly.

Mental health is another area of urgent need. The Guam Behavioral Health and Wellness Center (GBHWC) serves as the island's central provider of mental health and substance use services. Despite earning a three-year CARF accreditation, the Center has identified opportunities to strengthen its service delivery, infrastructure, and engagement with clients. Land use strategies that support mental health include:

- Preserving quiet, natural spaces for reflection and healing
- Locating behavioral health facilities near transportation corridors and population centers
- Ensuring new developments include supportive housing and community service centers

The plan encourages cross-sector partnerships—between developers, health providers, and local agencies—to embed these services into the fabric of everyday life.

6.3.3. Supporting Vulnerable Communities

Equity is at the heart of a sustainable and vibrant culture. Guam's foster care system, behavioral health services, and programs for individuals with disabilities face resource shortages and staffing gaps, exacerbated by high demand and economic hardship. As of 2024, only 80 licensed foster families serve more than 670 foster children, often placed in care due to poverty and substance use.

Land use planning can support these vulnerable populations by:

- Allocating space for family support services, emergency shelters, and affordable housing
- Ensuring every village has access to inclusive public spaces and health services within a 15-minute walk
- Prioritizing infrastructure investments in disadvantaged communities

For individuals with disabilities, inclusive design standards must be embedded into zoning codes, public infrastructure, and parks planning to ensure accessibility and independence.

Land use planning and development decisions can also take into account social vulnerability broadly to guide and prioritize outcomes. The recent Guam Hazard Mitigation Plan developed a social vulnerability index (SVI) for Guam drawing on recognized methodologies for

understanding factors that shape the vulnerability of specific communities and populations. Such factors include demographic characteristics like age and socio-economic status, housing and environmental conditions, such as the availability of services, and access to communication services, such as phone and internet service. Figure xx shows the ranking of each of Guam's villages based on this SVI assessment in the GHMP.

Table 8. Social Vulnerability Index (SVI) and Percentile Rank for the 19 Municipalities in Guam Stratified by Methodology[16]

CDC Methodology			Adjusted Methodology*		
Rank	SVI	Municipality	Rank	SVI	Municipality
1	1.00	Agat	1	1.00	Agat
2	0.94	Merizo	2	0.94	Dededo
3	0.89	Hagatna	3	0.89	Yigo
4	0.83	Mongmong-Toto-Maite	4	0.83	Hagatna
5	0.78	Dededo	5	0.78	Umatac
6	0.72	Mangilao	6	0.72	Mangilao
7	0.67	Umatac	7	0.67	Merizo
8	0.61	Yigo	8	0.61	Mongmong-Toto-Maite
9	0.56	Sinajana	9	0.56	Inarajan
10	0.50	Yona	10	0.50	Chalan Pago-Ordot
11	0.44	Barrigada	11	0.44	Barrigada
12	0.39	Inarajan	12	0.39	Yona
13	0.33	Chalan Pago-Ordot	13	0.33	Sinajana
14	0.28	Agana Heights	14	0.28	Talofofo
15	0.22	Talofofo	15	0.22	Tamuning
16	0.17	Tamuning	16	0.17	Agana Heights
17	0.11	Asan-Maina	17	0.11	Asan-Maina
18	0.06	Santa Rita	18	0.06	Santa Rita
19	0.00	Piti	19	0.00	Piti

* Adjusted for Guam definition of minority (neither CHamoru nor Filipino) and additional Guam-specific variables on housing, connection, and other minority indicators.

Figure 6-4. Social Vulnerability of Guam's Villages (Guam Homeland Security, 2024).

6.3.4. Childcare and Community Infrastructure

High-quality, affordable childcare enables families to thrive. The Bureau of Child Care Services (BCCS) under DPHSS plays a key role in expanding access to early childhood and afterschool programs for working families. Land use policy can support this mission by:

- Encouraging the integration of childcare facilities in residential and commercial zones
- Offering incentives for developments that include on-site early learning centers
- Ensuring safe routes to childcare through improved pedestrian infrastructure

These strategies directly support workforce participation and long-term child development.

6.3.5. Leveraging Parks and Open Spaces for Community Health

Guam's parks, natural areas, and recreational facilities are vital community assets that provide space for physical activity, stress relief, cultural connection, and climate resilience. The Guam Department of Parks and Recreation (DPR) serves the island's residents and visitors by managing public parks, beaches, recreational facilities, community programs, and preserving historical and cultural resources. The DPR oversees approximately 68 public parks and beaches, including 12 beach parks, manages Guam's only public cemetery, and as summarized above, is responsible for protecting historic areas, buildings, and sites significant to Guam's history. Figure xx shows the general location of DPR's park assets. These areas encompass 1,261 acres of public land. The DPR's Parks Division is tasked with controlling, managing, developing, and maintaining all of the areas within the Guam Territorial Park System.

Parks and Recreation Strategic Goals

- Promote healthy active lifestyles through community recreation programs, public-private partnerships, and development of public recreational facilities and public parks.
- Maintain clean and safe public parks, beaches and restrooms for island residents and visitors alike.
- Promote, preserve and protect Guam's rich cultural and historical resources.
- Identity, evaluate, and nominate historic properties.
- Strengthen community involvement in historic preservation.
- Establish strong partnerships.
- Improve efficient retrieval of information for research and distribution.

DPR CITIZENS CENTRIC REPORT FY2021.

In addition to its management responsibilities, the DPR plays a role in land use planning by ensuring that new residential subdivisions and planned unit developments meet requirements for parks and recreation functions. This integration aims to enhance the quality of outdoor recreation resources and accommodate the anticipated growth of Guam's population, which will place additional demands on parks and recreation services. The DPR also is involved in the Guam Territorial Park System's development and maintenance, classifying areas as Natural Preserves, Conservation Reserves, Historic Sites, or Recreation Areas. This classification guides the appropriate use and development of these lands, balancing conservation efforts with public access and recreation needs. The DPR faces several challenges in its operations. One significant issue is inadequate funding, which hampers the Park Patrol's ability to meet growing demands. Challenges include understaffing, limited resources, and outdated equipment. Such resources are necessary in part to ensure safety and security in DPR-managed areas.

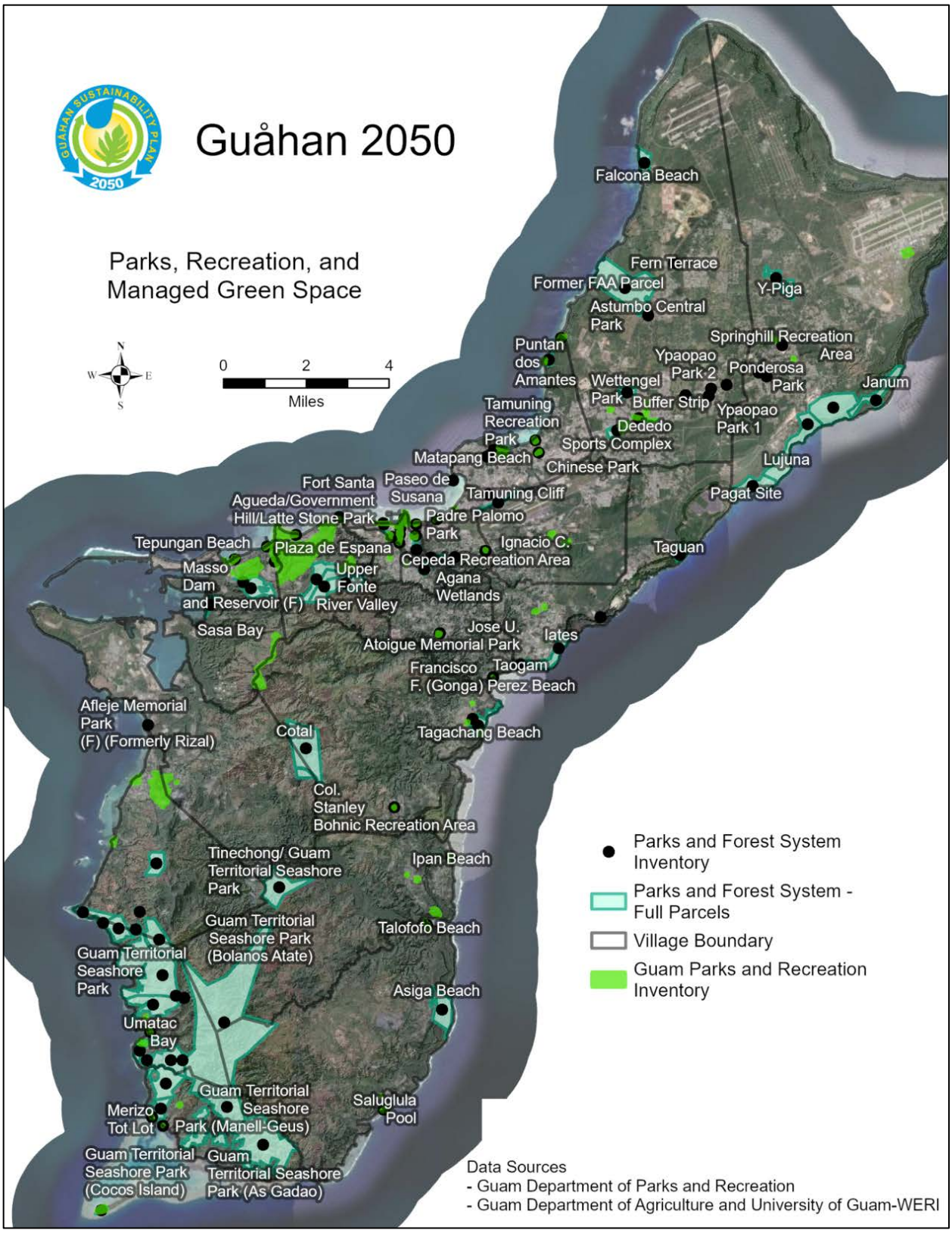

Figure 6-5. Parks and Recreation Areas on Guam.

From a land use planning perspective, it is important that parks and open spaces areas are both adequate and equitably distributed to serve the population. Guam has a significant number of parks and recreation facilities, as well as other lands available for public use and enjoyment. In addition to the 1,261 acres of land programmed specifically for parks and recreation, as of 2014 DPR also managed an additional 5,414 acres of undeveloped property. In addition, and in some cases adjacent to these realized and potential areas are nearly 10,000 acres of green space within Guam's Forest System Inventory, and roughly 5,000 acres of managed space in ecological preserves, conservation areas, and the territorial seashore reserve. These large expanses of nearby green or open space offer varying levels of recreational opportunities, and have potential to greatly expand access in instances where associated land management, e.g. conservation areas, may be compatible with certain recreational opportunities. Figure x and Table x highlight parks, recreation and green space access by village, including the basic DPR land inventory, as well as all open and green spaces within each village.

Table 6-1. Parks, Recreation, and Green Space on Guam.

Village	Area (Sq. Mi.)	Population (2020)	Park Area per Capita (SF)	Percent of Village Recreation or Park Space	Village
Humåtak	6.1	647	850.3	0.32	100
Hågat	10.6	4515	1435.7	2.19	68.9
Malesso'	6.0	1604	144.7	0.14	57.6
Santa Rita	16.4	6470	187.4	0.26	40.7
Yigo	35.8	19339	45.9	0.09	39.7
Piti	7.3	1585	4598.5	3.56	34.8
Dededo	30.3	44908	38.7	0.21	32.2
Asan-Ma'ina	5.7	2011	13506.5	17.17	31.3
Talo'fo'fo	17.8	3550	321.3	0.23	25.6
Hagåtña	0.8	943	2620.3	10.48	24.5
Inålahan	18.7	2317	134.2	0.06	8.2
Sinajana	0.9	2611	15.7	0.16	7.7

Village	Area (Sq. Mi.)	Population (2020)	Park Area per Capita (SF)	Percent of Village Recreation or Park Space	Village
Yona	20.3	6298	318.8	0.36	5.4
Tamuning	5.7	18489	103.4	1.2	3.2
Mangilao	10.3	13476	17.8	0.08	3.1
Mongmong-To'to-Maite'	1.8	6380	6.9	0.09	0.8
Agana Heights (Paasan)	1.0	3673	22.6	0.29	0.7
Chalan Pagu-Otdot	5.7	7064	18.9	0.08	0.3
Barrigada	8.5	7956	31.4	0.11	0.3

As shown, access to these park resources is uneven. For example, while villages like Piti and Hagåtña have abundant green space per capita, others like Dededo, Yigo, and Mongmong-Toto-Maite all have much less so.

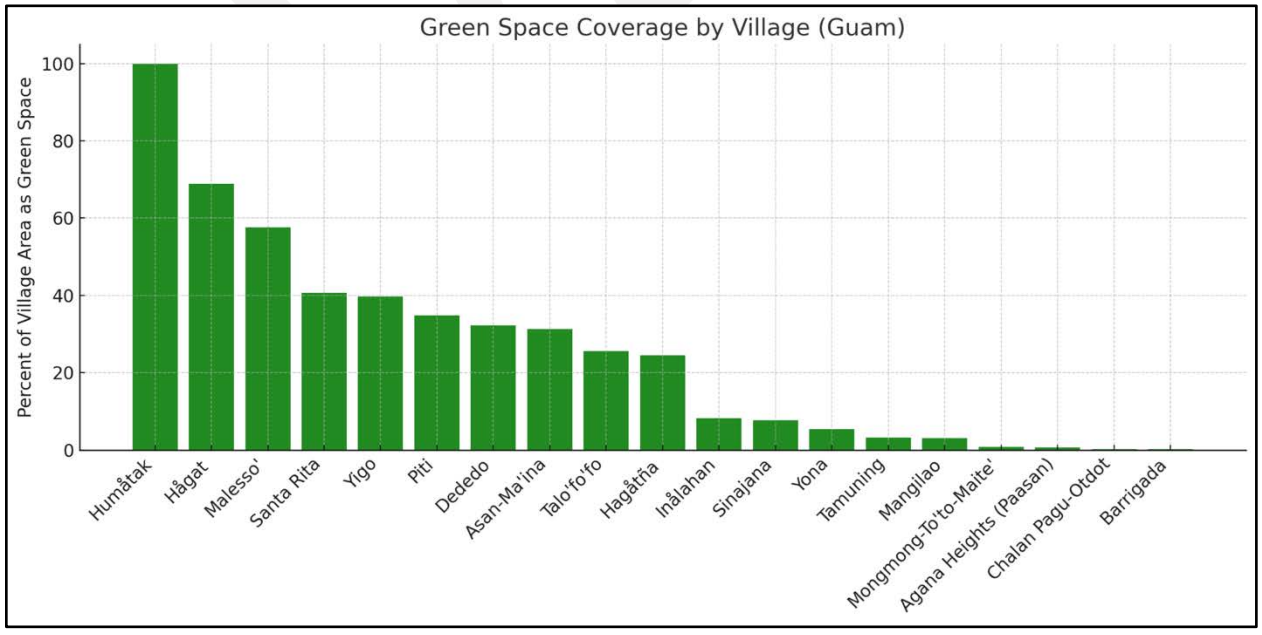

Figure 6-6. Green Space Coverage by Village (Data Sources: Guam Department of Parks and Recreation, Guam Department of Agriculture, National Park Service, Guam Bureau of Statistics and Plans).

Access to areas that are specifically managed for recreational purposes, primarily through DPR and the National Park Service, are largely concentrated along the central-west coastal villages and associated community centers. Hågat, Hagåtña, Piti, and Asan-Ma'ina in particular have a variety of recreational opportunities, community and urban parks, and accessible shorelines distributed along primary transportation routes and popular reaches of shoreline, and the highest ratio of parks and open spaces per resident. Talo'fo'fo and Humatak also maintain a larger amount of green space access relative to the rest of the island, with coastal and seashore parks in particular featuring as key community assets.

While the other northern and central villages maintain key community facilities, including popular sports complexes and community centers, these spaces have not expanded in pace with residential growth, and may require particular attention in the face of projected expansion of development in this region of Guam. In Southern Guam, growth and development pressures are less pressing, although a surge of interest in restoration of natural areas throughout upper watersheds and along the shoreline, present a key moment of opportunity to align with SCORP objectives.

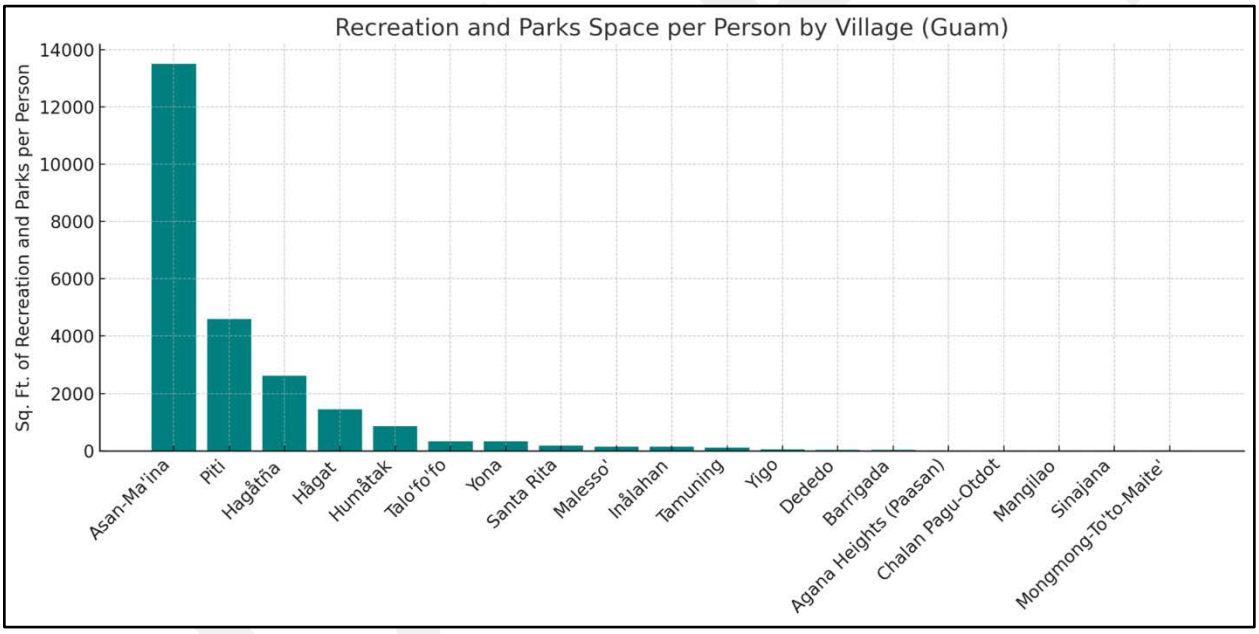

Figure 6-7. Recreation and Park Space per Person by Village

Guam has addressed these concerns in the most recent Statewide Comprehensive Outdoor Recreation Plan (SCORP) in 2014. This plan articulated primary goals as:

- Enhancing the quality of outdoor recreation resources
- Increasing the quantity of outdoor recreational resources
- Improving public awareness of available outdoor recreational resources
- Encouraging intergovernmental and private sector planning to meet the growing outdoor recreation needs of the Territory

The plan also supported targeted investments in:

- New and revitalized parks in growing residential areas
- ADA-accessible trails, outdoor fitness zones, and community gardens
- Shoreline access, nature reserves, and urban forests

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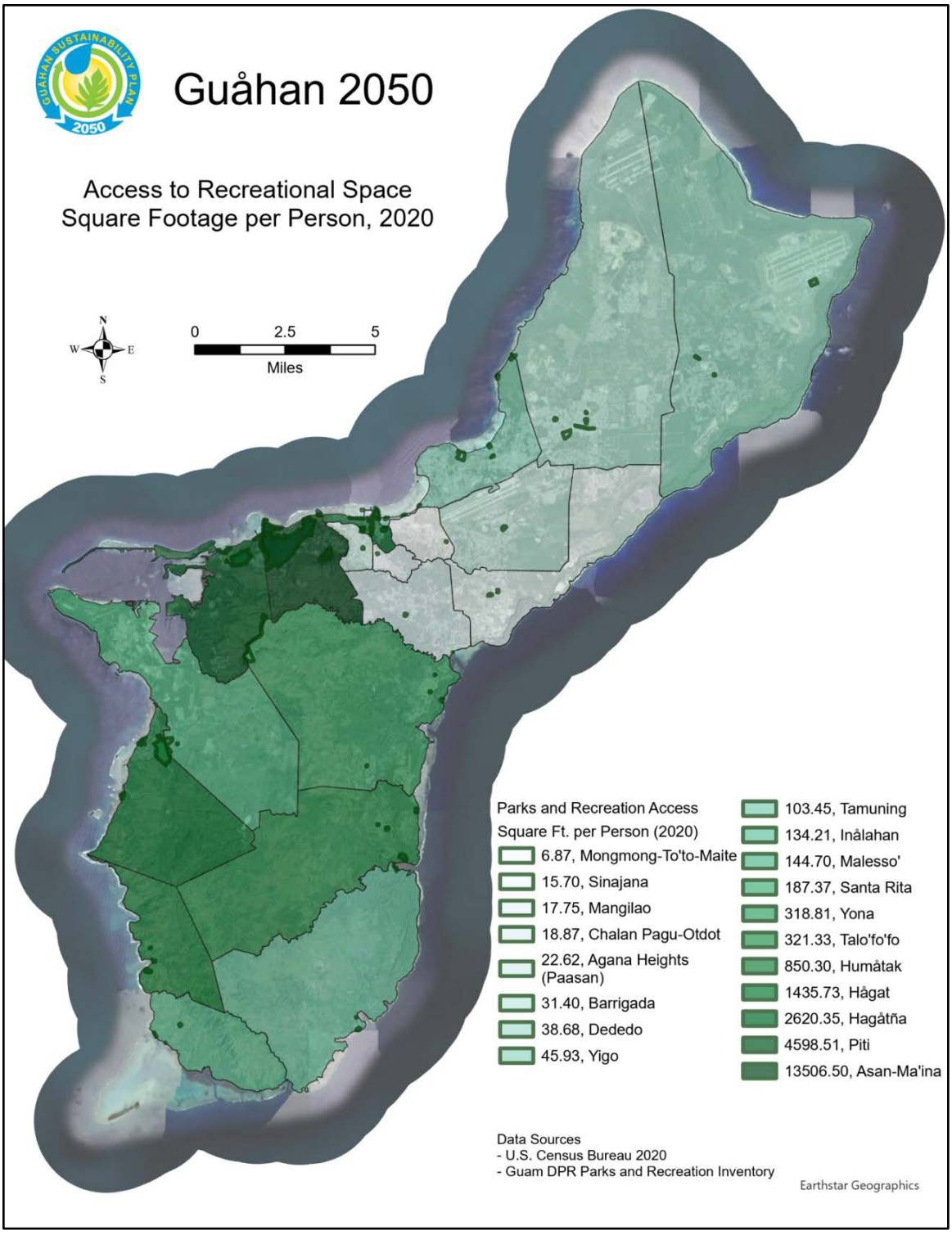

*Figure 6-8. Map highlighting village access to parks and recreation as a ratio of population to area, including Guam DPR facilities NPS National Historic Park units. Table x – Parks, Recreation, and Green Space Areas by Village. *Any Green Space includes Guam Forest System Inventory, National Wildlife Refuge, Seashore Park, Conservation Areas, Natl. Park Service Units, and Guam DPR Inventory*

Embedded in these goals and targets are land use planning implications, particularly with respect to increasing the quantity of resources, and enhancing quality in part through enabling or ensuring greater access. Input gathered through public meetings, user surveys, and agency feedback have highlighted the need to leverage partnerships with the private sector and entities involved in Guam's development (SCORP 2014). The latter have a potential role in the programming of undeveloped areas wherein new growth can be paralleled by new or enhanced allocations of green space, particularly during the land use decision-making and negotiation process. Other land use objectives, such as integrating climate-resilient designs—such as shaded walkways, stormwater gardens, and wind-resistant structures—will help ensure that parks and public spaces remain safe, comfortable, and usable in Guam's changing climate.

6.3.6. Public Shoreline Access

Public access to Guam's shoreline is both a cultural right and a legal guarantee rooted in traditional practices and supported by the Ocean Shore Public Access Law of 1987. The island's coastline has long served as a vital space for fishing, recreation, cultural ceremonies, and family gatherings. However, increasing development pressures and privatization of coastal areas have limited access to many parts of the shoreline, particularly where traditional rights-of-way have been obstructed or neglected. This has not only infringed on the public's right to free movement in public spaces, but also impacted community well-being and the preservation of cultural lifeways tied to the ocean.

To address these issues, the law establishes clear requirements for the protection and maintenance of traditional access routes such as footpaths, bull cart trails, and roads historically used by the public. It prohibits the blocking of these paths by private landowners and ensures that development permits are contingent upon maintaining or providing alternative public access to the shore. This creates a foundation for Parks and Recreation, in coordination with land use planning agencies, to actively defend existing pathways and prevent further loss of shoreline accessibility due to unregulated development.

Beyond preserving traditional access, the law empowers the Department of Parks and Recreation to acquire new rights-of-way where existing ones are insufficient or unavailable. This authority is essential for creating equitable access, especially in areas where land ownership patterns or physical barriers have left communities cut off from the coast. Additionally, any government land situated between a public highway and the ocean must include a perpetual public easement before it can be transferred, ensuring long-term access across public property.

Incorporating these legal safeguards into long-range planning will be critical for upholding the vision of the Guåhan 2050 Sustainability Plan. As shoreline use increases due to population growth and climate adaptation efforts, a proactive, legally informed strategy for access will ensure that all residents can enjoy Guam's coastal resources. Strengthening shoreline access policies through Parks and Recreation initiatives will support social equity, cultural vitality, and environmental stewardship—core values of a sustainable future for Guam.

6.3.7. Scenic and Visual Resource Protection

Guam's scenic and visual resources are among its most treasured assets, deeply tied to the island's natural character, cultural identity, and quality of life. From limestone cliffs overlooking vibrant coral reefs to historic coastal villages nestled in lush hills, these vistas provide not only recreational and aesthetic enjoyment, but also spiritual and cultural grounding for many CHamoru communities. As development pressures increase and sea level rise encroaches on coastal lands, the protection of scenic resources becomes both a land use and a cultural imperative.

Many of Guam's most iconic views are experienced from public overlooks, roads, trails, and coastal points such as Puntan Dos Amantes (Two Lovers Point), Mount Lamlam, and the overlooks at Cetti Bay and Umatac Bay. These views are often layered with ecological richness and historical significance, offering panoramas of intact limestone forests, coral lagoons, and historically important landmarks. Some of these areas, like Ritidian Point and the Fena Valley watershed, are also important for biodiversity conservation, reinforcing the importance of scenic landscapes as multi-benefit resources.

Current Guam law reflects the importance of protecting these landscapes. One of the objectives for the Seashore Reserve Plan, per Title 21 GCA Section 63107, is: "(E) Public access for maximum visual and physical use and enjoyment of the seashore reserve by the public." Title 21 GCA § 61504 recognizes the unique visual and ecological importance of Guam's beach areas, prohibiting indiscriminate building within 35 feet of the high-water mark and limiting the height of buildings within 75 feet. These restrictions serve not only to reduce environmental harm and preserve public access, but also to protect the visual quality of beachscapes, which are central to the island's identity and tourism economy. This legal framework supports stronger integration of visual quality into land use decision-making and coastal development controls.

Accordingly, the Guåhan 2050 Sustainability Plan elevates visual resource protection as a cross-cutting theme in the Land Use and Vibrant Communities elements. Land use policies VC-30

through VC-36 emphasize maintaining public access to scenic areas, locating incompatible uses away from critical view corridors, and reinforcing development restrictions near fragile coastal zones. Future land use planning efforts should expand view corridor mapping, designate additional scenic overlooks, and promote climate-resilient public infrastructure in ways that honor and preserve Guam's scenic heritage.

Below is a table of significant scenic viewpoints, which can serve as a basis for protection priorities, interpretive planning, or future updates to zoning and coastal management regulations. Map 6.xx shows the visual resources identified in the table. Additional viewpoints may be identified through participatory planning and local knowledge sharing.

Table 6-2. Significant Views and Scenic Resources on Guam.

Name	Village	Significance	Landscape
Puntan Dos Amantes (Two Lovers Point)	Tumon	limestone cliff with panoramic views of Tumon Bay and the Philippine Sea.	Sweeping views of lush volcanic hills, deep blue waters, and historic coastal terrain.
Cetti Bay Overlook	Umatac	Part of the Guam National Natural Landmark (together with Sella Bay and Fena Valley).	Sweeping views of lush volcanic hills, deep blue waters, and historic coastal terrain.

Name	Village	Significance	Landscape
Mount Lamlam and Mount Jumullong Manglo	Agat	Mount Lamlam is often described as the world's tallest mountain from base to peak (from the Marianas Trench base to its summit).	High-elevation views of southern Guam's rugged interior, forests, and coastlines.
Umatac Bay and Fort Nuestra SeÃ±ora de la Soledad	Umatac	Historic Spanish-era village and fort.	Classic southern Guam coastline with hills descending to a picturesque bay.
Ritidian Point (Guåhan National Wildlife Refuge)	Yigo	Northernmost point of Guam; limestone forest, endangered species habitat.	White sand beaches, turquoise lagoons, and dramatic cliffs.
Talofofo Falls and River Valley	Talo'fo'fo'	One of Guam's most accessible waterfalls.	Lush jungle river valley, waterfalls, and scenic trails.
Pago Bay and University of Guam Ridge	Mangilao	Major east coast bay with expansive ocean views and prominent limestone ridges.	Combination of coastal and inland views; coral reef and estuarine habitats.
Inarajan Pools and Coastline	Inarajan	Natural saltwater pools and lava rock formations.	Unique rocky shoreline with tidal pools and reef platforms.
Sella Bay Overlook and Trail	Umatac	Historic trail access to a remote bay.	Limestone hills and scenic coastal views with cultural remnants (e.g., latte stones).
Asan Bay Overlook	Asan	Commemorates the U.S. Marines landing during WWII. Features memorials and interpretive panels about the island's liberation.	Rolling hills and a wide view of the bay and capital city Hagåtña.
Latte of Freedom	Hagåtña	Symbolizes Chamorro strength and resilience. Located at the Governor’s Complex, it offers views of the western coastline.	Towering latte stone structure with a 360Â° viewing platform.
Fort Santa Agueda	Hagåtña	Spanish fort built in the early 1800s. Offers a blend of colonial history and urban scenery.	Elevated views of the capital city and Hagåtña Bay.

Name	Village	Significance	Landscape
Talofofo Bay Overlook	Talo'fo'fo'	Dramatic Views	A black sand beach with dramatic waves and lush cliffs.
Ipan Beach Park Lookout	Talo'fo'fo'	Popular with locals for weekend gatherings and cultural events.	Wide ocean views with a peaceful beach and picnic areas.
Tanguisson Beach and Lookout	Dededo	A hidden gem with ties to ancient Chamorro fishing practices.	Unique mushroom-shaped limestone formations and a rugged shoreline.

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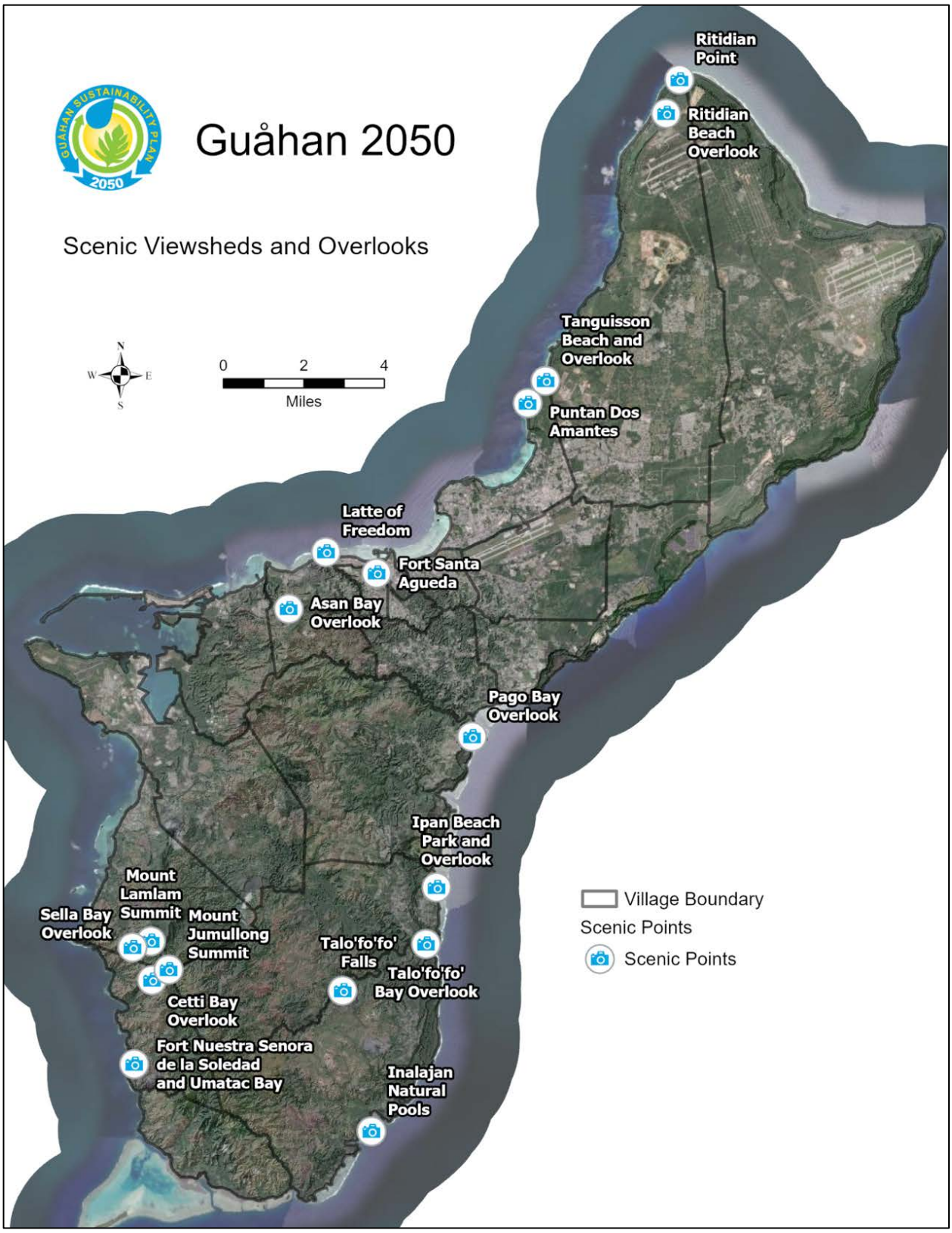

Figure 6-9. Visual Resources Map.

6.3.8. Community Well-Being and Sustainability

The Vibrant Culture Land Use Policies in Guam's Sustainability Plan demonstrate strong alignment with multiple United Nations Sustainable Development Goals (SDGs), particularly SDG 3 (Good Health and Well-Being), SDG 11 (Sustainable Cities and Communities), and SDG 13 (Climate Action). Policies promote health equity by ensuring that new developments and existing underserved areas have access to essential health services and emergency care. These provisions reflect SDG Target 3.8, which emphasizes access to quality essential health-care services and the importance of universal health coverage, including mental health and culturally competent care.

Other policies further Guam's commitment to promoting healthy lifestyles and public participation by integrating active transportation infrastructure, community gardens, and urban forests into the built environment—advancing SDG 11.7, which seeks to provide universal access to safe, inclusive, and accessible green and public spaces. These policies also support SDG 3.4 by addressing non-communicable diseases through increased physical activity and community-based wellness programs. By embedding evaluation mechanisms and community feedback loops into land use planning, these strategies reinforce the SDG 16.6 goal of accountable and responsive institutions.

G50SP policies also explicitly focus on social equity and environmental justice, targeting disadvantaged communities for vulnerability assessments and ensuring equitable access to parks and public facilities. These priorities align closely with SDG 10 (Reduced Inequalities) and SDG 1.5, which emphasize building resilience among vulnerable populations. Additionally, integrating community voices into the design and stewardship of cultural and recreational spaces supports SDG 17.17, encouraging inclusive decision-making and effective partnerships at the local level.

Finally, the coastal and environmental focus of the plan highlights Guam's commitment to environmental sustainability and climate resilience. Protecting shoreline parks, regulating development in fragile ecosystems, promoting visual quality, and integrating nature-based solutions directly align with SDG 13 (Climate Action), SDG 14 (Life Below Water), and SDG 15 (Life on Land). These policies also support SDG 6.6 and 11.b by promoting water quality and urban resilience. Through these integrated and locally grounded policies, Guam's land use

strategy models how place-based planning can advance the global goals of sustainable development.

6.3.9. Community Well-Being Land Use Policies

Community Health and Well-Being

VC-24. Expand Essential Community Facilities.

Prioritize the construction of health clinics and emergency services in underserved areas. Upgrade existing facilities to include modern medical technologies and culturally competent care services.

VC-25. New Development.

Require new developments to include provisions for community health facilities, such as clinics, emergency response stations, and wellness centers.

VC-26. Active Lifestyles.

Mandate the inclusion of pedestrian-friendly infrastructure, bike paths, and public transportation connectivity to promote active lifestyles. Designate and protect areas for community gardens, nature reserves, and urban forests to improve air quality and provide mental health benefits. Develop a network of multi-use trails and recreational areas that promote physical activity and social interaction. Introduce programs that encourage the use of parks for fitness, education, and cultural exchange.

VC-27. Monitor and Evaluate Outcomes.

Establish performance metrics to assess the effectiveness of health and recreational policies in improving quality of life. Regularly update the land use plan based on community feedback, demographic changes, and environmental conditions.

Social Equity and Environmental Justice

VC-28. Disadvantaged Communities.

Prioritize vulnerability assessment and response in disadvantaged communities

VC-29. Community Engagement.

Encourage community participation in the design and management of parks, recreational facilities, and cultural sites. Ensure that all communities on Guam have equitable access to parks, recreational areas, and open spaces within a 15-minute walk of residential areas. Establish emergency evacuation routes, shelters, and communication hubs in accessible locations throughout the island.

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Parks and Recreation

VC-30. Public Access (CZM).

The public's right of unrestricted access shall be ensured to all non-federally owned beach areas and all Territorial recreation areas, parks, scenic overlooks, designated conservation areas and other public lands; and agreements shall be encouraged with the owners of private and federal property for the provision of reasonable access to, and use of, resources of public nature located on such land.

VC-31. Recreational Areas (CZM).

The Government of Guam shall encourage development of varied types of recreation facilities located and maintained so as to be compatible with the surrounding environment and land uses, adequately serve community centers and urban areas, and protect beaches and such passive recreational areas as wildlife and marine conservation areas, scenic overlooks, parks, and historic sites.

VC-31. Preserving Public Shoreline Access and Traditional Rights-of-Way.

All traditional public access routes to the ocean shore, including trails, bull cart roads, and paths established through historic or legal precedent, shall be preserved and protected from obstruction or development unless the routes do not provide access to natural resources, consistent with Title 21 GCA Chapter 75.

VC-32. Regulate Development to Ensure Continued Access.

No development adjacent to the shoreline shall be approved if it blocks or impedes a traditional right-of-way unless an alternative, legally recorded perpetual access route is provided.

VC-33. Acquire and Establish New Public Access Routes Where Needed.

The Guam Department of Recreation shall proactively acquire land or easements to establish new public rights-of-way to the shoreline where traditional access is unavailable or insufficient.

VC-34. Require Public Access Through Government Land Transfers.

No public land between a public road and the ocean shore shall be sold, leased, or exchanged without first establishing a perpetual public access easement.

VC-35. Visual Quality (CZM).

Preservation and enhancement of, and respect for the island's scenic resources shall be encouraged through increased enforcement of and compliance with sign, litter, zoning, subdivision, building and related land-use laws; visually objectionable uses shall be located to the maximum extent practicable, so as not to degrade significantly views from scenic overlooks, highways, and trails.

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VC-36. Fragile Areas (CZM).

Development in the following types of fragile areas shall be regulated to protect their unique character: historic and archaeological sites, wildlife habitats, pristine marine and terrestrial communities, limestone forests, and mangrove stands and other wetlands. Identify and preserve existing scenic views from public places, such as parks, highways and shoreline areas. Integrate climate-resilient designs in parks and health facilities to withstand typhoons and rising sea levels.

VC-37. Promote Environmental Health.

Reduce urban heat island effects by planting trees and preserving wetlands. Ensure all recreational areas adhere to environmental health standards, including safe water sources and waste management systems.

VC-38. Increase Funding and Partnerships.

Collaborate with public, private, and nonprofit sectors to secure funding for parks, recreation, and health infrastructure projects. Partner with local organizations to deliver community health initiatives and educational programs.

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Chapter 7. **Village Sustainability**

The nineteen villages of Guam are the foundation of the island's identity; each shaped by distinct histories, cultures, landscapes, and community values. From the bustling commercial centers of Tamuning and Dededo to the quiet coastal communities of Malesso' and Humåtak, Guam's villages reflect a wide range of land use patterns, environmental settings, and developmental needs. At the same time, the villages share many of the same aspirations and challenges: sustainable growth, preservation of cultural heritage, protection of natural resources, and increased resilience to environmental hazards. This chapter of the Guåhan Sustainability Plan explores the unique and shared characteristics of Guam's villages, focusing on land use planning that supports vibrant, resilient, and sustainable village life. The first section provides an overview of key themes that guide village-level planning, followed by detailed profiles of each village's priorities and opportunities. As with other chapters of the G50SP, these discussions are informed by various sources, including independent planning analysis, Guampedia.com, BSP's Guam Statistical Yearbook, interviews with mayors from all villages, and community engagement events. The policies of the chapter are guided by the following goal and related land use objectives.

> **Goal:** *Support the unique needs and identities of Guam's villages through context-sensitive development.*
>
> **Land Use Objectives:**
>
> - Align building scale, design, and land use with each village's character and infrastructure.
> - Ensure every village has access to core public services and civic facilities.
> - Engage village leaders and residents in the planning and implementation process.
> - Promote village-scaled eco-cultural tourism and community-centered development.

7.1. Village Diversity and Sustainability

7.1.1. Overview: Village Diversity and Shared Land Use Challenges

While each of the villages on Guam has its own uniqueness and physical context, land use planning must begin with the recognition that village diversity is a strength. Village planning must be sensitive to cultural heritage, the built environment, and the ecological context of each community. For instance, the rural southern villages are often closely tied to traditional fishing and farming practices, while central and northern villages serve as residential and commercial

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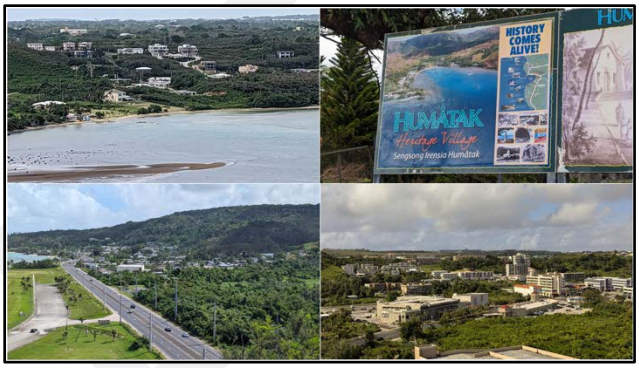
hubs. Supporting this diversity means allowing for different approaches to growth, while also promoting shared values such as sustainability, equity, and community cohesion.

Despite their differences, villages across Guam face common land use challenges. Infrastructure limitations, pressure from urban sprawl, degradation of natural resources, and vulnerability to climate change impact all communities to varying degrees. Communities consistently call for improvements in public infrastructure—roads, sewer, drainage—as well as better access to parks, public facilities, and essential services. These concerns underline the need for an island-wide policy framework that promotes tailored, but coordinated, village development.



One strategy for achieving sustainable village development is the promotion of well-designed, mixed-use village centers. Many communities envision walkable hubs that combine civic spaces, small-scale commerce, housing, and cultural amenities. Revitalizing or creating these centers helps reinforce village identity while supporting economic activity and social cohesion. Land use planning should encourage pedestrian-scale development patterns that connect residents to services and public spaces, and reduce dependence on vehicular travel.

Environmental and cultural stewardship is another cross-cutting priority. Whether protecting coastal ecosystems in Piti, conserving cultural sites in Barrigada, or maintaining agricultural traditions in Hågat, villages are united in their call for land use policies that respect the ecological and cultural landscapes of Guam. Development should be designed to enhance—not erode—the island's natural beauty and historical identity, while also promoting hazard resilience through smart siting, green infrastructure, and disaster-preparedness. The goal of land use planning for Guam's villages is to build sustainable, resilient, and thriving communities that reflect and maintain local values and respond to both immediate and long-term challenges. The policies below provide a foundation for village-level planning throughout the island. In some cases they also resonate with and affirm many similar policies in other chapters of the G50SP.

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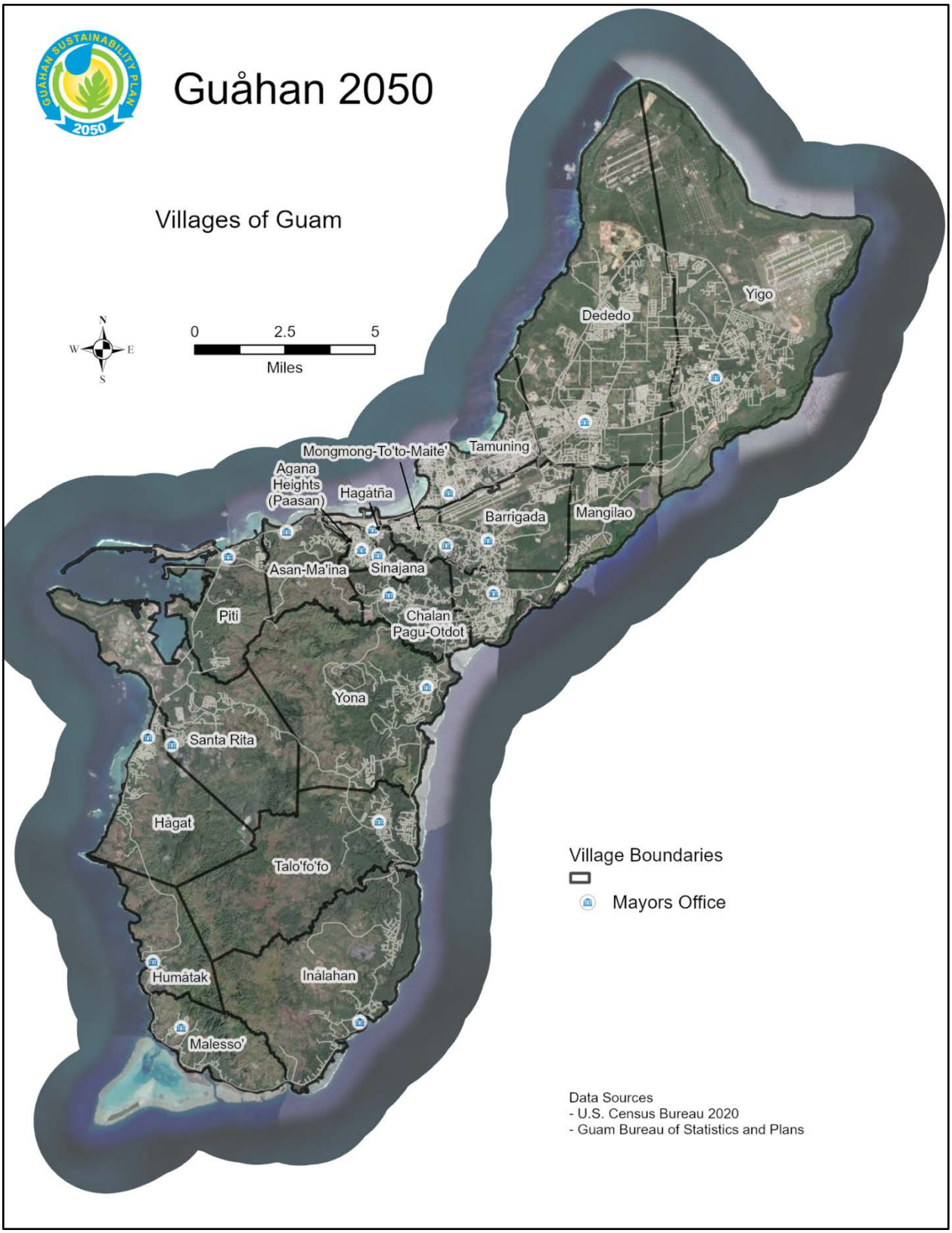

Figure 7-1. The Villages of Guam.

7.1.2. Village Land Use and Sustainability

The policies for Guam's villages closely align with several of the United Nations Sustainable Development Goals (SDGs), reinforcing Guam's commitment to global sustainability principles while responding to local needs. Policies that promote community facilities, civic spaces, and vibrant village life directly support SDG 11: Sustainable Cities and Communities, particularly targets 11.3 and 11.7, which emphasize inclusive and sustainable urbanization and access to safe, inclusive, and accessible public spaces. By focusing on pedestrian-scale, mixed-use village centers, these policies also contribute to reducing the environmental footprint of development and encouraging social cohesion—core elements of sustainable community design.

The environmental components of the policies—such as protection of local environments, preservation of natural settings, and climate and hazard resilience—are strongly aligned with SDG 13: Climate Action, SDG 14: Life Below Water, and SDG 15: Life on Land. These goals call for strengthened resilience and adaptive capacity to climate-related hazards, as well as conservation of terrestrial and marine ecosystems. For example, policies that encourage green buffers, shoreline adaptation, and the protection of aquifers and coastal ecosystems echo targets like 13.1 (climate resilience), 14.2 (sustainable management of marine ecosystems), and 15.1 (conservation of inland freshwater and terrestrial ecosystems).

Additionally, the emphasis on cultural identity, local governance, and equitable access to infrastructure supports SDG 10: Reduced Inequalities and SDG 16: Peace, Justice and Strong Institutions by promoting inclusive decision-making, preserving cultural heritage, and ensuring fair access to resources across all communities. The integrated nature of these land use policies mirrors the SDGs' holistic approach, recognizing that environmental sustainability, social well-being, and economic development are deeply interconnected. By tailoring these global principles to Guam's unique village landscape, the policies offer a path toward a more resilient, inclusive, and sustainable future.

7.1.3. Island-wide Village Land Use Policies

VS-1. Village Diversity.

Encourage land use decisions that reflect the distinct cultural, historical, and ecological character of each village by incorporating village-level planning processes and community input into development reviews.

VS-2. Village Character.

Protect and preserve each village's identity by maintaining traditional land use patterns, supporting heritage preservation, and avoiding incompatible development that could erode community character.

VS-3. Community Facilities.

Ensure that every village has access to well-maintained, adequately sized community facilities—including libraries, mayor's offices, and multipurpose centers—to support local programming and services.

VS-4. Public Recreation.

Promote equitable access to public recreational spaces in all villages by investing in parks, sports fields, and nature trails that reflect the community's recreational needs and environmental context.

VS-5. Civic Spaces.

Designate and improve civic spaces in each village center to host public gatherings, cultural events, and local markets, enhancing community connection and public life.

VS-6. Vibrant Village Life.

Support programs and infrastructure that enable vibrant social, cultural, and economic activity in villages, including festivals, local business hubs, and after-school programs.

VS-7. Village Center Development.

Promote development of walkable, mixed-use village centers that combine housing, commerce, civic uses, and public spaces, tailored to the scale and identity of each village.

VS-8. Pedestrian-scale, Mixed Use.

Encourage pedestrian-scale development through zoning and design standards that support mixed-use buildings, complete streets, and accessible sidewalks within village cores.

VS-9. Natural Settings.

Integrate natural features such as ridgelines, coastlines, rivers, and forested areas into land use planning to protect ecological functions and preserve scenic and cultural value.

VS-10. Protection of Local Environments.

Require land use practices that minimize environmental degradation, protect sensitive ecosystems, and incorporate conservation strategies such as green buffers and sustainable agriculture.

VS-11. Climate and Hazard Resilience.

Ensure that all village land use plans address hazard mitigation and climate adaptation through strategies such as shoreline management, flood mitigation infrastructure, and emergency preparedness.

7.2. The Villages of Guam

The nineteen villages of Guam are the product of centuries of political, cultural, and social transformation. The foundation of village life on Guam originates with the ancient CHamoru people, who established settlements near freshwater sources, fertile land, and coastal areas for fishing and trade. During the Spanish colonial era, beginning in the late 1600s, the Spanish government implemented a policy of population centralization known as the reducción, forcibly relocating CHamorus from dispersed rancherías into organized villages centered around churches and colonial governance (Rogers, 1995). These consolidated settlements laid the groundwork for several of the island's current villages. The subsequent American administration, particularly after World War II, further formalized village boundaries through civil governance reforms and land surveys. Wartime destruction and the postwar reconstruction period also led to the resettlement or merging of communities, such as the relocation of Sumay residents into what is now Santa Rita-Sumai, following the establishment of U.S. Naval Base Guam (Cogan, 2008).

Today, village boundaries define not only political districts and administrative responsibilities—such as the election of village mayors—but also the planning framework for infrastructure, land use, and zoning regulations. These boundaries are used for voter registration, resource allocation, and public service delivery. However, they are not merely administrative divisions; they also reflect deep-rooted community identities shaped by shared experiences, such as historical land dispossession, environmental change, and cultural revitalization efforts (Underwood, 2000). While some villages like Tamuning-Tumon-Harmon have become major centers for tourism and commerce, others like Hågatña—Guam's capital—and Malesso' remain symbolically and historically central to CHamoru identity. Understanding these distinct origins and evolutions is essential for guiding land use planning that respects both the historical context and future aspirations of each community.

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NORTHERN VILLAGES

7.2.1. Dededo

Dededo is Guam's second largest and most populous village, spanning thirty square miles on the island's limestone plateau and sitting above the Northern Aquifer, which supplies 80% of Guam's drinking water (Clement Jr. and Champaco Mendiola 2024). The village name, *Dededu* in CHamoru, may come from the practice of measuring using fingers as the Spanish word for finger is "dedo" and potentially someone measured out the original village this way. Another possibility is that "dededo" is a version of "dedeggo," which is "heel of the foot" or "deggo," which means to "walk on tiptoes" (Clement Jr. and Champaco Mendiola 2024).

7.2.1.1. Community Setting

Once a small farming and ranching community that focused on copra, timber, fruits, vegetables, and cattle, Dededo is now a major commercial and residential hub and is the largest village by population on Guam (Guam Visitor's Bureau). It houses the Micronesia Mall, the region's largest mall, and has multiple housing developments built since the 1960s, originally designed with uniform cement homes that have since been modified. There are several small stores and other businesses as well as several vegetable stands selling local crop products off the highway that cater to the local, mostly Filipino community, (Clement Jr. and Champaco Mendiola 2024). "Dededo Village" is an area containing the village square in which the mayor's office, community center, public library, Santa Barbara Catholic Church, and the school are located.

Dededo's history is marked by significant changes in boundaries during the 20th century. Previously, it extended farther south, including present-day Tamuning-Tumon-Harmon. The original village center was relocated after WWII when the US military built Anderson Air Force Base and Naval Communications Station on Dededo's land. Post-war, agriculture declined as employment at nearby military bases increased. Dededo expanded rapidly after the devastation of typhoons Karen and Olive in the 1960s, leading to new housing projects like Kaiser subdivision and Liguan Terrace. Today, Dededo is a diverse, fast-growing community with a mix of CHamoru and Filipino families. New subdivisions have been rapidly enclosing former ranches and dense jungle.

In 2017, Dededo had 501 establishments and 14,092 paid employees with an annual payroll of a combined $189.7 million ($13,460 per capita) (BSP 2024). Dededo had 17,795 land parcels in 2023 worth approximately $2.8 billion, and 14,291 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $3.4 billion (BSP 2024). In 2020, there were 44,908 residents in 13,651 housing units, and in 2023, there were 67 reported homeless households (BSP 2024).

Key areas of Dededo include:

- **Route 1:** The main road, which splits the village.
- **Dededo SkatePark:** This park is near Santa Barbara Catholic Church and shares land with Lencho Park.
- **Kaiser Subdivision:** Built after Typhoon Karen in 1962 for displaced residents.
- **Sports Facilities:** Including the Robbie Webber Soccer Field, Wettengel Rugby Field, and Guam Sports Complex
- **Waste Transfer Station**
- **Starts Guam Golf Course and Guam International Country Club**
- **Schools**
- **Tanguisson Beach Park:** Located at the bottom of a cliff down a narrow winding road, Tanguisson Beach Park has beautiful mushroom-shaped rock formations in the water, and popular hiking trails with a freshwater sinkhole. It also has remnants of an ancient CHamoru village.
- **Guam National Wildlife Refuge:** Includes the Ritidian Unit of the Guam Refuge with a visitor's center and guided tours of an ancient Guam village. The area has a lovely pristine beach and is a favorite spot for fishermen.

Dededo Community Center: The Dededo Community Center is located along West Santa Barbara Avenue in the village of Dededo, Guam. It is situated near key landmarks such as Santa Barbara Church and Duenas Catering Services, and adjacent to a green open space, making it a central gathering spot for the community. The center is accessible from nearby streets such as Iglesia Circle, Redondo Luchan, and Adela Lane. This area is surrounded by residential neighborhoods, local businesses, and other community facilities, making it a hub for events and activities.

Dededo celebrates two fiestas of patron saints: Santa Barbara's feast day during the first week of December, and St. Andrew Kim feast day on the first Saturday of July (Clement Jr. and Champaco Mendiola 2024). The initiative, *Korason Y Sengsong* (The Heart of the Village), was launched in 2013, featuring a family fitness center where parents can learn parenting skills, tutoring techniques, and access resources for family development. Additionally, Dededo aims to boost community safety by expanding the Community Assisted Policing Effort (CAPE) and increasing volunteer recruitment to address problem areas in the village (Paco 2013).

7.2.1.2. Land Use Issues and Challenges

As the most populated village, Dededo faces multiple land use issues. The significant presence of U.S. military facilities, including major construction activities related to the buildup, bring added challenges. Dededo is also the location of most of the CHamoru Land Trust lands.

As discussed in prior chapters, residential growth has occurred without adequate infrastructure, including sewer capacity. This places pressure on the aquifer related to water quality and sustainability. Road capacity and services are also inadequate for development patterns, and there is village concern about the loss of rural, agricultural lands that could potentially support a renewal of agriculture on Guam.

Dededo also faces many of the intermittent flooding challenges of heavy storms, despite being on the northern plateau. Inadequate stormwater capacity is a concern, connected to inadequate infrastructure planning for ad hoc residential subdivisions and development. While ponding basins are welcome, they require maintenance, which has not been the case for some. In addition, water lines have been installed under unpaved roads, and they have become exposed as the roads wear away, thus getting damaged. The galvanized water lines in Dededo are old, undersized, and failing.

Dededo also has significant limestone forest habitat areas, though much of this has been impacted by the buildup and expanded development of Camp Blaz. Dededo is also absorbing substantial growth both for more permanent housing and temporary workforce housing to support the buildup. Additionally, there is a need for schools, medical facilities, and dependable transportation to enhance the quality of life.

Residents do not believe the amount of park space in Dededo is adequate for the population. Anticipated new developments due to tourism-related investment and increased military presence make it more important to provide increased recreational areas. Better planning for public spaces and amenities can promote community well-being and satisfaction. Finally, as with any large population, Dededo residents are concerned about crime and a lack of police presence. The Guam Police Department struggles with staffing shortages, particularly in Dededo.

7.2.1.3. Village Policies and Programs

VS-35. Community Program Facilities.

Maintain facilities for village programs that provide after school programs, tutoring, parenting skills, and anger management, as well as encourage fitness.

VS-36. Dededo Infrastructure.

Promote sustainable growth and development by providing green spaces, and schools and recreational facilities with new housing developments

VS-37. Dededo Community Spaces.

Upgrade the Dededo Flea Market area to include shaded markets and small business hubs.

VS-38. Dededo Area and CHamoru Lands Specific Plan.

Develop a Specific Plan for Dededo Village to concentrate urban development, provide sustainable infrastructure, facilitate affordable housing, promote small-scale agriculture, protect CHamoru heritage, and enhance recreational and natural open spaces. Evaluate a cross-village CHamoru Heritage Parkway to preserve remaining undeveloped lands for open space, recreation, and rural land use.

VS-39. Community Policing.

Boost community safety by expanding the Community Assisted Policing Effort (CAPE) and increasing volunteer recruitment to address problem areas in the village.

7.2.2. Yigu (Yigo)

Yigo is Guam's largest and northernmost village. The meaning of “Yigo” is unclear. According to some, it comes from the Spanish word yugo which means yoke (the type used to secure a carabao to a cart or plow). However, some sources refer to the area as Asyigo which means the home of (a person known as) Yigo. If this is the case, “yigo” may be an ancient word whose meaning has been lost (Guampedia, 2025).

Yigo spans about 35 square miles from the beaches of Ritidian to the coastal area near Pågat cave. Yigo is home to the Andersen Air Force Base, the only Air Force base on-island. Being the largest village on Guam, there are many housing subdivisions that have been constructed on Yigo, however it still maintains a rural feel in the village with its acres of greenery. Like most northern villages, Yigo sits on top of the Northern Guam Leans Aquifer (NGLA), which is the source of 80% of Guam’s fresh drinking water (Clement Jr. c).

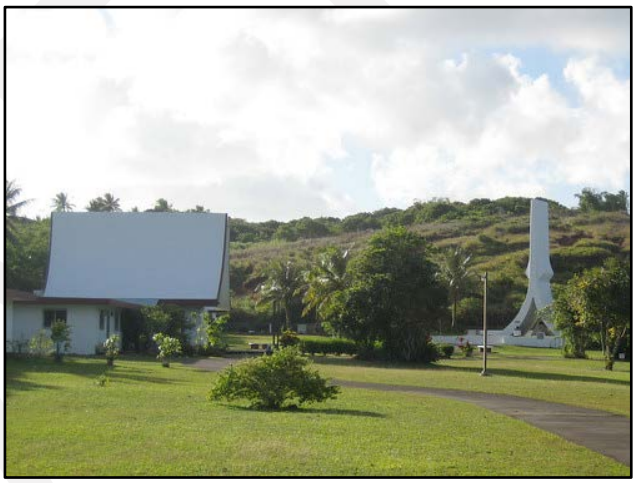
7.2.2.1. Community Setting

Yigo had, in 2022, 146 establishments and 3,554 paid employees with an annual payroll of a combined $44.6 million, which if divided equally, is roughly $12,500 annually (BSP 2024). Yigo had 9,533 land parcels in 2023 worth approximately $719 million, and 4,928 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $705 million (BSP 2024). In 2020, there were 19,339 residents in 6,360 housing units, and in 2023, there were 94 reported homeless households (BSP 2024).

Yigo used to be the location of a large number of villages as evidenced by the latte dwellings found in the Mt. Santa Rose and Mataguac areas. Due to the war in the 18th century, northern residents migrated to the central and southern villages. In the 19th century, rich residents from

Hagåtña began purchasing land in Yigo due to its fertile soil that was ideal for growing cocoa, avocado, citrus, and copra. Ranching was also popular in the area. Residents of Yigo were mostly self-sufficient but they still had to travel to Hagåtña to purchase household goods.

During World War II, most residents of Yigo were able to remain. The wealthy residents of Hagåtña moved to their Yigo ranches to stay out of the conflict. However, at the end of World War II, Yigo was the site of a major battle that destroyed the church and many village homes.



After WWII, Yigo's landscape changed. Displaced Hagåtña families settled ranch lands in Yigo. Although some villagers continued to farm, Yigo's economy shifted to account for the presence of the Andersen Air Force Base. Some civil service and military members who came to Guam permanently settled in Yigo (Clement Jr. c). Yigo is now Guam's second most populated village.

The Yigo Senior Center is located in the village of Yigo, Guam. It serves as a community hub for senior citizens, providing various services and activities for local residents. The center is situated near important community infrastructure and is active in local planning and public meetings, including events like municipal planning council sessions.

The most important public spaces in Yigo include the gym and recreational facilities, as well as the senior center, basketball court, and baseball field. The Yigo Senior Citizens Center, which is a key community hub for the area, is located near Gayinero Road, next to the Yigo Baseball Field. It is situated south of landmarks like the Yigo Gym and is a short distance from the local grocery stores and other facilities.

Other key points of interest in Yigo include:

- **Our Lady of Lourdes Church:** The church was founded in 1920. Yigo's fiesta celebrates Our Lady of Lourdes on the second Saturday in February.
- **Schools:** There are five public schools and two private schools in Yigo, as well as schools associated with Andersen Air Force Base.

- **Battle of Yigo Monument:** Commemorating the final battle of World War II, the memorial sits at Route 15 and Chalan Lolan.
- **Pacific Peace Memorial Park:** Japanese erected the memorial at the site of the last Japanese command post to commemorate those who died during World War II.

- **Mt. Santa Rosa:** This mountain is the highest point in northern Guam from which you can see Guam and Rota. There was pineapple farm at its base in decades past (Guampedia).
- **Yigo Race Track (or Guam Raceway Park):** This drag strip and off road track was built in 2001 off Route 15.

7.2.2.2. Issues and Challenges

The village has several initiatives aimed at improving recreational facilities, fixing roads, and enhancing water and sewer infrastructure. The infrastructure is unable to support the current and future population. Better planning is necessary to implement infrastructure to address issues including flooding and stormwater management. Flooding occurs regularly due to inadequate stormwater drainage. Several roads require repair. The water pressure is low, and the sewer system requires expansion. The sewer system stops at the gym with no more towards the ocean.

There are land use issues in Yigo. Some properties are inaccessible because there are landlocked properties with no easements that occurred during subdividing. One area is proposed for development but the community is against it until the flooding is addressed; the concern is that development will lead to flooding in existing yards because no ponding basin exists.

The village noted that there is a lack of recreational spaces. However, it was also pointed out that Yigo has several government properties that could be repurposed for the community. For example, the Guam Raceway Park could be turned into a park and host events for the village. A gym could also be constructed on the property. Access to the coast via creation of a boat ramp was also noted as a priority.

To encourage economic sustainability, Yigo needs more commercial developments and high-income job opportunities. Yigo could use more office buildings as well. There are underserved communities in Yigo that have no paved roads nor water and sewer infrastructure. For example, the Gilbreeze Subdivision has its nearest water source outside the subdivision, the houses are not typically built to code, there are temporary and/or makeshift water storage facilities such as drums and totes, and no drainage or paved roads (Guam Waterworks Authority 2019). Gill Baza

is another subdivision in Yigo that experiences the same issues (Pacific Daily News 2024). Using US Environmental Protection Agency funds, Gilbreeze may finally get proper utility hookups (Pacific Daily News 2024).

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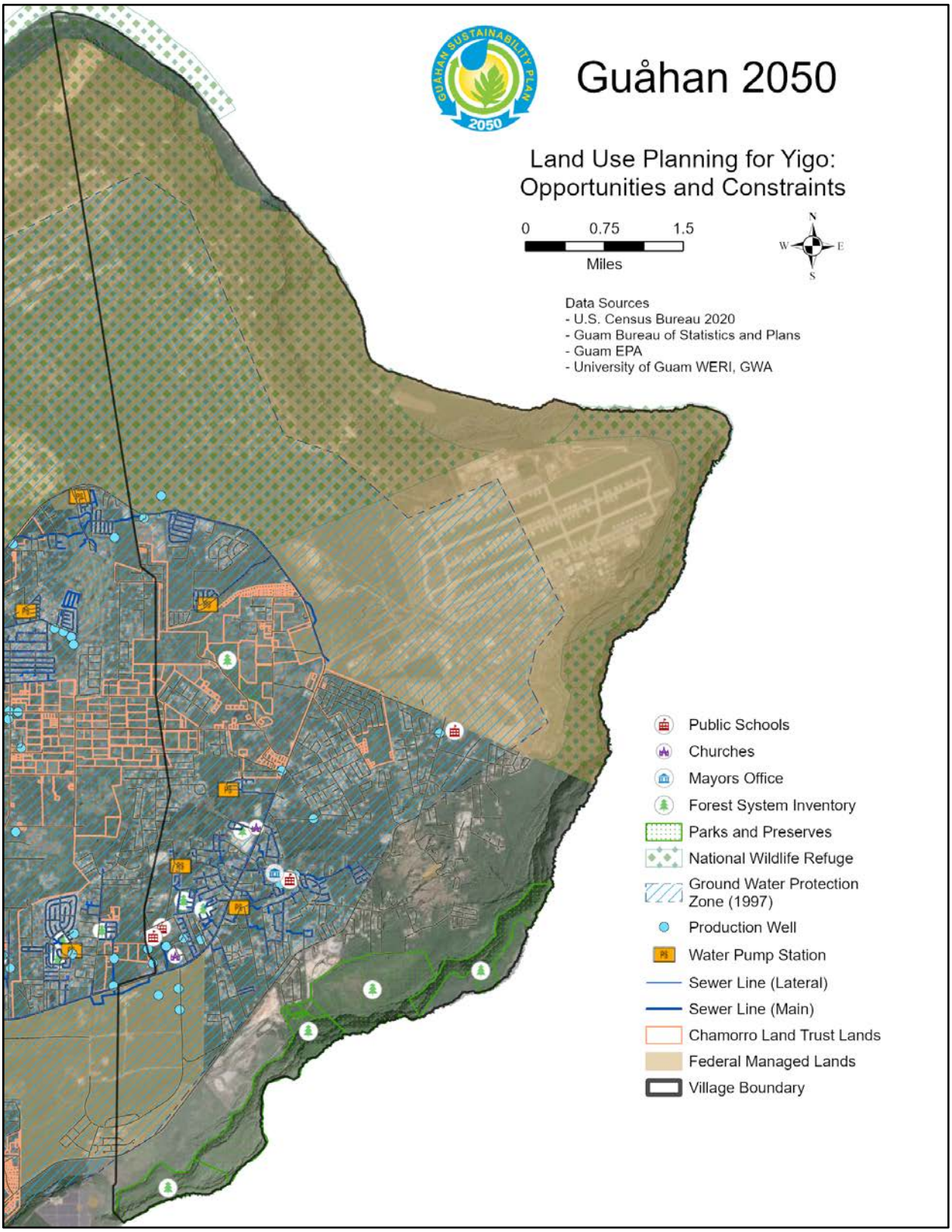

Figure 7-2. Land Use Planning for Yigo: Opportunities and Constraints

7.2.2.3. Village Policies and Programs

Yigo's development should focus on preserving its agricultural heritage while accommodating residential growth. Initiatives include improving road networks, expanding recreational spaces, and supporting sustainable farming practices. Investment in community facilities and disaster preparedness infrastructure is also essential. Residents voiced interest in more recreational facilities and opportunities, as well as economic development such as restaurants, a movie theater, roller rink, bowling alley, etc. The thought is that the population will be high enough to support that type of economic development in the near future.

The limestone forest near the Racetrack is an important natural asset to Yigo, including Anao Point, while the Racetrack itself is an important economic asset.

The character of the village includes many different cultures including CHamoru, Micronesians, and more. Thus, if village character were to be included in structural designs or motif, the village would prefer to see different cultures represented so that all in the village can have pride. The suggested symbol of the village is the proa, a local sailing vessel.

VS-82. Agriculture.
Preserve agricultural heritage while accommodating residential growth. Protect agricultural land and opportunities.

VS-83. Community Infrastructure.
Provide and improve roads and other infrastructure, including disaster preparedness and recreational facilities.

VS-84. Community Character.
Protect the diversity of the Yigo's built environment and character.

CENTRAL VILLAGES

7.2.3. Agaña Heights

Agaña Heights is in the central part of the island north of Hågatña, the capital of Guam, and is part of the Kattan (Eastern) District. It was a resettlement for many residents of old Hågatña after World War II ended in 1944 (San Nicolas 2024). Prior to being called Agaña Heights, the area was called Tutujan, for which there is disagreement about whether that derives from the CHamoru word *tutuhon* (to begin, start), or from the name of a trail along the cliffside between Fort Santa Agueda and Government House. Alternatively, the name may derive from "*Tutuhon luhan,"* which means someone who becomes scared because of impending doom or is terrified about something (MCOG).

Prior to World War II, Agaña Heights was a farming community for those living in Hågatña. This included ranching on top of the steep cliffs along the village perimeter (Mayors' Council of Governments (*Konsehelon Mahot Guåhan*; MCOG). Today it is a thriving community that is predominantly residential (San Nicolas 2024).

7.3.1.1. Community Setting

In 2020, Agaña Heights had 3,673 residents in 1,210 housing units (BSP 2024). In 2022, the village had 28 establishments and 405 paid employees with an annual combined payroll of about $4.1 million ($10,227/person annually) (BSP 2024). In 2023, there were 283 land parcels worth approximately $19.1 million, and 172 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $24.3 million (BSP 2024).

Agaña Heights is the birthplace of Little League Baseball on Guam. The first Little League game was played in 1955 and they won three consecutive championships from 1955-1957. The Agaña Heights Cougars won the first Guam Major League Baseball Championship in 1974. Many baseball teams continue to play for the village (San Nicolas 2024).

Agaña Heights Senior Center: The Agaña Heights Senior Center is located in the village of Agaña Heights in central Guam, an area close to Hagåtña. The center is situated near Tai Gigo Road and Vicente Salomon Drive, easily accessible via main routes in the area. It serves as an important community hub for senior activities and support, and is near notable landmarks like the U.S. Naval Hospital, as Agaña Heights houses part of the military community and educational facilities like McCool Elementary/Middle School.

There are numerous other locations of special interest in Agaña Heights, including public buildings and community facilities:

- **Sgt. Pedro C. Pangelinan Baseball Field:** One of Guam's first and oldest baseball fields (1951). It was the site of the first Little League Baseball game on Guam.
- **Archbishop's Residence:** Constructed in the early 1960s.
- **Elk's Club:** This was relocated to Agaña Heights after World War II.
- **Government House:** This is the Governor's official residence. The design was completed in 1951 by Richard Nuetra and incorporates elements of CHamoru and Spanish cultural heritage.
- **Our Lady of the Blessed Sacrament Church:** This church sits in the center of the village and hosts the annual village fiesta of Our Lady of the Blessed Sacrament in November.
- **U.S. Naval Hospital:** This hospital sits on 47 acres overlooking the capital. It is the primary medical provider for military members and their families.
- **Fort Santa Agueda:** This battery was built for tactical purposes. It sits atop Apugan Hill and is also called Fort Agupan. It is one of the few surviving Spanish forts on Guam.

- **Fonte River:** This river borders Agaña Heights and Maina. It has a bridge that is the topic of a local ghost story about the "White Lady." Libugon Dam was the first dam built on Guam and was built in this river to provide fresh water for Hagåtña before World War II. The river is a popular swimming spot and hiking trail.
- **Tutujan Park:** This park is also known as Triangle Park and has water and power. It is often reserved for private functions through the Mayor's Office.

In 2023, the University of Guam Sea Grant and Center for Island Sustainability, and Guam Green Growth launched the Yo'åmte project at the Government House. Yo'åmte, the CHamoru word for "traditional healer," focuses on promoting and preserving traditional medicine and healing practices through apprenticeship, training, and outreach (Losinio 2023).

7.3.1.2. Land Use Issues and Challenges

Agaña Heights is largely built out, with most parcels served by public water and sewer. There has been a long standing issue with some residences currently not connected to the main sewer line relying on aging septic systems.[20] The entire village is within the mapped groundwater protection zone. There are relatively few other land use constraints. The village is adjacent to urbanized areas of Asan-Maina, Hågatña, and Sinajana to the northwest, north, and east, separated from more significant undeveloped areas to the south and southwest by the Chaot and Fonte rivers.

There are a few identified FEMA flood hazard areas in the village, including at the ballfield next to the Mayor's office. Infrastructure and best management practices may not be adequate to address peak storm and rain events. Flooding occurs along the Fonte River also, where areas of prime farmland are also mapped by the NRCS soils program. A major wetland and flooding zone lies to the north east along the Hågatña River (see below). Traffic congestion can be an issue around the Naval Hospital. As discussed in Chapter 6, Agaña Heights does not have as much public green and park spaces as other villages. In addition, there are relatively few, if any, natural habitat areas, and invasive species such as the rhinoceros beetle and brown tree snake are an increasing problem.

7.3.1.3. Agaña Heights Village Policies and Programs

Infrastructure improvements, community facility expansions, and preservation of residential charm should be prioritized in Agaña Heights. Initiatives that enhance public spaces and disaster preparedness will benefit residents. In addition, the village provides an opportunity for

[20] According to the Mayor, there is an issue with private property obstructions and lack of public easements to support adequate sewer system connections.

initiatives to implement micro farming, or small-scale agricultural systems that can be practiced in urban and rural settings.

VS-12. Agaña Heights Infrastructure and Community Facilities.
Prioritize infrastructure improvements and community facility expansions while preserving residential charm.

VS-13. Agaña Heights Public Space and Preparedness.
Enhance public spaces and disaster preparedness.

VS-14. Agaña Heights Agricultural Opportunity.
Implement micro farming, or small-scale agricultural systems as practices in urban and rural settings.

7.2.4. Assan-Ma'ina (Asan-Maina)

Assan-Ma'ina is located in central Guam abutting Agaña Bay. It borders Hågatña and Agaña Heights. Assan is a coastal community, while Ma'ina is nestled in a valley between Nimitz Hill and Agaña Heights (Babauta a). The topography is both hillside and flat land, and many of the houses are built on steep roads.

Assan has a large grassy park, called Asan Beach Park, which is the Asan Beach Unit of the War in the Pacific National Historical Park. The other park in the village is Asan Bay Overlook, which is located on Nimitz Hill and hosts a memorial wall of those who died on Guam during WWII, as well as a panoramic lookout over the area in which the Asan battle took place.

Ma'ina is a small community that is spread out between Nimitz Hill to the back of Agan Heights. It has extensive lush vegetation supported by the nutrient-rich soil near the river, as well as Fonte Dam, which provided freshwater to the people in Hagåtña prior to WWII (Babauta a).

7.2.4.1. Community Setting

Assan-Ma'ina is a smaller community, with only 16 establishments and 662 paid employees as of 2022 (BSP 2024). In 2022, there was an annual payroll of only $7 million, which equates, if divided equally, to a salary of about $10,600 per person. In 2023, Assan-Ma'ina had 1,067 parcels of land worth $119.7M, and 512 buildings worth approximately $76.2M (BSP 2024). Assan-Ma'ina had a smaller population of 2,011 in 2020 relative to other villages (BSP 2024).

Assan-Ma'ina has a vibrant community spirit and a resilient cadre of local enterprises which contribute collectively to the economic sustainability and vitality of the village. Assan-Ma'ina boasts several "mom-and-pop" stores, and nurtures its small businesses. There are concerted efforts to honor traditions and foster learning opportunities throughout the village, as well as efforts to provide programs for the elderly population. Community engagement is integral to village life, reflecting a shared sense of identity and pride. Efforts to enhance village spirit and preserve historical landmarks, such as Camel Rock and the Asan Bay Overlook, highlight the importance of cultural heritage. Assan-Ma'ina has a modern basketball facility and dining facility, which is used for many community gatherings.

7.2.4.2. Land Use Issues and Challenges

Assan-Ma'ina has fewer developed areas than other villages in the north and central parts of Guam, but infrastructure resilience is an on-going concern. There are developed shoreline areas, which are vulnerable to typhoons, storms, flooding, and sea level rise over the longer run. Typhoon Mawar damaged significant infrastructure recently. Thus the community requires funds to fix or rebuild damaged items, such as Maina's bridge. Despite having underground power lines in Asan, recovery efforts are slower compared to Maina, where aerial posts are utilized. Sewer issues, including backups during floods and blocked stormwater drains, require proactive maintenance to mitigate risks.

Similarly, water supply disruptions in Ma'ina, exacerbated by generator malfunctions post-typhoons, necessitate reliable infrastructure and contingency plans. Road damages, often caused by incomplete repairs after waterworks interventions, underscore the importance of coordinated maintenance efforts. Additionally, shoreline erosion and seawater incursion are issues in Assan-Ma'ina, likely due to sea level rise and erosion. The War in the Pacific Historic National Park has conducted a sea level rise vulnerability assessment, finding moderate to high shoreline vulnerability (NPS, 2005). A breakwater was suggested as an option for reducing sand loss and to protect the pavilions from Adelup to Asan Beach National Park.

Other land use issues include illegal dumping, particularly abandoned vehicles, invasive species (including fire ants, chickens, wild pigs, and stray dogs), as well as concerns about building community infrastructure, such as playgrounds, and the availability of funding for new facilities. Some village residents have raised concerns about land use constraints on new development, such as wetland areas, and the larger ownership by the National Park Service.

Ensuring public safety is a priority for the village, particularly in regards to the adequacy of police facilities and presence. There are also some ancestral lands in the village in the vicinity of Nimitz Hill.

Finally, the interior upland areas of Assan-Ma'ina boast significant natural areas with hiking trails and important habitat areas. These include large areas of savannah and native volcanic forest. Part of Assan-Ma'ina also overlays the Northern Guam groundwater protection area.

7.2.4.3. Assan-Ma'ina Village Policies and Programs

Assan-Ma'ina is a small village. The village residents prefer not to expand their economy through development of shopping malls, and instead prefer smaller shops and additional housing, including low-income housing. The community empowers their residents by enhancing their skill development through various education activities such as summer school and after-school programs.

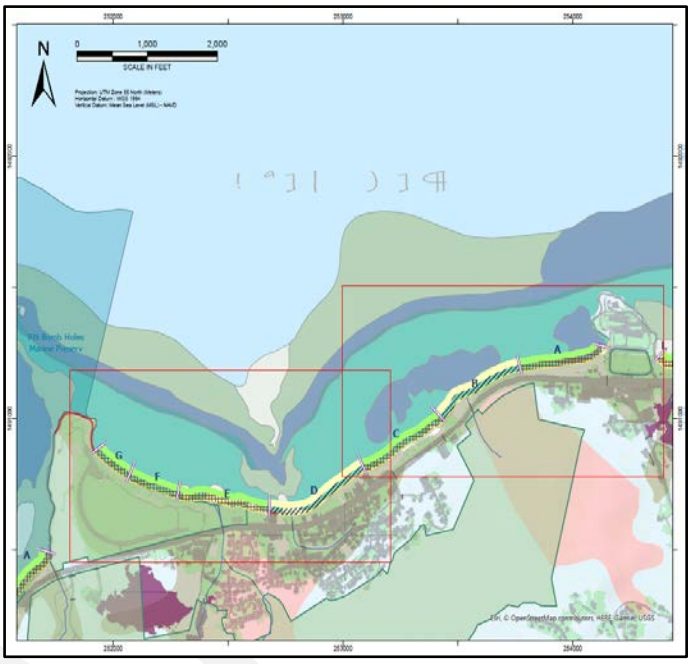

Figure 7-3. Assan-Ma'ina

The village holds a strong stance on balancing development with environmental conservation and management. For example, the mayor aims to balance the need for a school with the significance of parks. The mayor has also promoted recycling initiatives and attempted to protect vulnerable ecosystems by planting trees along beach areas. Safety is a priority in Assan-Ma'ina including a solid police presence, as well as providing adequate public and recreational areas.

Asan-Maina should focus on preserving its historical and cultural significance while addressing infrastructure needs. Enhancing public spaces, promoting heritage tourism, and improving access to services will strengthen its community identity.

VS-15. Priority Development.
Prioritize development of smaller scale shops and commercial development. Large scale commercial development, such as shopping malls, shall be avoided.

VS-16. Affordable Housing.
Facilitate affordable housing at appropriate densities.

VS-17. Balanced Village Development.
Balance development with environmental conservation and management, ensuring protection of vulnerable ecosystems.

VS-18. Clear Boundaries.
Delineate clear village boundaries to ensure accurate registration for voting and resource allocation purposes.

VS-19. Assan-Ma'ina Recreation.
Ensure adequate public and recreational areas.

VS-20. Infrastructure.
Address infrastructure needs while preserving historical and cultural significance

VS-21. Assan-Ma'ina Community Identify.
Enhancing public spaces, promoting heritage tourism, and improving access to services will strengthen its community identity.

VS-22. Assan-Ma'ina Open Space and Habitat.
Protect and maintain natural habitat areas and public recreational access and open space.

7.2.5. Barigåda (Barrigada)

Barrigada is a land-locked village located near the center of the island on limestone plateau. It stretches from the cliff line overlooking Harmon Industrial Park in the East to Mt. Barrigada in the north. Upscale homes have been developed on Mt. Barrigada, along an area known as Barrigada Heights; overlooking Tiyan, the interior hills of Guam, and the Philippine Sea. To the south is the village of Mongmong-Toto-Maite, and to the east is the village Mangilao (Clement Jr. a).

7.2.5.1. Community Setting

Barrigada is a larger village with 7,956 residents in 2,533 housing units in 2020 (BSP 2024). In 2022, there were 278 establishments and 10,120 paid employees with an annual payroll of a combined $121.6 million (BSP 2024). Barrigada, combined with Mangilao, had 6,949 land parcels in 2023 worth approximately $985.3 million, and 4,739 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $984.9 million (BSP 2024). In the past Barrigada was a popular ranching area for people from Hagåtña. Some parts of the village still have a rural feel attributed to the long winding roads that make their way through hills, valleys, dense vegetation, and wetlands (Clement Jr. a). Barrigada is now a heavily-populated residential area bordered by considerable commercial development along routes 8 (Purple Heart Memorial Highway), 10 (Vietnam Veterans Highway), and 16 (US Army Corps Drive). The recently returned former federally-designated land located in Tiyan (formerly the Naval Air Station, Guam) has become the site of some government of Guam offices, private businesses, and residential homes.

Barrigada is characterized by ancient latte stones that served as foundations for traditional Chamorro houses. Barrigada has a significant concentration of latte stones, indicating it was a densely populated ancient community. Residents are undertaking conservation measures to

ensure their longevity, including stabilizing the structures and protecting them from natural erosion and human interference (Carter 2023).

The Barrigada Community Center is located along San Roque Drive, in the central part of the village of Barrigada. It is near the intersection with Route 10 (Vietnam Memorial Highway) and close to landmarks like San Vicente Catholic Church and the Barrigada Mayor's Office. The area is easily accessible via Guam's main road network, including Routes 10 and 16. The center is a hub for community events and activities in Barrigada, a village known for its cultural events, schools, and central location on Guam.

Other points of interest in Barrigada include:

- **Schools:** 2 elementary schools, 1 middle school, and 1 high school
- **Main U.S. Post Office Facility**
- **AB Won Pat Guam International Airport Authority**
- **Several Churches**: Particularly San Vicente Catholic Church, which is a gathering place for religious ceremonies and events, and brings the community together in worship.
- **Mt. Barrigada:** Many upscale homes are located along the hillside of Mt. Barrigada, as is the Guam Memorial Hospital's Skilled Nursing Facility, a senior care facility, and a church.
- **Former "Naval Air Station Brewer Field":** This has softball and football fields, and is a favorite walking and running area for residents.

Barrigada has three feast days for the patron saints San Vicente (April), San Roke (August), and San Ramon (also in August). The primary fiesta is the Barrigada Fiesta in April, which showcases Barrigada's cultural traditions through religious processions, traditional dances, music performances and local delicacies (Carter 2023). Cultural displays exhibit various aspects of Barrigada's cultural heritage, including artifacts, clothing, and other items.

Barrigada grew quickly in the 1940s, which altered its demographic composition and reshaped its landscape and cultural heritage. Traditional practices and customs have been shaped by external influences, which has led to shifts in social dynamics and values (Carter 2023).

7.2.5.2. Land Use Issues and Challenges

Barrigada has four general areas: 1) the airport; 2) developed areas of Barrigada; 3) Barrigada Heights; and 4) the south eastern area of the village consisting mostly of federal military holdings. There are also substantial Ancestral Land Commission holdings in Barrigada. There is some indication of farming activity in the undeveloped areas.

Due to the heavy rainfall during the rainy season, some areas prone to flooding are a result of human development and stormwater accumulation. Flash flooding, which occurs frequently in Barrigada, can cause safety hazards, property damage, and ecologically destructive erosion, including in low lying areas and highly developed zones (Guam Watershed Plan 2022). Road

infrastructure repairs are critical to ameliorate flooding impacting on local residents. When flash flooding occurs, the fissures and cracks in the already rocky roadways divert to surrounding residential properties, sometimes inundating properties. There are plenty of storm drains, but they can be plugged with debris and require maintenance. There are not enough ponding basins, but Barrigada lacks land for additional ponding basins.

Barrigada also lacks adequate and optimally-located recreational and green spaces within the village as a result of poor urban planning, and furthermore these recreational and green spaces are characterized by residential use only. Security is an issue of concern in regards to parks and open spaces. Parks that are located in subdivisions are typically not frequented due to the greater susceptibility to litter, noise after park curfew, etc.

Some structural properties in Barriagada contain hazardous materials or elevated levels of toxic contaminants and cannot be converted for residential or educational use. This is a result of military development and related activities and as a result, can only be zoned for commercial use. Remediation efforts have attempted to abate known contaminants, but currently, these properties can only be zoned for commercial use. In order to continue to develop and grow, it may be that more properties suitable for residential, R-2, zoning are needed.

Much of Barrigada also is situated on top of the Northern Guam Lens Aquifer (NGLA). Adequate and efficient municipal wastewater systems and treatment facilities are needed to preserve and protect domestic water supply. Additionally, there are recurring issues with water outages and maintaining hydraulic pressure for adequate supply to residents. It is imperative that the existing infrastructure is replaced and repaired to avoid persistent issues.

7.2.5.3. Barrigada Village Policies and Programs

VS-23. Enhance Central Development Areas.
Focus on enhancing Barrigada's central location by improving traffic management, creating mixed-use developments, and upgrading community amenities.

VS-24. Cultural Sites.
Preserve cultural sites while promoting modern infrastructure to balance development with heritage.

VS-25. Infrastructure Sustainability.
Ensure adequate infrastructure to protect the limestone plateau and the aquifer.

VS-26. Increased Development Density.
Increase the availability of R-2 zoned properties with corresponding improved infrastructure to support new development (i.e. ensure no flooding of adjacent properties due to parcel subdivision, install sewer, ensure water supply, and sufficient roads).

VS-27. Community Facilities.

Assess the need for a new mayor's office, library, and field house, as well as conservation of the current community center.

7.2.6. Chålan Pågu-Otdot (Chalan Pago-Ordot)

Chalan Pago refers to the area that was traveled to get from Hagåtña to Pago, and is a CHamoru word that means "Pago Road." Ordot is derived from the CHamoru word *otdot*, which means "ant." This could be because the soil type of the village was attractive to some ants.

Chålan Pågu-Otdot stretches halfway across the narrow part of the island, encompassing the land from the south borders of Sinajana and Toto to Pago Bay. Housing is mostly along Route 4 and Pago Bay. It has diverse and rugged topography containing low hills, small valleys, wetlands, and streams. Initially it was the center of ranching for people from Hagåtña due to its fertile soil, but is now the two tight-knit communities with several new housing subdivisions.

Chålan Pågu-Otdot has the island's former landfill, which is now closed after village residents held protests due to decades of needing to evacuate their homes for periods of time during fires, stench after heavy rains, excessive flies, and sanitary concerns.

7.2.6.1. Community Setting

Chålan Pågu-Otdot is a medium sized village, with the 2020 census showing 7,064 residents in 2,129 housing units (BSP 2024). In 2022, Chalan Pago-Ordot had 43 establishments and 662 paid employees with an annual payroll of a combined $8.5 million ($12,800/capita) (BSP 2024). Chalan Pago-Ordot had 1,570 land parcels in 2023 worth approximately $111.2 million, and 705 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $114.2 million (BSP 2024).

Ordot celebrates San Jaun Bautista's feast day on June 24, while Chalan Pago celebrates the fiestas Our Lady of Peace and Safe Journey in the third week of January, and the Sacred Heart of Mary on the second Friday in June. Chalan Pago-Ordot has a village mural that states "We are Guam, We are Ordot - Chalan Pago" on Route 10 across from Song Market. It was designed by teachers from John F. Kennedy High School and George Washington High School. The teachers led a community of volunteers to complete it.

There are several institutions that are points of interest within the village, including the Agueda Iglesias Johnston Middle School, Baha'i Assembly, Dominican Child Development Center, Sanctuary Inc., and the Island Community Church. The village also hosts the Frank Perez Park along Pago Bay, which is the only area within Pago Bay that provides easy public access to the shoreline. It is often used by fishermen to launch their day boats or wade for fishing with *talaya*

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nets or fishing poles. Historic Japanese bunkers built in World War II are south of the park along the shoreline.

7.2.6.2. Land Use Issues and Challenges

Chålan Pågu-Otdot is developed along the major road corridors across the island and down to Pago Bay. Undeveloped areas contain some sensitive habitat and wetland areas. Some of these also overlap with identified flooding locations. Flooding occurs regularly due to insufficient ponding basins. Storm drains are on all routed roads. Most of the village is located over the Northern Groundwater Protection Zone.

Infrastructure has been an issue in the past, including in relation to a controversial Pago Bay hotel development just over the village line in Mangilao. The project may have required road widening and expanded sewer capacity. There are also longstanding concerns with the closed Ordot landfill, which must be fully mitigated before it can be converted to a municipal park. More generally, there is a need for road improvements, such as adding shoulders. Water availability also is an issue in Chålan Pågu-Otdot because of changes in pipe sizes, as well as the fact that the pumps are inadequate to provide water. The inadequacy of pumps is an issue, particularly for any additional development in Chalan Pago.

In a 2009 assessment, the Village Road Improvement Plan estimated the cost for non-routed road repair was $68 million for Chalan Pago and the improvements have never been implemented. Chålan Pågu-Otdot is an LMI village (low-moderate income community). Additional R1 and R2 residential units, particularly medium density housing, and associated commercial spaces to support the housing in terms of single story “mom-and-pop” shops would be welcome in development.

7.2.6.3. Village Policies and Programs

VS-28. Managed Growth.
Balance residential growth with environmental conservation.

VS-29. Community Infrastructure and Sustainable Development.
Upgrade infrastructure, expand community facilities, and protect natural areas to ensure sustainable development.

VS-30. Increased Residential Density.
Expand opportunities for medium density housing and mixed use areas.

VS-31. Sustainable Housing.
Ensure that new, higher density residential development is connected to public sewer and water systems.

VS-32. Road Design.
Ensure basic two-lane road design with shoulders are developed when parcels are subdivided.

VS-33. Adequate pedestrian infrastructure.
Ensure road right-of-way easements are wider than 20 feet to accommodate sidewalks and road shoulders. Develop sidewalks as feasible.

VS-34. Invasive Species.
Control feral pigs and other invasive species to allow for utilization of residential gardens.

7.2.7. Hagåtña

Hagåtña is derived from *haga*, meaning blood. This is perhaps due to the bloodlines of the families that established the village. On Spanish maps, the village was called Agadña or Agaña, and Agaña on American maps.

Hagåtña is the capital of Guam, located in central Guam between Agaña Bay and the Agaña Heights cliffs. It was declared a city and the capital of the Marianas by Spanish Royal Decree in March 1686. Tamuning and Asan border Hagåtña. Hagåtña has several commercial activities as well as the government offices and the religious center for the Catholic church (Leon-Guerrero 2024).

7.2.7.1. Community Setting

Despite being the capital, Hagåtña is one of Guam's least populated villages. In 2020, there were 943 residents in 407 housing units (BSP 2024). Although Hagåtña is one of the least populated villages, in 2022 it had 393 establishments and 18,886 paid employees with an annual payroll of

a combined $214.8 million, which if divided equally, is roughly $21,400 annually (BSP 2024). Hagåtña has 1,185 land parcels in 2023 worth approximately $190.7 million, and 342 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $216.1 million (BSP 2024). Although not included in the statistics from the Guam Homeless Coalition and Guam Housing and Urban Renewal Authority cited in BSP 2024, there are numerous homeless persons in Hagatña. The Guam Homeless Coalition is currently trying to purchase a building in which to house the homeless.

As the capital, Hagåtña is the seat of Guam's judicial, legislative, and executive branches. There are several commercial activities including law offices, banks, technical and professional services, restaurants, and more. The village has several public facilities as well as important cultural resources.

After World War II, which destroyed more than 1200 homes and several public and private buildings, the federal government and later the Guam government condemned large tracts of land and redrew property lots, redistributing village resources. In some cases, this left original landowners without any property. The village population dropped from about 10,000 to 800 from 1940 to 1950. Although the population increased to 1,642 by 1960 then 2,119 in 1970, it has since declined again. However, as the seat of Guam's government, the center of commerce and trade, and possessing significant historical and cultural heritage, there is a push to revitalize the capital and to preserve and protect its heritage and economic vitality (Leon-Guerrero 2024).

There are several points of interest throughout Hagåtña:

- **Academy of Our Lady of Guam:** Guam's only all-girls Catholic school was opened in 1949. It is a four-year high school.

- **Senator Angel Leon Guerrero Santos Memorial Park / Latte Stone Park:** This park has eight latte stone pillars that were transferred by the military from Me'pu and Fena in the southern interior of Guam as the military built new bases in those locations.
- **Japanese World War II Caves:** The man-made caves are located at the base of the cliff line and were used for shelter and supplies storage by the Japanese.
- **Lujan House:** This is one of the few remaining pre-World War II houses in Hagåtña. After being built in 1911 as a private residence for Jose Pangelinan Lujan, it was moved into by the Guam Institute in 1928. The Guam Institute was forced to close during World War II and is now on the National Register of Historic Places.
- **Plaza de España:** The plaza served as the Governor's Palace during the Spanish occupation. Most of the palace was destroyed during World War II, but several historical structures survived including the Garden House, Chocolate House, and Azotea and inner court.
- **Dulce Nombre de Maria Cathedral - Basilica:** The Cathedral-Basilica is located on the site of the first Roman Catholic mission in the Mariana Islands. It was renovated in 1998.
- **Spanish Bridge:** This bridge spanned the Hatana River before the river's course was changed after Hagåtña was rebuilt after World War II. *La Sirena*, Guam's legendary mermaid, sits on the south side of the bridge.
- **Guam Museum:** Opened in 2016, the museum is at Skinner Plaza and reflects the diversity, creativity, and resilience of Guam and the Mariana Islands.
- **Guam Congress Building:** This building is newly restored and holds the legislative session hall, hearing rooms, and senators' offices.
- **The Guam Fishermen's Co-op at the Marina:** Specializes in local seafood items caught daily by its members and processed for sales in the store.

7.2.7.2. Land Use Issues and Challenges

Hagåtña Restoration and Redevelopment Authority.
The Hagåtña Restoration and Redevelopment Authority (HRRA) is the lead agency responsible for guiding the revitalization of Guam's capital city. Established by law, HRRA is tasked with promoting the heritage, economic vitality, and redevelopment of Hagåtña through the creation and implementation of the Hagåtña Master Plan. Its mission emphasizes expanding affordable housing, increasing employment opportunities, and fostering the social and economic well-being of the community. HRRA plays a central role in coordinating public and private investments, preserving historic and cultural assets, and ensuring that land use decisions align with the city's long-term vision. Through its leadership, HRRA seeks to transform Hagåtña into a thriving, sustainable urban center that reflects the island's cultural identity and supports the needs of its residents and visitors alike.

The Hagåtña Master Plan (HRRA, 2022).
The Hagåtña Master Plan addresses several key land use issues in Guam's capital city, focusing on revitalizing the area as a cultural, civic, and economic hub. The main land use issues identified include the city's declining population and underutilized land, the dominance of government uses, fragmented land ownership, and the presence of incompatible land uses that disrupt community cohesion. Additionally, stakeholders raised concerns about flooding, inadequate parking, and the lack of vibrant tourism and mixed-use development. The limited residential population has impacted the city's liveliness and economic potential, contributing to a downtown that lacks the vibrancy of a true capital center.

In response, the plan outlines objectives to re-establish Hagåtña as the governmental and cultural heart of Guam through mixed-use development, increased residential opportunities, and preservation of historical and cultural landmarks. The vision centers on creating a vibrant, walkable downtown with civic spaces, commercial areas, and mixed-use neighborhoods that foster social, economic, and cultural activity. A key goal is to encourage more residents to live in Hagåtña, improving housing diversity and affordability, while simultaneously supporting economic growth through infill development, tourism, and local business support.

The policies support these objectives through strategic land use planning and targeted actions. For example, the plan promotes mixed-use nodes around key districts and transit areas, incentivizes redevelopment, and calls for preserving cultural resources such as the Heritage Trail and Spanish-era architecture. Additionally, urban design standards are proposed to enhance walkability, aesthetics, and connectivity. These standards include guidelines for building maintenance, wayfinding, and pedestrian amenities. The waterfront and riverwalk areas are also targeted for redevelopment that respects cultural heritage and environmental sustainability while creating spaces for recreation and commerce.

To support implementation, the plan identifies a comprehensive framework of policies: improving pedestrian and transit infrastructure, encouraging public-private partnerships, and aligning land use with sustainability goals. Historic preservation is integrated into land use decisions, while the plan also calls for improved coordination across government agencies. Overall, the land use component of the Hagåtña Master Plan seeks to transform the city into a dynamic urban center that honors its past while building a resilient, inclusive future.

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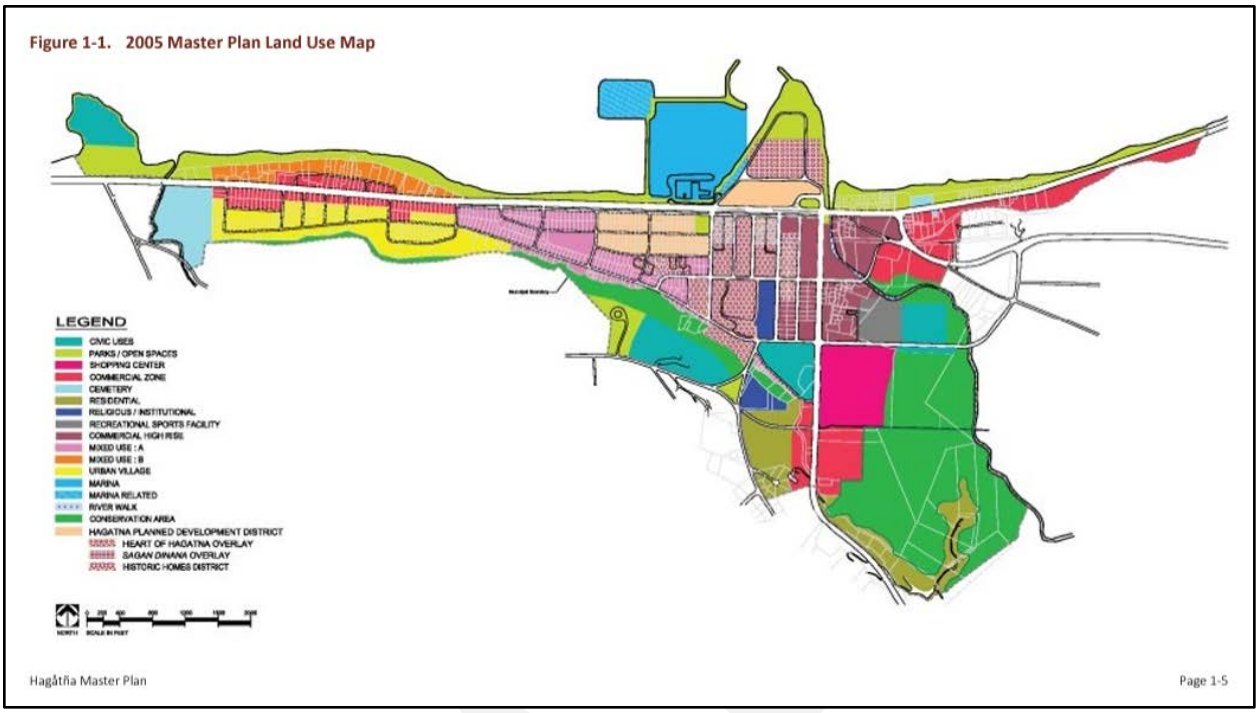

Figure 7-4. Hagåtña 2005 Master Plan Land Use Map.

Hagåtña is interested in expanding their tourism industry, including looking into creating a tourist area in the marina for docking large cruise ships. To do so, the Hagåtña plans would need updating. Ideas also include additional restaurants and nightclubs to stimulate the economy through attracting tourists and locals.

Other Issues. The greatest environmental issue in Hagåtña may be the functioning of the wastewater pump station in the village and associated odor. Illegal dumping also is an environmental issue. With respect to erosion, mud runoff goes into the ocean from the river during big rains. There are flooding issues because the drainage is clogged. Additionally, there is insufficient drainage, which is exacerbated by construction of commercial buildings and lack of repaving of roads.

With respect to culture and community, residents feel that drugs have become an issue, causing people to become homeless, which has led to a rise in theft, fights, and squatting in abandoned buildings and parks. Additionally, some feel that the sense of cultural identity is becoming lost, with many children not able to speak CHamoru and losing CHamoru values.

The U.S. Army Corps of Engineers is assessing the feasibility of options in the East Hagåtña Shoreline Protection Project (USACE 2023). For several years, there has been a significant shoreline erosion issue. A seawall that was constructed in the 1990s is being undercut by erosion and on the verge of collapse, despite its intended purpose was mitigation of this exact erosion. Continued erosion will impact the primary roadway, Marine Corps Drive, connecting Andersen Air Force Base and Navy Base Guam, as well as primary access to many villages including downtown Hagåtña.

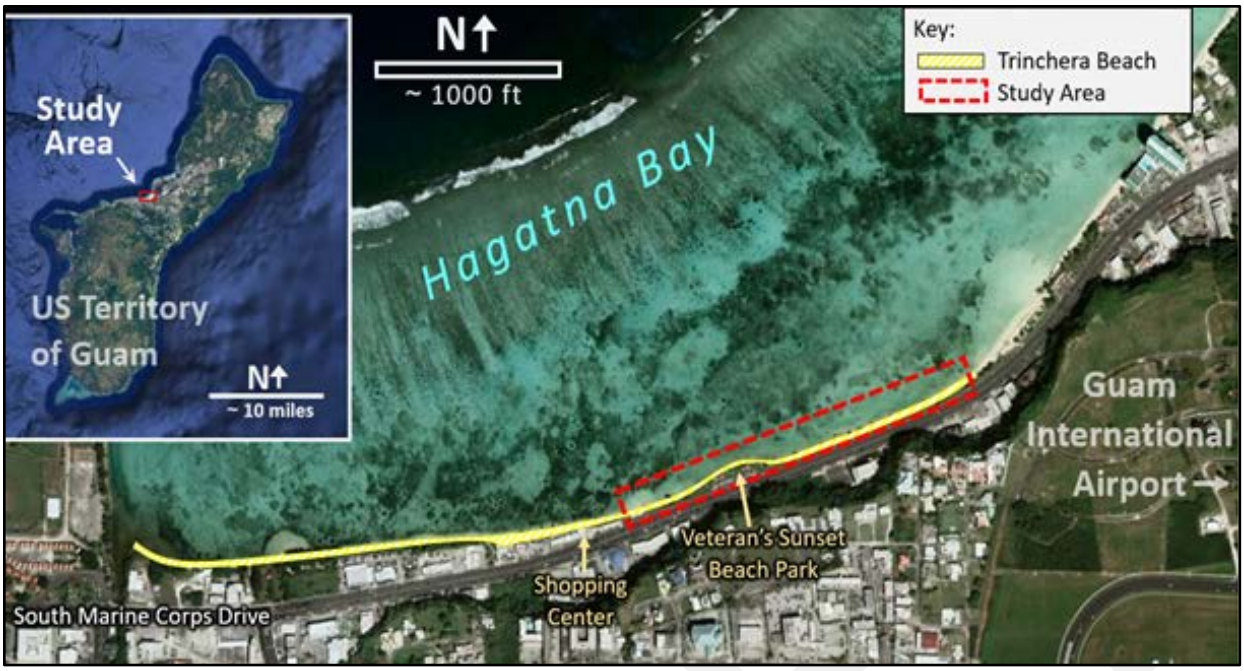

Figure 7-5. Site for the USACE East Hagåtña Shoreline Protection Project.

7.2.7.3. Village Land Use Policies and Programs

As the capital, Hagåtña should prioritize revitalization efforts, including mixed-use developments, improved public spaces, and heritage preservation, consistent with the Hagåtña Master Plan. Supporting cultural events and tourism will reinforce the village's identity as Guam's cultural and administrative center. Development that includes new buildings should focus on a Spanish style design.

VS-45. Hagåtña Master Plan.
Assure that land use planning and development decisions are consistent with the Hagåtña Master Plan.

VS-46. Coordination with Hagåtña Restoration and Redevelopment Authority.
Coordinate implementation of the G50SP by BSP, DLM, and other land use authorities with the Hagåtña Restoration and Redevelopment Authority.

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7.2.8. Mangilao

Mangilao village got its name from the word *ilao*, which means to look for something (Leon Guerrero 2025). Hunters and fishermen historically went to Mangilao to search for crabs, deer, wild pigs, and fish.

Mangilao is in central Guam between Barrigada and Chalan Pago. It includes several subdivisions such as Latte Heights, Sunrise Village, and lower and upper Pågat. Guam Community College and University of Guam are both located in Mangilao, as well as several government agencies and the prison.

7.2.8.1. Community Setting

The village of Mangilao today is fairly new, but has ancient sites dating back more than 1,000 years including an ancient CHamoru village in Pågat. Pågat has breathtaking cliff lines overlooking the Pacific Ocean, as well as jungle trails leading to freshwater caves and ancient latte (Leon Guerrero 2025).

Mangilao lacks a natural water source, thus it was not repopulated until after water wells were established in the late 1920s. Mangilao began to flourish in the late 1920s with agricultural initiatives. Following World War II, Mangilao became a key agricultural center, attracting workers and leading to significant development. Officially recognized as a separate municipality in 1952, Mangilao has evolved into a dynamic community with educational, governmental, and residential infrastructure.

Mangilao had, in 2022, 126 establishments and 10,256 paid employees with an annual payroll of a combined $81.1 million, which if divided equally, is roughly $7,900 annually (BSP 2024). Mangilao had 2,434 land parcels in 2023 worth approximately $221.7 million, and 1,341 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $279.4 million (BSP 2024). In 2020, there were 13,476 residents in 4,656 housing units, and in 2023, there were 13 reported homeless households (BSP 2024).

At present, the central point of the village is the area where the Santa Teresita Catholic Church, Mangilao Community Center, and Mayor's Office is located. Though divided by the main road, Route 10, this area is where night markets, social events, and other village gatherings take place.

Mangilao Senior Center: The Mangilao Senior Center is located near the Mangilao Community Park and Santa Teresita Catholic Church. Additionally, there is a walking path and park sign nearby to help residents access the center and other community amenities. A sign was installed at the Mangilao Night Market that displays walking routes and park maps (University of Guam

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2023). The Mangilao Senior Center is part of the local efforts to enhance community health and engagement.

Other key points of interest in Mangilao include:

- **The University of Guam:** A U.S. Land Grant and Sea Grant Institution in the heart of Mangilao overlooking Pago Bay.
- **Sisters of Mercy Convent:** This is the second convent on Guam.
- **Caves:** Marbo Cave is a freshwater coastal cave. Pågat Cave is on the eastern side along the coastline in a sinkhole at the bottom of a cliff. It contains fresh water.
- **Eagle Field:** This recreational and sports field was recently renovated for youth football leagues. The field is also used by private skydiving companies as a landing site.
- **Thousand Steps:** Roughly 150 concrete very steep steps provide access to the beach at Mangilao Golf Club. It provides a panoramic view of the Pacific Ocean.

7.2.8.2. Issues and Challenges

The mayors identified key challenges in Mangilao related to land use, environmental management, infrastructure, and cultural preservation. Land disputes over zoning, access easements, and ownership, especially in residential areas, caused issues with utility billing and mail delivery, while family subdivisions led to infrastructure strain. Housing was generally available but concerns about affordability remained, particularly for multi-family homes.

Environmental issues included illegal dumping, flooding, and feral pigs encroaching on residential areas due to habitat loss. Infrastructure concerns focused on water access, power, and internet connectivity in underserved areas, along with waste management, law enforcement, sewer, and road improvements. Bus stop additions and enhanced public transportation were suggested. Despite current police and fire protection services being viewed as sufficient, an increase in police presence within the village was suggested. Culturally, access to natural resources for traditional practices was affected by environmental factors such as invasive species.

7.2.8.3. Village Policies and Programs

VS-53. Educational Land Reserve.

Designate and protect strategic land parcels near existing institutions for future university and community college expansion, including mixed-use developments that support student housing, research facilities, and walkable amenities.

VS-54. Community Recreation Access.

Establish minimum park space standards per capita and prioritize the development of parks, green spaces, and playgrounds within walking distance of all residential areas.

VS-55. Integrated Waste Management Zoning.

Identify and zone land for waste transfer and recycling centers to reduce illegal dumping and improve access to sustainable waste services, while supporting local clean-up efforts with formal infrastructure.

VS-56. Cultural Economy Zoning Overlay.

Create a Cultural Economy Zone near the village center or public markets to support artisans, cultural practitioners, and local food vendors through dedicated space, flexible permitting, and infrastructure for year-round cultural events.

VS-57. Agricultural and Small Business Support.

Promote mixed-use and agri-commercial zones that allow integration of small farms, community gardens, and food-related microenterprises within the village core and outskirts.

VS-58. Resilient Village Design Guidelines.

Adopt village-scale design standards that incorporate climate resilience, walkability, and public health outcomes into all new developments, especially around schools, markets, and community centers.

7.2.9. Mongmong-To'to-Maite' (Mongmong-Toto-Maite)

Mongmong, Toto, and Maite comprise one municipality. Momongmon, which later became Mongmong, describes the sound of a heartbeat. Toto means to recline, and maite means to nudge or touch another person (Leon Guerrero 2025b). Mongmong may also refer to the sound that dirt ridges of holes make as they crumble when people walk on them.

Mongmong-Toto-Maite is north of Hagåtña in central Guam. Mongmong and Toto are mostly rural, residential areas. Mongmong is parallel to Maite and the center of the municipality. It is also the most populated of the three villages. Toto borders Barrigada and has winding roads and swamplands. Maite boasts a beautiful cliffline from which you can watch the sunsets.

The area of Maite and Toto between Tiyan and Hagåtña is primarily industrial with warehouses, hardware and furniture stores, mom and pop markets, and popular bargain shops. However, prior to the Japanese occupation in 1941, Mongmong-Toto-Maite was mostly used for small-scale farming and raising poultry and other livestock. Most people using the land lived in Hagåtña and would walk to the tri-village area daily to work (Leon Guerrero 2025b). After the war, the tri-villages provided housing to those who used to live in the capital.

7.2.9.1. Community Setting

Nuestra Senora de Las Aguas, Mongmong's Catholic Church, hosts an annual fiesta to honor their patron saint on the last Saturday of January. The Immaculate Heart of Mary Church in Toto celebrates its patron saint's fiesta annually in June. Maite does not have a village fiesta.

Mongmong-Toto-Maite had, in 2022, 66 establishments and 2,815 paid employees with an annual payroll of a combined $35.5 million, which, if divided equally, is roughly $12,600 annually (BSP 2024). Mongmong/Toto/Maite had 574 land parcels in 2023 worth approximately $105 million, and 393 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $115.7 million (BSP 2024). In 2020, there were 6,380 residents in 2,277 housing units, and in 2023, there were 4 reported homeless households (BSP 2023).

7.2.9.2. Issues and Challenges

The existing municipal wastewater system needs to be repaired and improved as sewage is a persistent issue throughout the village. The Agaña Wastewater Treatment Plant (WWTP) currently services the village, however, it is not sufficient to meet wastewater effluent from residents and treatment demands. Additionally, the electric grid requires modernization to increase electric capacity to accommodate the current demand by village residents. The principal utility is currently the Guam Power Authority.

PCB soil contamination from the Agaña Power Plant (APP) is an environmental and human health concern in Mongmong (Guam Daily Post 2021) because it borders the Agaña Wetlands, which abuts the APP. The APP used polychlorinated biphenyls (PCBs) as cooling oils for its electrical transformers and switching-gears. By 1989, most transformers and related equipment were either removed or the oils were replaced with non-PCB coolants. In 1998, as part of its standard turnover procedure for the transfer of former industrial properties, the Navy tested for traces of chemicals that could be harmful to humans and the environment. PCBs, dioxins, and polycyclic aromatic hydrocarbons (PAHs) were detected in soils and foods at or near APP. The Navy is currently characterizing and cleaning up the contaminated areas (ATSDR 2010).

Many of the locals have migrated out of the village and there has been an influx of migration in recent years, so the opportunity for local investment is very scarce. There are not many opportunities for investors to develop in the village with the local economy in mind. Crime rates have also increased in recent years and it is no longer considered a safe and open community. There is an increasing demand for modern, suburban and more upscale housing such as townhomes, but the village predominantly consists of rental housing units and is considered at maximum capacity for new housing development projects.

Illegal dumping and abandoned vehicles are a significant concern to residents. The mayor's office can issue fines for abandoned vehicles, but it takes a long time to be processed with the municipal courts and violators are not sufficiently disincentivized. There currently isn't an

impound lot so the vehicles are consequently amassed on public property. Residents also complain about lack of delineated property easements, resulting in frequent disputes amongst property owners. There are no updated assessor maps.

7.2.9.3. Village Policies and Programs

VS-65. Community Facilities and Infrastructure.
Upgrade infrastructure and community facilities as feasible. Strengthen disaster resilience.

VS-66. Sustainable Housing Development.
Promote sustainable housing while preserving natural spaces.

7.2.10. Piti

Piti's name likely derived from the CHamoru word *puti*, which means hurt or ache (Guampedia.com). Piti is quite large, spanning from Apra Harbor at the south end to Tepungan Beach Park at the north, then at the junction with Asan Beach Park, Piti goes south past Nimitz Hill to Mount Chachao and Mount Tenjo, circles the wastewater treatment plant, then heads west to reconnect with Marine Corps Drive. Piti also hosts the Port of Guam and the Marianas Yacht Club, as well as the War in the Pacific National Historic Park. There are a few recreational beaches, including Family Beach at the end of Cabras Island and Tepungan Beach Park.

7.2.10.1. Community Setting

The residents have Piti Pride. It is considered a cohesive community that enjoys being together and are proud to be residents of Piti. The village proper is located across from Cabras Island on the cliffside of Marine Corps Drive. It is a small residential area with several older homes dating back to the 1940s-1950s. There are several important points of interest:

- **Guam Veterans Cemetery:** 18 acres of land across from the Jose LG Rios Middle School. It is the resting place for US military veterans and their families.
- **Our Lady of the Assumption Catholic Church:** A small concrete chapel built in 1930 at which a fiesta and procession are held in mid-August annually.
- **Piti Guns:** One of seven units of the War in the Pacific National Historical Park, the guns are located in the heart of Piti and were built for the Japanese to defend against US naval ships and landing craft.
- **Santa Cruz Shrine:** The shrine is located on a narrow road in the jungle off Marine Corps Drive and has a small shelter for those in the village who make the annual trek to honor the cross. The surrounding swamp is the "Swamp of the Immaculate Virgin."
- **Atlantis Guam:** This is a small peninsula in Apra Harbor, which hosts the Marianas Yacht Club and Port Authority Beach.

- **Fish Eye Marine Park:** Micronesia's first and only underwater observatory that was constructed to show visitors the beautiful undersea wonders. More than 200,000 visitors are logged annually.
- **Mahogany Forest:** The forest is near the Piti Guns. The trees were planted around 1928 as part of the Guam Agricultural Experiment Station.
- **Piti Bomb Holes Marine Preserve:** A designated marine preserve that attracts large amounts of fish and other marine life. Many snorkelers, swimmers, and divers visit annually. The area is named "bomb holes" because it looks as though craters were created by bombs, although they are natural coral formations.
- **Cabras Island:** Once a low-lying finger of land offshore In WWII it was connected by a causeway to the mainland and extended by the Glass Breakwater. Cabras has both the Port of Guam and important Guam Power Authority generators supplying Guam

Piti is a medium-sized community, with 66 establishments and 2,685 paid employees as of 2022 (BSP 2023). In 2022, there was an annual payroll of $28.8 million, which equates, if divided equally, to a salary of about $10,700 per person. In 2023, Piti had 1,107 parcels of land with an approximate value of $169.7 million and 530 buildings with an appraised value of $111.8 million (BSP 2024). As of 2020, Piti has 1,585 people and 578 housing units, with 3 homeless households in 2023 (BSP 2024). However, interestingly, the residents reported that homelessness is a problem within the village during outreach associated with this project and that people need better paying jobs.

Apra Harbor, for which Piti and Santa Rita host shoreline, is very protected and is the location of most maritime industry as well as the port for US naval vessels. The beach parks are used by the community frequently for village gatherings, events, and sports, such as Christmas in the Park, paddling, and family gatherings.

7.2.10.2. Issues and Challenges

Improved sustainability of the ocean and its resources was emphasized by the community because previously, the initial focus was on recycling, and as one citizen stated, "Sustainability is so much more than that!" Runoff, erosion, and sedimentation are issues, and flooding continues to worsen due to a lack of drainage under Marine Corps Drive. Removal of pigs, which are a primary cause of watershed degradation, should improve the environment.

Property availability is scarce - available properties are predominantly wetlands (wetland areas with mangroves) or private properties. The feeling is that only the government could develop within Piti due to the lack of available land upon which to develop. For example, the area in the

southern part of Piti is Sasa Bay, a marine preserve designated in 1997 for its valuable habitat, which would likely not be developed, nor would residents want development there.

Water infrastructure and roads are a challenge. Water pipes are eroded and leak regularly. Water pressure varies throughout the village. Route 6 needs a better maintenance plan because it requires better drainage, as do other secondary roads throughout the village. These are issues that would need to be addressed prior to additional development. Transportation is an issue for the residents. More residents are relying on the transit system, but it is many hours between buses. Few residents have cars.

7.2.10.3. Village Policies and Programs

VS-67. Marine Environment.

Protect Piti's coastal and ecological significance, particularly the coral reefs, fisheries' sustainability, and connections to local culture and the economy. Expand recreational opportunities and improve disaster resilience.

VS-68. Sustainable Development.

Promote small-scale development, such as creating space in the village for a coral nursery and where the community can learn about the reef, rebuilding the canoe house, and creating space for revenue generation such as a restaurant and bar near Santos Park. Explore opportunities on available GovGuam properties for community-related development.

VS-69. Senior Housing.

Provide senior housing and assisted living opportunities for the community.

VS-70. Cultural Resources.

Protect the Latte site and Atantano for their significant cultural importance to the community. Consider cultural education development opportunities, prioritizing the preservation of cultural heritage, medicinal plants, and the historical relevance of Piti's locale.

7.2.11. Sinahånña (Sinajana)

Sinajana is believed to be derived from *chinåhan-ña*, which is his or her cooking ground. Yams grew plentiful in this area, which were harvested and cooked in earthen ovens in the ground. That process is called *chinåhan* (Castro).

Sinajana is on the hilltop above Hagåtña between Agaña Springs and Agaña Heights. It borders the Agaña Wetlands. Prior to World War II, Sinajana was an agricultural village, at one time supplying all civilian Guam with coffee. Sinajana took in many families when Hagåtña was destroyed during World War II. After supertyphoon Karen destroyed 80% of the village structures in 1962,

"urban renewal" forced the relocation of hundreds of villagers to other parts of the island over the next decade (Castro).

7.2.11.1. Community Setting

Sinajana had, in 2022, 32 establishments and 628 paid employees with an annual payroll of a combined $8.9 million, which, if divided equally, is roughly $14,100 annually (BSP 2024). Sinajana had 5,121 land parcels in 2023 worth approximately $437.5 million, and 3,540 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $495.9 million (BSP 2024). In 2020, there were 2,611 residents in 836 housing units, and in 2022, there were 3 reported homeless households for Agaña Heights and Sinajana combined (BSP 2024).

Sinajana is home to the Saint Jude Thaddeus Catholic Church, and their annual village fiesta is celebrated in honor of Saint Jude, patron saint of the impossible, on the last weekend in October (Castro). The village has two schools. The Sinijana Community Center hosts the mayoral administrative houses, Senior Citizen Recreational Center, Guma' Mami Inc. (a nonprofit community-based organization providing support to those with disabilities), and baseball and basketball facilities. The church and community center are located in the heart of the village, which is a peaceful area with sidewalks, making it ideal for walking or jogging.

Other key points of interest in Sinajana include:

- **Ada's Funeral Home:** This is the first funeral home to operate on the island.
- **Butler's Store:** Butler's Emporium was founded by Chester Butler, the first person to receive a license to manufacture and sell soda outside the continental US.
- **Hotno:** This old Spanish stone oven can be found in the yard of the old Won Pat store.

7.2.11.2. Issues and Challenges

One of the predominant concerns in Sinajana is water. Sinajana provides water to the central areas, but during high-demand times, there is low pressure. Four areas have water lines that are constantly breaking.

The residents of the village desire a commercial space, already identified, to provide for a laundromat, barbershop, fish shop, and more. The village is also facing increased prices for housing - people from outside the village want to move into the village because of the progress the village has made. Thus, affordable housing is a concern.

Another issue is the border of Sinajana. Sinajana used to be bigger, but the borders were moved because the original straight lines divided people's houses, where one half was in Sinajana and the other half in another village. However, when the border was moved, it resulted in some children going to the wrong school because they could not attend the school in their neighborhood, since the border moved the school to the next village.

Maintenance of culverts and the three ponding basins were noted as problematic. The ponding basins are overgrown and sometimes residents throw yard waste into the culverts, clogging them. Larger drainage systems using 24-inch pipes instead of 12-inch.may be needed also.

The power infrastructure is old and fragile. The village had poor planning during development, and subsequently, the needed additional megawatts were not anticipated. To rectify this, village residents are installing solar, and a new power plant in Hagatna will contribute to Sinajana's electricity.

With respect to flooding, the issue primarily pertains to land use rules regarding retaining walls. The runoff caused by a retaining wall, which doesn't require a permit to build, ends up flooding neighbors' houses and yards.

Lastly, there are insufficient typhoon shelters in Sinajana. Most people shelter in place. The goal is to make the community center a Tier 2[21] location for typhoons that can double as a staging area.

7.2.11.3. Village Policies and Programs

Sinajana's approach to development is holistic, where investments in facilities and programs subsequently foster a positive communal atmosphere, and supports mental and physical well-being of residents of all ages. The most important public space in Sinajana is considered to be the community center and the church.

The village has identified places for development using GHURA lands - 3 for community gardens, 3 for open spaces with benches, and 3 where the community would plant native trees. Additionally, a Green Market comprised of a metal structure with a solar panel roof is planned with stalls for selling produce, baked goods, home goods, and more.

VS-71. Community Development Objectives.

Focus on maintaining a small-community feel while upgrading infrastructure and community facilities. Avoid large-scale development. Expand recreational spaces and improve access to services to enhance quality of life. Create spaces that promote walkability and connectivity. Prioritize affordable housing as a paramount objective.

[21] As described in Guam's Hazard Mitigation Plan: "Tier 1 shelters provide immediate, short-term refuge; Tier 2 shelters offer more comprehensive services for longer durations; and Tier 3 shelters are equipped for extended stays, providing full-scale support including, healthcare, food, and long-term accommodation" (Guam Homeland Security, 2024).

7.2.12. Tamuneng-Tomhom (Tamuning-Tumon-Harmon)

Tamuning was the Carolinian name given to the area where Carolinians settled after a typhoon devastated Lamotrek and Satawal. The name may have come from the Carolinian chief's clan. The Carolinians were relocated to Saipan in the early 1900s. The ancient CHamoru name was *Apurgan* or *Apotgan* (Clement Jr. b).

Major parts of Tamuning include Tumon, Guam's tourism district; and Harmon, Guam's industrial park. Upper Tumon and Harmon are relatively flat, sitting on high cliffs above Tumon Bay. The low plateau of Oka Point divides Tumon and Hagåtña Bays. Tumon has beautiful white sand beaches and protected waters, and has been developed over the last 40 years into Guam's tourism center.

Tamuning and its surrounding areas have a large number of latte stones and other archeological finds around Tumon Bay. There are freshwater springs and excellent inshore fishing, making this location a major population center for the island for centuries. In the late 1600s, Tumon was listed as a major village. However, with the resettlement of CHamorus during the Spanish-CHamoru wars, the area was vacated. For the subsequent two centuries, the area was primarily used for ranching, hunting, and fishing. The village of Tamuning was established in 1849 by Governor Perez as a refuge for a group of Carolinians whose islands had been destroyed by a typhoon in 1848 (Clement Jr. b).

After the Carolinians were moved to Saipan by Governor Schroeder, people began to settle permanently in the Tumon-Tamuning-Harmon area during Guam's American naval era. Tumon was a popular fishing and salt-making spot during those years.

Ranchers were restricted from the area during World War II. After the war, CHamorus began to return to the area to find that the US military had taken over their land. Much of the land in Tumon Bay is now off limits because it is a designated Army Air Corps recreation area. The military planned to condemn the entire area, but was stopped by one man armed with a shotgun. To prevent public outcry, the military stopped. Areas such as Ipao that had been used by the military for recreation sites were then turned over to the Government of Guam. Subsequently, Tumon families built permanent houses where their ranches had been (Clement Jr. b). In the 1980s, rapid development changed Tumon and many residents moved to other parts of Guam. After the war, Tamuning also changed from ranching to permanent housing for the ranching families as well as refugees from Hagåtña.

7.2.12.1. Community Setting

Tamuning is the most ethnically diverse community since statesiders, Filipinos, Hawaiians, and Asians started moving into the village in the 1960s. They came with the military, federal government, or tourism-related industries (Clement Jr. b). After Yigo, Tamuning (inclusive of Tumon and Harmon) has the highest population on Guam.

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Tamuning had, in 2022, 1,616 establishments and 82,508 paid employees with an annual payroll of a combined $985.3 million, which if divided equally, is roughly $11,900 annually (BSP 2023). Tamuning had 1,850 land parcels in 2023 worth approximately $781.2 million, and 1,579 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $1.18 billion (BSP 2024). In 2020, there were 18,489 residents in 8,692 housing units in Tamuning as a whole, and in 2022, there were 18 reported homeless households in Tamuning, 25 homeless households in Harmon, and 21 homeless households in Tumon (BSP 2024).

The two-mile long coastline between Ypao Point and Gun Beach forms a broad concave embayment known as Tumon Bay. The bay is bordered at both ends by limestone cliffs. Ypao Point, the south boundary, is a prominent headland more than 200 feet high. There are no streams discharging into the Tumon Bay area, but several storm drain culverts discharge across the shoreline. Beaches extend along most of the Tumon Bay shoreline, the principal ones being Fafai, Gun, Gogna, Naton and Ypao Beaches. They are among the most heavily used recreational beaches on Guam. Much of Guam's hotel development is concentrated along the Tumon Bay shoreline and backshore terrace, with associated residential and commercial development. Tumon Bay is a popular region for net fishing, snorkeling, reef walking, outrigger canoe paddling, stand-up paddle boarding, kayaking, and diving. Tumon Bay is one of five marine preserves on Guam.

The Tamuning Senior Center is located in Tamuning, Guam, situated near key landmarks such as the Guam Memorial Hospital and Antonio B. Won Pat International Airport. Tamuning itself is a bustling village on the island, and the senior center is accessible via Marine Corps Drive, a major road in the area. The center is close to residential neighborhoods, as well as the Guam Memorial Hospital and shopping centers like the Guam Premier Outlets.

Key points of interest in Tamuning include:

- **Blessed Diego Luis de San Vitores Church:** This church is in the heart of Tumon and has long been a pilgrimage church for Catholics on Guam.
- **St. Anthony Catholic Church:** This church, originally named St. Victor's Chapel, was built after World War II. Although the church has been renamed, St. Victor is still the patron saint of Tamuning.
- **Schools:** There are six schools in Tamuning including public and private schools.
- **San Vitores Monument:** The monument is the site where Blessed Diego Luis de San Vitores was killed by Chief Mata'pang in 1672. His death sparked the Spanish-CHamoru wars. CHamorus have maintained the site since the day he was murdered.

- **Ypao Beach Park:** Also known as Governor Joseph Flores Memorial Park, this is Tumon's largest and oldest beach park. It is at the site of an ancient CHamoru burial ground, and was also the location of a leper colony established by the U.S. Naval Government. Today, the beach park is a popular weekend location for festivities, barbeques, and parties. The waters of Tumon Bay off the park are part of the Tumon Bay Marine Preserve, in which fishing is limited and people are not allowed to take marine life.
- **Cushing Zoo:** Guam's only zoo is located next to Matapang Beach Park.
- **Matapang Beach Park:** Dedicated to CHamoru Chief Mata'pang, this beach park houses outrigger canoes used by local canoe clubs.
- **Tumon Tourist District:** Tumon is the island's tourist district. It contains luxury hotels, high-end shops, several restaurants and bars, dance clubs, and more.
- **Two Lovers Point:** Two Lovers Point is a steep cliff face that marks the northern border of Tumon Bay. It has beautiful views of the ocean and the Guam shoreline.

7.2.12.2. Issues and Challenges

Zoning issues have been raised out of concern that current zoning may not is an issue. There are currently several projects that aim to improve land use policies and ensure zoning regulations reflect ecological considerations and community needs. With respect to the environment, illegal dumping and improved environmental management practices were listed by community members as issues to tackle. Flooding needs to be mitigated.

Tamuning needs investments in infrastructure, including roads, water supply, and stormwater systems. Plans exist to improve recreational facilities and public spaces to enhance community well-being and ensure the facilities meet the needs of all residents.

Due to economic challenges, Tamuning has initiatives aimed at attracting businesses to contribute economically and socially to the community. Residents voiced concerns about preserving the local culture during development. They have undertaken efforts to promote cultural understanding through educational programs.

7.2.12.3. Villages Policies and Programs

VS-75. Shoreline Management.

Consider establishing a shoreline management district to promote beach protection and tourism, water quality enhancement, public shoreline access and adaptation to sea level rise.

VS-76. Hotel Redevelopment and Enhancement.

Facilitate opportunities for reinvestment and enhancement of existing hotel stock and tourism facilities.

VS-77. Community Circulation and Infrastructure.

Assess circulation and infrastructure constraints, including extreme flooding events, road capacity, and mixed-modal transportation management.

VS-78. Mixed Use Development.

Promote mixed use development in the urban cores.

SOUTHERN VILLAGES

7.2.13. Hågat (Agat)

Hågat may have been named by the first clan who settled the village, or is potentially derived from *aga*, the CHamoru name of the Marianas crow that makes the sound "aga" while flying. It could also be derived from *håga*, which means blood in CHamoru. Hågat is the commercial center of the southern part of the island just south of Naval Base Guam, and boasts some of the finest beaches on Guam (Babauta b).

Prior to World War II, Hågat supported farming, ranching, and fishing. There were rice paddies on the coastal flats and flat inland areas, and coconut trees that produced copra along the coast. The original village site was destroyed by American bombings to clear Japanese positions prior to the US utilizing the beaches of Hågat for entry onto the island. After the war, a new Hågat village was established farther south than the original location (Babauta b).

7.2.13.1. Community Setting

Hågat has several commercial and residential areas along its main route. It also has a group of public buildings, including the Hågat Community Center and mayor's office, as well as Hågat Marina and several parks dedicated to World War II that are part of the War in the Pacific National Historical Park.

The first church in Hågat was established in 1680. There are now three predominant churches in Hågat - Our Lady of Mount Carmel Catholic Church, St. Andrew's by the Philippine sea, and Santa Ana Chapel. Hågat also hosts the Our Lady of Mount Carmel School and the Southern Christian Academy.

Hågat had, in 2022, 35 establishments and 1,893 paid employees with an annual payroll of a combined $20.4 million, which if divided equally, is roughly $10,755 annually (BSP 2024). Hågat had 3,009 land parcels in 2023 worth approximately $236.1 million, and 1,641 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $213.9 million (BSP 2024). In 2020, there were 4,515 residents in 1,472 housing units, and in 2023, there were 14 reported homeless households in Hågat and Santa Rita combined (BSP 2024).

Points of interest include:

- **Hågat Beach Unit of the War in the Pacific National Historic Park:** This park has visitor facilities including interpretive displays, picnic pavilions, restrooms, and parking, as well as memorials and monuments.
- **Mount Alifan:** This mountain has many artifacts and locations from World War II, including craters, foxholes, emplacements, caves, and rifle-pits, shell and bomb fragments, and bullets.
- **Taleyfac and Taelayag Spanish Bridges:** These two stone bridges are a couple of the few remaining bridges built using Spanish stone and mortar construction and are listed on the Guam and National Registers of Historic Sites.
- **Hågat Commercial Point Center:** This center hosts restaurants and businesses for the village and is located at the northern entrance to the village.
- **Hågat Sagan Bisita:** The Sagan Bisita is a series of pavilions around a courtyard with a large stage. It hosts the Tuesday Night Market and annual Mango Festival.
- **Hågat Small Boat Marina:** The small boat marina is a modern facility that includes a sea rescue operation, restaurant, and ice house. It hosts fishing derbies and daily charter fishing trips.
- **Hågat Senior Citizen Center:** This center is where the village seniors can relax, and play bingo and other games.
- **Haya Youth Center:** The Haya Youth Center is between the Hågat Gymnasium and Hågat Senior Citizens Center, and holds various after school programs as well as the youth summer camp.
- **Nimitz Beach:** This beach is a popular public beach and recreational area with pavilions.

Hågat hosts its annual 3-day Mango Festival in May. It includes canoe paddle racing, displays, vendors, kiddie rides and games, arts and crafts, and a mango culinary competition. It also has an associated 2k or 5k run.

7.2.13.2. Issues and Challenges

Hågat is a medium sized village that lacks a hardened facility to serve as a Tier 2 shelter.[22] The village has a refurbished basketball court, but additional recreational facilities and parks are desired by the village residents. Two parks in Hågat have no water or power, just pavilions.

[22] As described in Guam's Hazard Mitigation Plan: "Tier 1 shelters provide immediate, short-term refuge; Tier 2 shelters offer more comprehensive services for longer durations; and Tier 3 shelters are equipped for extended stays, providing full-scale support including, healthcare, food, and long-term accommodation" (Guam Homeland Security, 2024).

There is a lot of open land through the Chamorro Land Trust, but there are concerns about enforcement of zoning so that the land is being used for its intended use. For example, some lands that are zoned agriculture are being used as dump sites.

With respect to shoreline erosion, Hågat's beaches have been eroding which not only impacts the recreational areas, but also along with rising tides, can cause issues for the utility poles that are located along Route 2 on the water front.

Flooding from heavy rainfall is a concern for residents. The flooding has been more intense in the last 10 years, and the village infrastructure is not designed to handle the amount of rain. Stormwater runoff from the rivers covers the reefs with mud. The flooding also causes backups in several houses. One of the primary drivers is that the roads are now higher, which causes flooding into people's homes. Hågat has existing drainage systems, but they are clogged and have been so for over 10 years.

7.2.13.3. Village Policies and Programs

Hågat's coastal location necessitates a focus on climate resilience, including shoreline protection and sustainable tourism development. Enhancing public spaces, such as parks and waterfront areas, alongside improving access to community services, will benefit residents and visitors alike. Potential improved community service access includes a Tier 2 shelter and a hospital or triage / urgent care facility in addition to the existing lab and pharmacy.

Hågat residents would like to see development that allows them to stay within the village instead of needing to leave to find a recreational facility or store in a neighboring village. The village is looking at incubators for little restaurants and eateries where owners of small businesses can utilize village facilities. However, the goal is to develop the community while resisting commercialization, maintaining the village's identity, perpetuating the culture, and promoting tourism experiences that are authentic to southern Guam.

The village residents are looking at furthering the economy through agriculture (e.g. coconuts, chicken eggs), aquaculture (e.g. tilapia), and fishing. The Hågat Marina provides an excellent location for servicing an aquaculture production in the nearshore area, and development of a co-op would allow fishermen to sell their fish in the village instead of driving elsewhere.

VS-40. Climate and Shoreline Resilience.

New development should facilitate climate resilience, including shoreline protection or adaptation to maintain shoreline line access and coastal resources.

VS-41. Hågat Community Character and Sustainable Development.

Develop the community while resisting commercialization, maintaining the village's identity, perpetuating the culture, and promoting sustainable tourism experiences that are authentic to southern Guam.

VS-42. Village Center and Community Space.

Enhance public spaces, such as parks and waterfront areas. Promote access to stores and recreational areas within the village.

VS-43. Hågat Community Services.

Improve access to community services, including a Tier 2 shelter and a hospital or triage / urgent care facility.

VS-44. Community Agriculture.

Grow the village economy through agriculture (e.g. coconuts, chicken eggs), aquaculture (e.g. tilapia), and fishing.

7.2.14. Humåtak (Umatac)

Humåtak derives its name from *uma*, meaning to carry something on the back or a heavy load on the shoulders. Humåtak is a small village located in southern Guam along Humåtak Bay. There are old houses and ruins along the bay's shoreline, and a bumpy two-lane road runs through the center of the village. The road then crosses the Humåtak Bridge and runs uphill to the ruins of Fort Nuestra Senora de la Soledad, which was constructed to protect the bay from pirates and other European explorers. North of the central part of the village is an overlook to Cetti Bay, which is a beautiful, secluded beach that can only be reached by hiking or sailing (Guampedia, Babauta f, 2025).

7.2.14.1. Community Setting

Humåtak is home to the "Fouha" rock, which the CHamorus believe is the resting place of goddess Fu'una and her brother Puntan. CHamoru legend credits the two for creating the world and its people. The rock is also referred to as the "Creation Point."
Humåtak had a combined 402 land parcels in 2023 worth approximately $54 million, and 145 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $14.8 million (BSP 2024). In 2020, there were 647 residents in 177 housing units, and in 2023, there was one reported homeless household (BSP 2024).

Although Humåtak is a small village, it does have a rich history. Before the Spanish occupation, CHamorus made pilgrimage to the Fouha rock located in Humåtak. In 1521, Ferdinand Magellan landed in Humåtak Bay, marking the start of the Spanish Era in Guam. His landing point is marked on the bay with an obelisk with a statement that says, "Magellan landed here." A reenactment of Magellan's landing is also held every year during Guam History and CHamoru

Heritage Day CHamoru Heritage Day. Humåtak was a chief port during the Spanish occupation, during which the Governor moved his residence from Hagåtña to Humåtak. Between 1680 and 1810, various forts were built around Humåtak. There was also a monumental road project planned to link Humåtak and Hagåtña, but it was never finished. Some parts of this project can still be found today in Humåtak, Sella Bay, and Hågat (Babauta f).

Other key points of interest in Humåtak include (Babauta f):

- **Guam Veteran's Memorial:** The memorial park overlooks the hillsides of Humåtak and is dedicated to 74 CHamoru who died in the Vietnam War. A special mass is held annually on Memorial Day at the park.
- **San Dionisio Catholic Church:** The church has been destroyed and rebuilt four times. It's been burnt, destroyed by a typhoon, destroyed by two earthquakes, then rebuilt in its new location in 1939, where it still stands. Ruins of the previous church building are on the National Register of Historic Places.

- **Spanish Forts:** To protect the Humåtak Bay harbor from pirates and privateers, the Spanish built Bateria de Nuestra Senora Del Carmen, Fort Santo Angel, Fort San Jose, and Fort Nuestra Senora de la Soledad. Bateria de Nuestra Senora Del Carmen protects the mouth of the Salupat River and Humåtak Bay. Fort Santo Angel is on top of a large rock structure at the entrance to Humåtak Bay. Fort San Jose is on the hill prior to entering Humåtak Bay from the north. Fort Soledad is now a park often visited by tourists and is located on top of a steep bluff that provides an excellent view of the village, Humåtak Bay, the coastline, and mountain range.
- **Humåtak Pride Outdoor Library:** This library is a large, highly decorative cement bookshelf that was built in 1933 to provide a place where villagers could exchange books. It sits next to the village's main road.
- **F.Q. Sanchez School:** In the Guam and National Registers of Historic Places (AIA, 2019).

7.2.14.2. Issues and Challenges

Priorities in the village include addressing flooding, sewer infrastructure, and storm-related erosion of the cemetery. The sewer distribution is insufficient and the power supply is inadequate. However, water supply experiences only occasional interruptions during storms due to sediment contamination. Road maintenance is hampered by the repairs to water lines.

Regarding environmental concerns, erosion continues along the river and coastline, which is exacerbated by seawater incursion and feral pigs. Flood control challenges seem to be more related to erosion rather than inadequate storm drainage. The village advocates for river dredging and tree planting as solutions. Shoreline erosion at the cemetery is causing the cemetery to sink.

With respect to land use, there are discrepancies in land allocation. Some noted that outside individuals receive land prior to village residents.

Public safety is a concern in Humåtak. There is a shared Humåtak/Malesso fire station though some observe that the village lacks on-site EMT and ambulances. Additionally, Humåtak lacks typhoon shelters, although efforts are underway to repurpose a FEMA-funded gym to provide shelter from typhoons. Lighting in park areas such as Fort Fort Nuestra Senora de la SoledadTrinidad and Sella Bay can also be improved to enhance safety.

7.2.14.3. Village Policies and Programs

Humåtak's historical significance requires initiatives that balance preservation with modern needs.

VS-79. Balanced Community Development.

Promote sustainable development that preserves local heritage sites while improving infrastructure. Promote eco-tourism, small-scale businesses and residential development, while avoiding high-rise developments.

VS-80. Community Facilities.

Develop new and repair existing community facilities such as a gym, senior center, community center, and pavilion. Assure adequate infrastructure for government and community facilities.

VS-81. Natural Beauty and CHamoru Heritage.

Pursue strategic development and economic expansion while retaining the natural beauty and charm of the village, and preserving CHamoru traditions and values. Uphold and pursue development consistent with the Humåtak Revitalization Plan

7.2.15. Inalåhan

Inalåhan probably refers to the *åla,* which are large woven coconut leaf harvest baskets that the village was known for. The name also could have been derived from *hålla*, which means to pull something or move it with a rope tied to it. The Spanish changed the l in CHamoru words to r, thus changing the village's name to Inarajan. The official spelling was changed in 2021 to Inalåhan.

Inalåhan is an expansive village located on the southeastern coast of Guam east of Malesso'. Inalåhan is divided into sections, including Lada (near Bear Rock), Belen, Peca, Chagamin Lago, Se'se' (going uphill to Inalåhan Middle School), and Tinaga. One of the biggest sections is Malojloj, which sits uphill and north of the main village (Babauta c).

7.2.15.1. Community Setting

In 2022 Inalåhan had 9 establishments and 102 paid employees with an annual payroll of a combined $699,000, which if divided equally, is roughly $6,800 annually (BSP 2024). Inalåhan had 2,226 land parcels in 2023 worth approximately $217.6 million, and 647 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $72.8 million (BSP 2024). In 2020, there were 2,317 residents in 605 housing units, and in 2022, there was 1 reported homeless household (BSP 2024).

The tranquil village of Inalåhan is rich with both CHamoru culture and Spanish history and is known as the most distinctly Spanish-style village on Guam (Babauta c). Considered the oldest village in Guam, its recorded history predates the island's discovery by Portuguese explorer Ferdinand Magellan in 1521.The subcommunity of Malojloj began as a farming community in the 1950s and has grown over the past twenty years, so that it now has its own Catholic church, San Isidro, as well as a gas station, a convent, a solid waste transfer station, and the Inalåhan mayor's office.

The village retains many of its traditional ways. Few modern structures have been built. However, a more recent addition is the Gef Pa'go Cultural Village on the bay that has ancient-style thatch roofed huts, and is staffed mostly by elder CHamorus who demonstrate traditional CHamoru arts, crafts, and cooking to visitors (Babauta c). Gef Pa'go Cultural Village also boasts the famous Hotnu Bakery, to which residents from all over Guam drive to for the fresh bread and pizzas.

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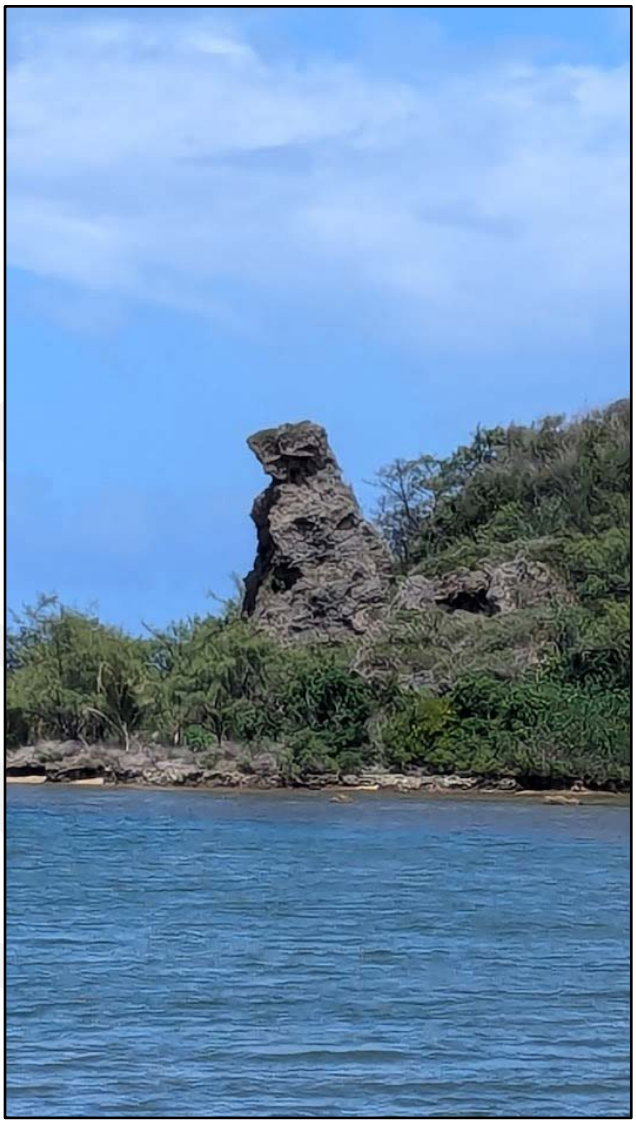
Inalåhan was listed on the National Register of Historic Places in 1977, and is also designated as a folk arts village. Due to an influx of visitors, including tourists and school children, the village is a bit faster paced and one of the one-way roads was expanded into a modern paved two-lane road.



Key points of interest in Inalåhan include (Babauta c):

- **Schools:** There is an elementary and middle school
- **Churches:** St. Joseph Church has been the center of Inalåhan for several hundred years. San Isidro Church is in Malojloj and is a more recent structure.
- **Baptist Church ruins:** The Baptist Church was constructed in the early 1900s. Only one wall remains standing.
- **Gadao's Cave:** Gadao's Cave is at the entrance to Inalåhan Bay and contains ancient pictographs of stick figure people. Chief Gadao was a legendary chief of Inalåhan who outsmarted a chief from Tumon in a strength contest that broke a canoe in half while they rowed in opposite directions. A statue of Chief Gadao rowing his half of the canoe to Inalåhan is on the shores of the main village.
- **Historic Homes:** Some of the oldest homes in the village have been preserved using federal funds, and the Gef Pa'go Cultural Village gives a tour of the Leon Guerrero House, built in 1901, which housed the village commissioner and his 16 children. The Jose Duenas Cruz House is maintained by the Historic Inalåhan Foundation, and the George Flores building is cared for by the Guam Preservation Trust.
- **Bear Rock:** This is a large, natural formation of rock at the edge of Agfayan Bay that, from some angles, looks like the shape of a bear.
- **Gef Pa'go Cultural Village:** This cultural village, located along Inalåhan Bay, now closed. Elders told stories of their childhood and gave demonstrations of traditional CHamoru cooking, crafts and arts. The cultural center also exhibited ancient CHamoru tools, tours of historical homes in the village, and cultural dances.

- **Salaglula Pools:** These natural pools of sea water are located toward the southern side of the main village.
- **Talo'fo'fo Bay Beach Park:** This black-sand beach was once a popular park for swimmers and family gatherings and is one of the island's prime surfing spots. The pavilions are mostly destroyed. Although it is named Talo'fo'fo Bay park, its facilities are on the southern side of the bay in Inalåhan.

7.2.15.2. Issues and Challenges

Revitalization Plan. Inalåhan has developed the *Inalåhan Historic District Revitalization Plan* (2013), which is a comprehensive blueprint aimed at preserving and revitalizing the historic core of Inalåhan. This area is notable as the island's last remaining example of Spanish-era village life and architecture. Developed through a collaboration between the American Institute of Architects (Guam & Micronesia Chapter), Guam Preservation Trust, the Historic Inalåhan Foundation, and community stakeholders, the plan builds upon decades of preservation efforts and is grounded in community engagement and historical research.

The plan's vision centers on safeguarding Inalåhan's unique sense of place while encouraging sustainable development. It emphasizes the need for revitalization efforts to honor the village's vernacular architecture—characterized by mamposteria (masonry) foundations, steep metal roofs, compact lot layouts, and traditional woodwork—while introducing new development that harmonizes with the historic setting. Equally important is showcasing the village's history, including through interpretive signage, museums, and walking tours that highlight significant local stories, such as those connected to St. Joseph's Church and Father Duenas.

Three guiding principles shape the revitalization strategy: preserving historical character, enhancing vitality and economic livelihood, and improving the public realm. These principles are addressed through an eight-phase implementation plan. Early phases prioritize urgent needs like repairing deteriorating structures, enacting a historic district ordinance, and upgrading utilities. Mid and later phases involve streetscape improvements, community parks, interim and permanent open space development, cultural attractions (e.g., Gef Pa'go), and new compatible buildings. A focus on cultural tourism and adaptive reuse is central to the plan, aiming to support small businesses, job creation, and a vibrant village life.

Challenges such as flood hazards, infrastructure deficiencies, unclear building codes, and probate land disputes are acknowledged as major obstacles. The plan recommends clear zoning guidelines, streamlined historic preservation processes, and coordinated infrastructure improvements—such as underground utilities and stormwater drainage—to overcome these

issues. Sustainability is woven throughout the plan, promoting the reuse of historic buildings, energy-efficient retrofits, local agriculture, and low-impact development.

Ultimately, the revitalization plan presents a community-centered, culturally rooted, and phased approach to preserving Inalåhan's past while building a sustainable, vibrant future.

Other Issues. Inalåhan sits close to the sea, thus has been hit hard by several typhoons (Babauta 2025). Development may be chilled because of high development costs, though the presence of the landfill in the village may lower certain land values. Even with plans and development of appropriately scaled tourist attractions (small, outdoor market/boardwalk for example), the village will need parking and support facilities (restrooms, e.g.) to be successful.

In Malojloj, there is a lack of sewer infrastructure. Slow-paced infrastructure development, particularly in power and water lines, contributes to issues such as low water pressure and new household connectivity. These have amplified during storms, where water and power supply is reduced or altogether absent.

There are extensive challenges with siltation, runoff, seawater incursion, and sea level rise, all of which affect fishing and coral health. Local hunters often slash and burn the mountainsides for easier hunting visibility for deer, but they are not aware that the exposed soil is consequently more susceptible to erosion and runoff into Inalåhan and Acfalle Bays.

Inalåhan and other areas along the eastern side of the island lack a dedicated police station. This results in prolonged emergency response times, which poses a risk to community safety. The community would like a police station in the village to improve response times and residents' safety. The same is true for fire and healthcare - Inalåhan lacks a dedicated fire station and private health care facilities, though the Federally Qualified Southern Region Community Health Center has been in operation there since 1984. The number of typhoon shelters should be increased in Inalåhan. Solutions include covering a basketball court to serve as temporary housing.

Guam's GTA TeleGuam gained approval in 2023 to build a new cable landing station in Inalåhan. The project site is on the corner of Belen Avenue and Route 4 / Chalan Canton Tåsi, which is near Inalåhan Bay. The proposed landing station will allow GTA to bring up to six new fiberoptic cables onshore (Swinhoe 2023).

Inalåhan is committed to community well-being, ensuring internet services were upgraded, providing online learning during the COVID-19 pandemic, providing year-round opportunities for children, and improving sports facilities and programs.

Development is encouraged in the village, with ambitions for creating a community kitchen to support local entrepreneurs, promote cultural practices, and generate employment. However, development should also be dependent on the appropriate infrastructure, such as ensuring the appropriate water pipe size, as well as in appropriate locations. Development is discouraged in some areas due to concerns about cultural and natural integrity and infrastructure limitations, and there is also resistance to high-rise buildings. Enhancing infrastructure and supporting eco-tourism will boost the village's appeal while meeting community needs. Adaptive reuse of existing structures, like converting them to community centers, could address infrastructure needs and contribute to economic sustainability by creating places for education and recreation. A suggestion is to build a boardwalk between Bear Rock and Inalåhan Pools to stimulate the economy and attract tourists.

The village has placed emphasis on building a boat ramp in the village to improve safety at sea. The length of time is extensive for rescue units from Hågat or Hagåtña to reach the village during search and rescue activities when individuals are lost at sea, particularly at Surf Side Beach in Talo'fo'fo Bay.

Inalåhan is seeking environmentally friendly and economically viable practices for agriculture and farming to improve overall community sustainability. Aquaculture, such as giant clam aquaculture, is identified for development in the village. The village would also welcome green infrastructure and renewable energy projects. Policies supporting responsible land use, biodiversity conservation, and climate change mitigation are vital for long-term environmental sustainability in Inalåhan.

7.2.15.3. Village Policies and Programs

VS-47. Historic Compatibility Requirement.

All development proposals, including new construction, additions, or exterior renovations, must demonstrate compatibility with the Inalåhan Historic District's vernacular architectural style. This includes adherence to traditional building forms (e.g., compact footprints, sloped metal roofs, mamposteria foundations), scale (1–2 story structures), spatial orientation (minimal setbacks, close street frontage), and use of historically appropriate materials.

VS-48. Adaptive Reuse and Mixed-Use Encouragement.

Development applications that propose the adaptive reuse of historic or contributing structures for compatible mixed-use purposes—such as artisan workshops, guest accommodations, small-scale retail, and cultural education—shall be prioritized during review. Proposed uses must not compromise the structural or visual integrity of historic features.

VS-49. Cultural Tourism Overlay Use Priority.

Within the designated Cultural Tourism Overlay Zone, land use approvals shall favor uses that promote cultural heritage and public engagement, including museums, interpretive centers, traditional food vendors, and event spaces. Uses must be pedestrian-oriented and contribute to the District's identity as a cultural destination.

VS-50. Public Realm Contribution Requirement.

Development proposals must contribute to public realm improvements proportionate to their scale and location. Contributions may include street-facing landscaping, period-appropriate lighting, public seating, interpretive signage, or improvements to pedestrian connections.

VS-51. Flood-Resilient Design Compliance.

All new construction or major rehabilitation projects within FEMA-designated flood hazard areas must incorporate elevated or bodega-style foundations to mitigate flood risk. Designs should reflect traditional architectural responses to coastal conditions.

VS-52. Interim Land Use Activation Policy.

Vacant or underutilized lots may be temporarily used for low-impact community uses such as cultural demonstrations, open-air markets, gardens, or art installations, provided such uses maintain the integrity and appearance of the surrounding historic fabric. Interim uses must not impede future long-term development.

7.2.16. Malesso' (Merizo)

Malesso' is derived from the CHamoru word *lesso'*, which is a rabbitfish juvenile stage. Schools of juvenile rabbitfish (*mañåhak*) run in the village's bays and inlets at certain times of the year. Groups of people work nets to gather the fish. Malesso' follows the shoreline at the southern tip of Guam. It boasts Cocos Lagoon, which is a large triangular lagoon bordered by Cocos Island. Cocos Lagoon has several protected coral reef areas and vast expanses of sand, including Achang Reef Flat Marine Preserve. In the past, there was a ferry that ran regularly from Bikini Island Club on the shore of Malesso' to the resort on Cocos Island (closed after Typhoon Mawar).

Malesso' spans from Cocos Lagoon up through nearby mountains that include lush valleys and dry savanna, as well as several rivers. Much of the Malesso' population lives in the rural valleys, which contain residential areas and agricultural lands.

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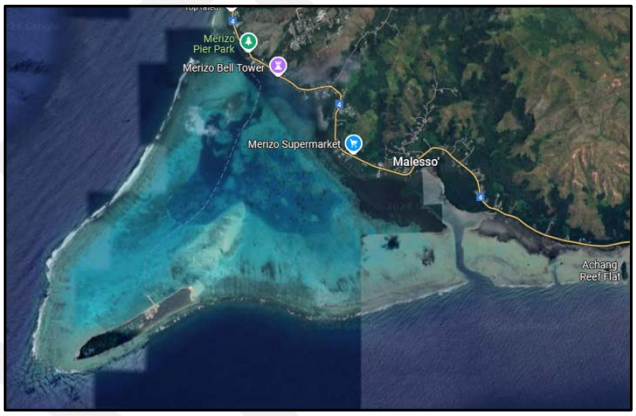
7.2.16.1. Community Setting

Malesso' is a smaller community with 1,604 people, 471 housing units, and 396 buildings as of 2022, worth $44.4 million with only two homeless households (BSP 2024). In 2022, there were 5 establishments, 105 paid employees, and an annual payroll of $1.2 million (BSP 2024). In 2023, Malesso had 1,290 parcels of land worth $126.5 million.

The Malesso' community holds two festivals annually that celebrate the importance of the ocean and its life-providing sustenance. The *Fiestan Tåsi* (Festival of the Sea) celebrates the importance of the ocean to Guam's past, present, and future and includes boat races and other water sports competitions. The 57th Fiestan Tåsi, a 3-day event, was held in November 2024 at the Malesso Veteran Sons and Daughters Pier Park. The Crab Festival, or Malesso' Gupot Chamoru, is also a 3-day event that is held annually in March. It includes arts and crafts, but most importantly, it includes local land crab dishes such as stuffed crab and crab cakes. There are also culinary competitions, talaya throwing (fish net), coconut husking, and other competitions.



Points of importance include:

- **Kampanayun Malesso:** The Malesso' Belltower dates back to 1910 and is on the National Register of Historic Places.
- **Malesso Kombento:** This is the home of the parish priest and office. It was built in the 1800s and restored in 2000 by the Guam Preservation Trust.
- **Merlyn G. Cook School:** Originally housing a naval radio facility in the 1920s, this is now a youth recreation center near the Malesso' Pier Park. It has also served as a village schoolhouse.
- **Santa Marian Kamalen Shrine:** This is a small park that holds a marble statue of Santa Marian Kamalen. This is a the site where a fisherman from Malesso' was fishing in the bay when he spotted two golden crabs carrying a statue of the Virgin Mary.
- **Malesso' Pier and Small Boat Ramp:** The pier and boat ramp are a public facility that provides the main pass to Cocos Lagoon, as well as the launch for the majority of Malesso's boat-based fishermen.
- **Priest's Pools:** The Priest's Pools are natural freshwater pools in the Pigua River, hidden in the hills of Malesso'.

- **Tinta and Faha massacre sites.**[23]

Malesso' is one of the few villages with a Community-Based Management Plan for Malesso Coastal and Marine Resources (see inset), which is built on collaborative efforts of Malesso village residents, participants from local business and agencies, federal agencies, and the broader Guam public and other interested organizations (Chargualaf and Mansapit 2014). The Manell-Geus watershed management plan was also completed in coordination with NOAA (see Chapter 5).

There is an emphasis on tourism in Malesso' with a desire to highlight the unique identity and traditions within Malesso' and to improve economic stimulation. However, there is also an acknowledgement that increased tourism must also be supported by improved infrastructure. Some noted also that there is no explicitly outlined plan for economic development in the village.

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[23] https://www.guampedia.com/war-atrocities-tinta-and-faha-massacres/.

Coastal Stewardship and Land Use in Malesso

Community-Based Management Rooted in Place

Malesso's *Community-Based Fisheries Management Plan* reflects a deep connection between land and sea, underscoring the need to integrate coastal resource management with land use planning. Developed through a collaborative process with residents, traditional leaders (Sainas), and agencies, the plan highlights how upland decisions affect nearshore health—linking watershed management, land development, and marine conservation.

Key Objectives with Land Use Relevance:

- **Conservation:** Protecting marine ecosystems (e.g., coral reefs, seagrass, mangroves) requires upstream land management to prevent runoff, erosion, and pollution—especially near sensitive areas like the Achang Reef Flat and Cocos Lagoon.
- **Socio-Economic:** Preserving access to coastal areas for subsistence and cultural fishing depends on shoreline zoning, infrastructure planning (piers, boat ramps), and balanced tourism development that avoids displacing local use.
- **Governance:** Stronger local involvement in land-use decisions—especially around the coastal zone—ensures traditional knowledge informs policies on access, habitat protection, and compatible uses.

Malesso's Land-Sea Linkages:

- The Geus River and surrounding watersheds drain into Cocos Lagoon, where degraded water quality has impacted fisheries and recreation.
- Land-based activities (e.g., road construction, upland erosion) have cumulative impacts on coastal habitats, underscoring the need for integrated watershed-coastal planning.
- Cultural and recreational spaces—like the Malesso Pier, Youth Center, and festival sites—are coastal landmarks whose land use must balance preservation and access.

Integrated Planning Pathway: The plan offers a framework for managing coastal resources through zoning, education, and community oversight—tools that can also guide shoreline land use and development. Moving forward, coordination between land and marine planning will be essential to sustaining Malesso's identity, ecosystems, and economy.

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7.2.16.2. Issues and Challenges

Tourism-associated activities, including boating, jet skiing, diving, and fishing, are adversely affecting the natural areas around Malesso' (Chargualaf and Mansapit 2014). There is also acknowledgement that Malesso' hosts an array of incompatible human activities and anticipated new uses, and its policies and procedures lack streamlining.

Issues raised at workshops hosted by the WPRFMC included management and enforcement of management objectives of land crabs, establishment of a marine preserve, user conflicts in Cocos Lagoon, and contamination of Cocos Island fishery resources (Chargualaf and Mansapit 2014).

Another issue is infrastructure. When it rains, Malesso' floods. This is particularly an issue because the sewer system cannot handle the additional input. Backflows occur in homes. Maintaining free-flowing stormwater drains is part of the issue, while sewage pumping stations are another part. Additionally, access to a local typhoon shelter should be provided for village residents due to the insufficient stormwater drainage and heaving flooding in the residential areas.

Substandard lots are an issue in Malesso', as well as property line disputes. Landlocked properties are problematic. And, there are setback rules that impact residents' ability to utilize all their land for building their house, as well as a two-story restriction for residential development.

The biggest environmental issue is sewer overflow and runoff. Runoff is damaging the coral. Ideas to address runoff include trenching the mountainside to capture rain. As discussed in Chapter 5 the community participated in development of the Manell-Geus Watershed Management Plan to address such concerns (King, 2014).

Coastal erosion is an ongoing problem, and sea level rise will become a significant long-term challenge. Increased shoreline management and appropriate adaptation strategies will be needed, particularly in relation to critical infrastructure like the main road.

7.2.16.3. Village Land Use Policies and Programs

The focus of the village should be on protecting its coastal and marine environment while promoting sustainable tourism. Enhancing disaster preparedness, expanding public spaces, and preserving cultural traditions will benefit residents and visitors. Careful development planning will mitigate issues that may arise with respect to overwhelming the infrastructure, especially sewer. The pier is a main focal point for events in Malesso' and future community planning.

VS-59. Sustainable Development.
Limit development to residential and smaller-scale commerce using careful development planning to mitigate overwhelming infrastructure.

VS-60. Sustainable Tourism.
Protect the coastal and marine environment while promoting sustainable tourism.

VS-61. Community Spaces and Traditions.
Enhance disaster preparedness, expand public spaces, and preserve cultural traditions to benefit residents and visitors.

VS-62. Pier and Recreational Facilities.
Maintain the functions of the pier and other recreational facilities.

VS-63. Community-Based Management Plan Objectives.

a. Conservation: Protect, maintain, and restore Malesso's living marine resources, ecosystems and habitats. Monitor and mitigate environmental impacts to ensure the quality and sustainability of the environment as a resource for the health and well-being of the Malesso Community and its future generations.

b. Socio-Economic: Protehe I Li'na'la'ta! Protect the local (indigenous) rights of the Malesso Community's resources for the community's sustainable livelihood, health and wellbeing. Educate and promote the traditional and cultural practices for present and future generations.

c. Governance: Ensure compatibility between federal, territorial and local management regimes that maximize obligations and local rights to the Malesso community for a sustainable livelihood, health, and well-being.

VS-64. Manage Marine Protection and Community Sustainability.
Balance marine conservation with community interests and sustainability. Maintain and protect community and public access to the shoreline and pier.

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7.2.17. Sånta Rita-Sumai (Santa Rita)

Sånta Rita-Sumai is named after its patron saint, St. Rita of Cascia. The village was established in 1945 to house the residents of Sumai village who were evicted by Japanese forces during World War II; Sumai was subsequently destroyed as American troops regained control of Guam. Sumai was added to Sånta Rita's name in 2021 to recognize the village's evolution prior to World War II. Where Sumai once sat is now part of the Naval base. Sånta Rita-Sumai is south of Apra Harbor in the foothills of Mount Alifan, and is bordered by Inarajan, Talo'fo'foTalofofo, Yona, Piti, and Hågat. The village is surrounded by natural water sources, including Tarzan Falls, Fena Lake, the Guatali River, and Namo River (Babauta d).

7.2.17.1. Community Setting

Sånta Rita-Sumai had, in 2022, 25 establishments and 493 paid employees with an annual payroll of a combined $5.95 million, which if divided equally, is roughly $12,000 annually (BSP 2024). Sånta Rita-Sumai 1,024 land parcels in 2023 worth approximately $63.8 million, and 458 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $63.6 million (BSP 2024). In 2020, there were 6,470 residents in 1,956 housing units, and in 2023, combined with Hågat, there were 14 reported homeless households (BSP 2024).

Present-day Santa Rita-Sumai has expanded in the previous years. The village now includes the lower areas of Talisay, the Hyundai Santa Rosa housing subdivision, all the military housing in Naval Station, Naval Magazine and Old and New Apra Heights. To this day, most of Santa Rita-Sumai's residents' families have been there since the village was built during the war. There are some signs of development as several homes have been built in recent years, but a good portion of the village still enjoys a spectacular view of Apra Harbor today.

Sånta Rita-Sumai is a tight-knit community. Village activities typically occur at the Our Lady of Guadalupe Church or the Senior Citizens Center and the baseball field. A memorial mass is held at Our Lady of Guadalupe Church every year to commemorate those who lost their lives during World War II.

The Fena reservoir is located in the village, which was intended to provide a dependable water supply to the US Navy, but is now the primary source of water supply in the south (Babauta d). A large population of carabao, now a cultural and historical icon on Guam, resides at the reservoir.

The contour and slopes of Mount Alifan made apportionment of lots difficult. Many postwar houses can still be seen along the precipices and chasms of Sånta Rita-Sumai, raised on stilts to avoid floods during heavy rains (Babauta d).

Key points of interest in Sånta Rita-Sumai include:

- **Our Lady of Guadalupe Church:** This Catholic church holds processions and fiestas for the village's patron saint of Sånta Rita-Sumai in May and for the patron saint of Our Lady of Guadalupe in December.
- **Namo Falls Tropical Garden:** Two waterfalls in the middle of the village are surrounded by tropical flowers and jungle foliage. It is not open to the public.
- **Fena Caves:** The caves are where Sumai residents took shelter when American troops were advancing on retaking Guam. It is where Japanese soldiers killed many men and women with hand grenades, machine guns, and bayonets. The annual memorial Mass was held here until 9/11, when the military closed off the area because it's within the perimeter of Naval Magazine.

7.2.17.2. Issues and Challenges

Flooding and erosion are significant issues in Sånta Rita-Sumai. The United States Army Corps of Engineers (USACE) and the Government of Guam conducted a flood study to understand flooding across the island (USACE 2020). This included a flood hazard study for Upper Namo River.

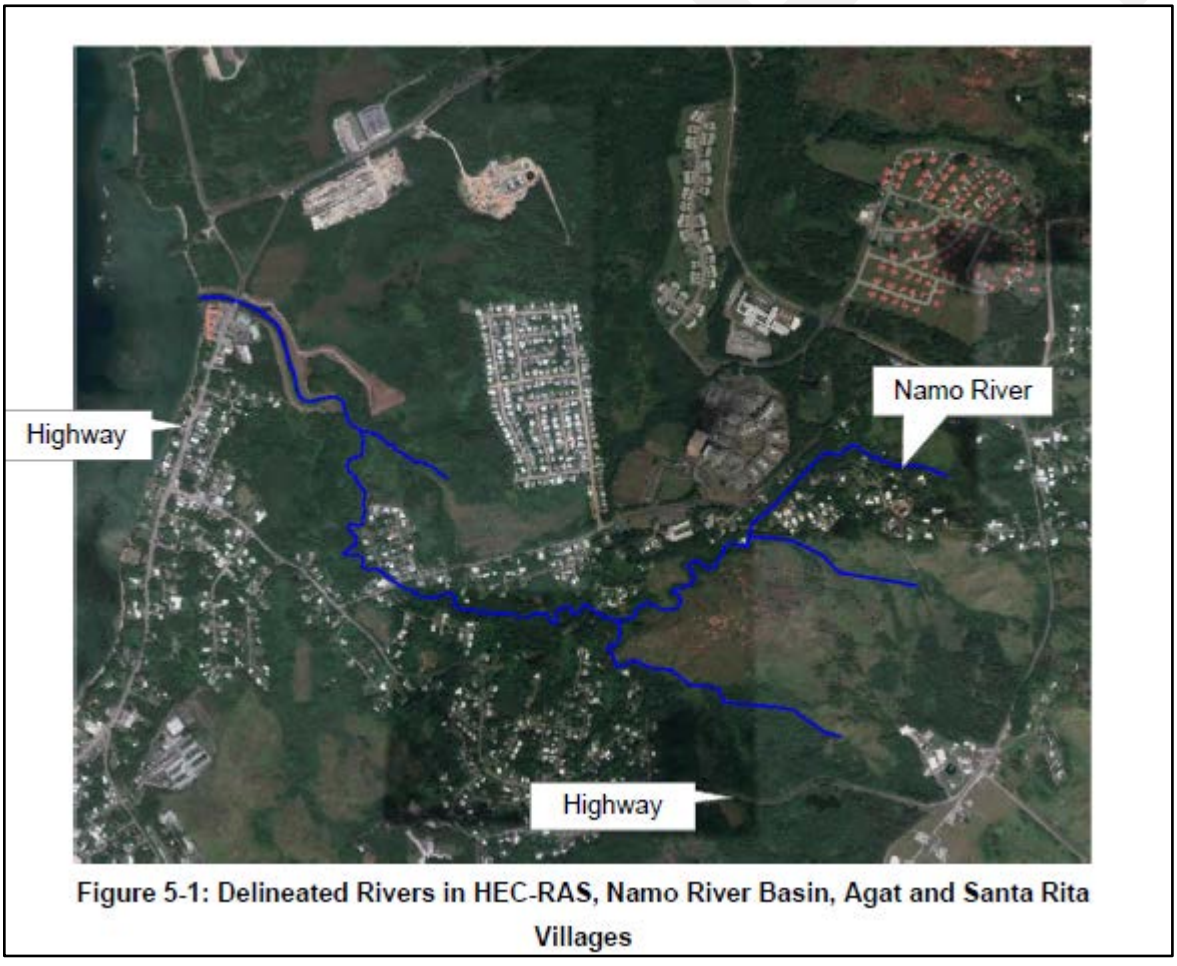

Figure 5-1: Delineated Rivers in HEC-RAS, Namo River Basin, Agat and Santa Rita Villages

Figure 7-6. Rivers in Namo River Basin, Agat and Santa Rita Villages (USACE, 2020, p. 27).

An example of the issue is from a resident who lost approximately four acres of land due to erosion and uncontrolled runoff through his property. The road near his property requires backfilling approximately every six months by the Guam Department of Public Works to prevent it from washing out (USACE 2020). USACE provided alternatives for mitigating against flooding and erosion for the Government of Guam to consider. Residents have also requested from the Government of Guam better storm drainage and installation of a ponding basin (the ponding basin was not suggested by USACE). Unfortunately, land ownership and private property issues have hindered some efforts to resolve the erosion issues. Addressing erosion along the river, though is paramount for flood prevention and protecting environmental resources.

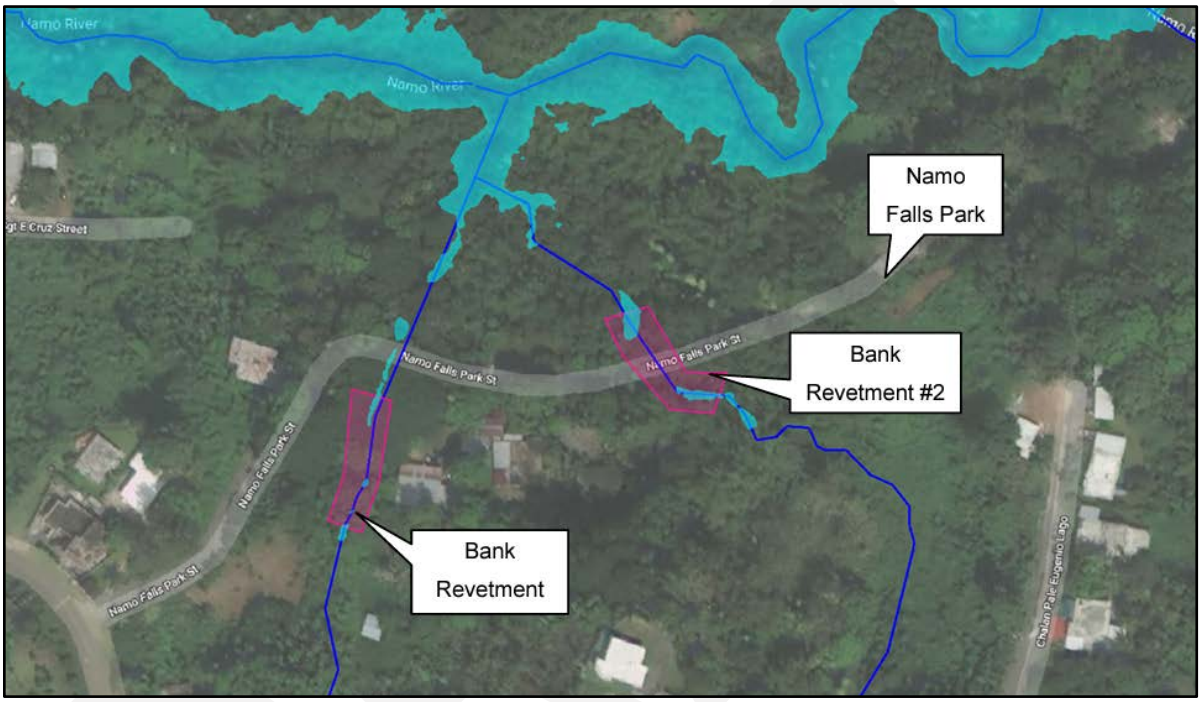

Figure 7-7. Upstream Flooding Areas, Namo River (USACE, 2020, p. 36.).

Regarding infrastructure, there is a lack of a comprehensive sewer system due to the costs associated with expansion. Road deterioration is also a concern because road maintenance is costly, although significant investments have recently enhanced transportation networks through the village. Power distribution was noted as being good, however, there are complaints about the length of time it takes to restore power and the generator breaking frequently.

There have been significant challenges to enhancing recreational opportunities, despite a strong desire to do so. Part of the issue is a scarcity of suitable land as well as financial constraints. The village's high income status limits access to grant funding, which further complicates the issue. Existing land, although available, is often steep or allocated for other purposes. There is also a lack of a central focal point in the village.

Dwindling opportunities for traditional activities like farming and village fiestas pose significant obstacles to preserving CHamoru values. The village, though, is making efforts to restore

historic buildings and traditional architectural elements like latte stones and CHamoru huts. Tours of Sumai also demonstrate a commitment to preserving cultural identity and fostering community cohesion.

Illegal dumping is prevalent in the village. This is exacerbating other issues such as erosion and wildlife disturbance. Another environmental issue are invasive species such as rhino beetles, fire ants, and feral pigs, all three of which are detrimental to the limited amount of arable farmable land in the village. Additionally, the pigs go into the village and break water pipes that are laid too shallow as they root for food, and spill trash that is awaiting pick up.

7.2.17.3. Village Policies and Programs

VS-71. Community Development Objectives.

Prioritize village tranquility while improving infrastructure. Expand recreational facilities, enhance disaster preparedness, and support sustainable housing developments to accommodate growth. Consider small-scale commercial development such as a mini-mall to generate employment opportunities.

7.2.18. Talo'fo'fo (Talofofo)

Talo'fo'fo likely derives its name from the phrase "*entalo'i fe'fo*," which means between the cliffs and *Fo'fo* means a bubbling spring. Since Talo'fo'fo River and Talo'fo'fo Falls are located in the village, it could mean"between the bubbling springs" (Guampedia, Babauta e, 2025).

Below the main village of Talo'fo'fo is the coastal community of Ipan, Talo'fo'fo, which has some houses, a beach park, and small businesses such as Jeff's Pirates Cove. The southern boundary of Talo'fo'fo is delineated by the Ugum River that flows into Talo'fo'fo Bay.

7.2.18.1. Community Setting

Talo'fo'fo was coined as "God's Country" by Former Mayor Tito Mantanona, which is now used by many residents and seen on signs throughout the village. Talo'fo'fo is centered around a four-way intersection at its heart, which is also the economic center. North of the intersection is the mayor's office, houses, and the San Miguel Catholic Church. East of the intersection is the Onward Talo'fo'fo Golf Course, and west is Talo'fo'fo Elementary School, Talo'fo'fo Gym, a sports field, and more houses. South of the intersection is Notre Dame High Schoola private Catholic high school and Seventh-day Adventist Church, and then the road heads down to the Talo'fo'fo communities of Ipan and Talo'fo'fo Bay.

The Talo'fo'fo Caves are along the road between the village and the bay. Ipan has several secluded beaches, some houses, and a gas station. Talo'fo'fo Bay is where the Ugum River meets the ocean. It hosts Talo'fo'fo Bay Park, the facilities for which are actually part of Inalåhan.

In 2022, Talo'fo'fo had 20 establishments and 197 paid employees with an annual payroll of a combined $2.5 million, which if divided equally, is roughly $12,800 annually (BSP 2024). Talo'fo'fo had 2,484 land parcels in 2023 worth approximately $231.5 million, and 974 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $149.8 million (BSP 2024). In 2020, there were 3,550 residents in 988 housing units, and in 2023, there were 2 reported homeless households (BSP 2024).

Other key points of interest in Talo'fo'fo include:

- **Talo'fo'fo Caves:** This series of caves on the side of the cliffs of the main village contain many artifacts and pictographs of the ancient CHamorus.
- **Beaches:** First Beach, just before the entrance to the main Talo'fo'fo village, has three large coral holes that form submerged natural pools. Ipan Beach Park has pavilions and barbecue pits. Tongan Beach is a privately owned resort for camping; it has a large pool and restrooms.

- **Valley of the Latte:** The ancient Talo'fo'fo Village is a site of a CHamoru hut and latte stones and is accessible by boat.
- **Talo'fo'fo Falls:** This waterfall is accessed by a road in Malojloj a section within the village of Inalåhan. There are swimming holes at the bottom of the two-tiered waterfall. A replica of Sgt. Shoichi Yokoi's cave, the Japanese soldier who hid in Guam's jungles for 28 years after World War II in a cave not far from the falls (Babauta e).

7.2.18.2. Issues and Challenges

The village identified the need for an expanded sewer system and upgraded water pipes that have corroded and leak. They also would like enhanced stormwater management to prevent or mitigate flooding during heavy storms. Infrastructure improvements are necessary for enabling the village's development goals and ensuring the well-being of its residents.

Talo'fo'fo has challenges related to land access and market competition. Economic development is geared towards the aquaculture and agriculture sectors, which have been identified both as potential drivers of employment as well as food security. Despite the challenges, there is hope around growth in those two sectors.

The village is addressing youth underemployment through community work programs that engage younger residents in productive activities that benefit the village. The goal is to build a robust local economy that supports Talo'fo'fo's residents.

Cultural preservation is a priority in Talo'fo'fo. CHamoru language and traditions are stressed as a way to maintain the village's unique identity. Talo'fo'fo has implemented initiatives that aim to integrate CHamoru culture into education and community activities.

Environmental protection is also a concern. The village advocates for safeguarding its natural habitats, particularly against invasive species and development pressures to maintain the biodiversity and ecological balance of the area.

7.2.18.3. Village Policies and Programs

VS-72. Scenic Landscapes and Sustainable Tourism.
Preserve scenic landscapes and promote eco-tourism. Enhance recreational facilities, improve road networks, and support sustainable growth.

VS-73. Sustainable Development.
Create a balanced community that provides necessary amenities and services locally, reducing the need of residents to seek employment and resources elsewhere. Promote residential areas, commercial developments, and tourist attractions that support a sustainable and self-sufficient community with a commitment to preserving the village's cultural identity and natural environment.

VS-74. Natural Habitats.
Safeguard Talo'fo'fo's natural habitats against threats including invasive species and development pressures.

7.2.19. Yo'ña (Yona)

Yo'ña is derived from iyo-ña, CHamoru for possessing something material, personal, or spiritual. The village was originally called As Misen, but visitors admired the area's bountiful coconut plantation and when they asked who owned it, the residents would reply "Iyo-ña," or "we own it" (Leon Guerrero 2025c).

Yo'ña, one of Guam's largest municipalities, is on the central eastern side of Guam south of Mangilao and Pago Bay. Yo'ña stretches six miles from Pago Bay to Jeff's Pirates Cove in Talo'fo'fo. The village stretches west to Tarzan Falls and south to Chalan Kanton Tåsi. It also includes the area from Pulantat and Manenggon Valley to Lonfit Bridge in Chalan Pago (Leon Guerrero 2025c). Yo'ña is divided into ten sections: Baza Gardens, Windward Hills, Ylig, Manenggon, Camp Witek, Pulantat, Triangle, Central Yona, Tagachang, and As Namo.

7.2.19.1. Community Setting

In 2017, Yo'ña had 30 establishments and 810 paid employees with an annual payroll of a combined $9.8 million, which if divided equally, is roughly $12,100 annually (BSP 2024). Yo'ña had 3,325 land parcels in 2023 worth approximately $473.4 million, and 1,696 buildings, including residential, condominiums, hotels, apartments, malls, churches, and cottages worth approximately $334.8 million (BSP 2024). In 2020, there were 6,298 residents in 1,843 housing units, and in 2023, there were 7 reported homeless households (BSP 2024).

Yo'ña's history dates back to ancient times. Many latte stones and an ancient burial site have been discovered in the interior district of Pulantat. Another ancient burial site is approximately 100 feet north of Ylig Bridge. Tagachang Beach Park is believed to have been an ancient CHamoru village.

Yo'ña was a rich farming area due to its fertile soil, good water, and abundant fishing grounds. All but two buildings were built of thatch prior to World War II. It remained a peaceful farming area until the last few weeks of the Japanese occupation of Guam. Japanese ordered people to relocate from their homes to march from one concentration camp to another until they reached the largest campsite in Yo'ña's Manenggon Valley. People used the Manenggon River to wash themselves and their clothes, and for cooking. Many people died of malnutrition or other illnesses or were killed by Japanese soldiers or US air raids. Victims were buried in the riverbanks. When the war ended, Manenggon Valley camp was converted to a refugee camp. As people began to leave the area to return home, Manenggon and other parts of Yo'ña became home to the Third and Ninth Division Marines (Leon Guerrero 2025c).

After Typhoon Karen damaged or destroyed 95% of Yo'ña's buildings in 1962, urban renewal changed Yo'ña as streets were redesigned, damaged structures were restored, new buildings were erected, and new homes were built.

The Yo'ña Community Center is in the heart of the village center between North Chalan Kanton Tåsi and Sister Mary Eucharita Drive. It is next to the Yo'ña fire station and mayor's office. The community center is a hub for community events including sports activities, cultural programs, and other gatherings.

Other key points of interest in Yo'ña include:

- **Church of St. Francis of Assisi:** This Catholic church originally built in the 1930s has been rebuilt twice after it was destroyed by an earthquake and during World War II. The

redesigned church was rededicated in 1954. A fiesta in honor of St. Francis of Assisi is celebrated on the first weekend of October.

- **Schools:** The Guam Adventist Academy, M.U. Lujan Elementary School, and St. Francis Catholic School are in Yo'ña.
- **Tank Farm:** The Tank Farm is in the central part of the island. No battle occurred on this site, but the area is littered with rusted World War II tanks put there for target practice for US military gunners.
- **Tagachang Beach Park:** This coastal park is between the limestone cliffs of Yo'ña and the fringing reef of eastern Guam. It is a well-known fishing ground and has a large pavilion and several smaller pavilions.
- **Turtle Cove:** Turtle Cove is an inlet of Ylig Bay that is used as a picnic area.
- **Guahan Sustainable Culture Food Resiliency Hub, formerly Hamamoto** Tropical Fruit World/Hamamoto Gardens (agroforestry project combines agriculture with tourism in a mixed forest interspersed with food-bearing trees) was at risk of being developed for military housing. GSC – a nonprofit – was able to secure the property Hamamoto Tropical Fruit World: This agroforestry project combines agriculture with tourism in a mixed forest interspersed with food-bearing trees. It's located on Cross Island Road (Route 17).
- **Windward Hills Country Club:** This is the oldest public golf course on Guam.
- **Country Club of the Pacific:** This golf course is along the ocean in Yonalpan.
- **Leo Palace Resort:** The resort is located in Manenggon Hills in interior Yo'ña and boasts a 36-hole golf course.
- **Channel 10 Radio Tower:** This tower on Nimitz Hill is noted by residents to have cultural and recreational value for the community.

7.2.19.2. Issues and Challenges

Erosion, particularly of roads, is an issue in flood prone areas and the village is feeling impacts from sea level rise, particularly in the south. Erosion along the riverbanks poses environmental risks.

Landlocked plots from parental subdivisions pose an issue in Yo'ña. Another issue is poorly marked water lines. People sometimes build their houses not realizing they're building on a water line until the line leaks.

Power distribution is an issue. High costs and occasional brownouts are also concerning for Yo'ña residents. Water distribution is generally good, although there are occasional pressure issues and old lines resurface in some places. Yo'ña needs updated water lines in certain areas to replace aging lines. Sewage is also an issue, with many homes relying on outdated septic systems that lead to frequent backups.

Stormwater drainage issues arise from development, causing blockages and flooding during heavy rains. Improved engineering and maintenance is required to address this issue. Residents

suggested a ponding basin be created. Road repairs and construction are an ongoing challenge. Additionally, the roads are narrow with blind spots.

Typhoon shelters require upgrades and increased availability. Existing facilities are often insufficient during natural disasters.

7.2.19.3. Village Policies and Programs

Yona's development should emphasize preserving its natural beauty and rural character. Initiatives include improving roadways, supporting eco-tourism, and expanding recreational spaces to enhance community livability. Yo'ña is looking to strike a balance between development, environmental preservation, cultural integrity, affordable housing, and improved agriculture. There are ongoing efforts to revitalize parks, playgrounds, and baseball fields. The community envisions multipurpose spaces that can host events and gatherings as well as sports.

Most residents prefer minimal commercial development. However, they acknowledge that commercial development is a way to create job opportunities. Traffic would be a concern though with increased development. Hotel development is not viewed positively.

Preserving cultural heritage and fostering education are important for the community given the challenges posed by the erosion of CHamoru language and values. Westernization has led to a decline in traditional practices, and there is an intrinsic connection between language and community values. Efforts to enhance cultural identity within the village including reclaiming symbols like the carabao and latte stone.

While poverty rates in the village are low, the community would like to support lower income families and foster economic resilience.

There is a desire to encourage farming and gardening. Commercial farming would make the village more self-sufficient and would create jobs, as well as result in cheaper vegetables because they would not need to be shipped in.

VS-85. Natural Environment.
Protect the natural environment and rural charm of the village.

VS-86. Sustainable Development.
Balance development, environmental preservation, cultural integrity, affordable housing, and expanded agricultural opportunities.

VS-87. Community Recreation and Health.
Revitalize community parks, playgrounds, and baseball fields.

VS-88. Traffic Capacity.
Assure adequate traffic capacity to support new commercial development

VS-89. Cultural Identity.

Preserve and enhance cultural heritage and foster education about the CHamoru language and values.

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Chapter 8. **Implementation**

8.1. Introduction

The Guåhan 2050 Sustainability Plan (G50SP) provides a framework for long-term land use planning that balances economic growth, environmental stewardship, and cultural preservation. Successful implementation, though, requires a coordinated effort among government agencies, private stakeholders, and the public. This chapter details the necessary components of implementation, including government actions and financing options to ensure that land-use decisions align with Guam's sustainability goals as set out in P.L. 35-110. It begins with stating the broad implementation goal and the planning objectives for success.

> **Goal**: *Establish a coordinated, accountable, and adaptive system for implementing the Guåhan 2050 Sustainability Plan that turns vision into action, strengthens interagency alignment, empowers community participation, and integrates planning, regulation, and investment across all levels of government*.

LAND USE PLANNING OBJECTIVES

1. **Coordinate and Lead Implementation**
    - Designate the Bureau of Statistics and Plans (BSP) as the lead agency responsible for guiding, monitoring, and reporting on G50SP implementation.
    - Establish a Sustainability Plan Implementation Task Force within Year 1 to formalize agency roles, align efforts, and develop coordination protocols.
2. **Align Institutions and Legal Frameworks**
    - Conduct a comprehensive legal review to align existing laws, permitting procedures, and agency mandates with the policies and land use framework of the G50SP.
    - Propose legislative and regulatory reforms to improve consistency, reduce conflict, and elevate plan compliance in early permitting stages.
3. **Operationalize the Plan through Phased Action**
    - Implement short-term (2025–2030), mid-term (2030–2040), and long-term (2040–2050) strategies across land use, housing, infrastructure, environment, and cultural preservation, prioritizing high-impact and time-sensitive actions.
    - Use tools such as updated zoning codes, development review processes, sustainability dashboards, and public reporting to guide and track implementation.
4. **Enable Integrated Planning and Cross-Plan Consistency**

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- Inventory and align existing government plans with the G50SP to eliminate duplication and promote shared goals.
- Support agencies in updating sectoral plans (e.g., water, housing, economic development) to reflect G50SP principles and priorities.

5. **Establish Financing and Funding Mechanisms**
    - Develop a Sustainability Strategic Financing Plan within the first two years, identifying federal, local, and private-sector sources to support implementation.
    - Pursue innovative financing tools such as Public-Private Partnerships, resilience bonds, and development impact fees to fund priority infrastructure and conservation actions.
6. **Advance Transparent, Inclusive Governance**
    - Institutionalize transparent public engagement and formal village-level consultation mechanisms throughout the implementation process.
    - Strengthen the role of the Application Review Committee (ARC) to ensure consistency reviews and coordinated agency feedback on development proposals.
7. **Foster Adaptive Management and Performance Monitoring**
    - Establish a performance tracking and monitoring system using indicators tied to G50SP objectives.
    - Conduct regular five-year reviews and plan updates to ensure accountability, responsiveness, and continuous improvement based on data and community input.

8.1.1. The Need for an Implementation Plan

An implementation plan or strategy for a comprehensive land use plan serves as the critical bridge between vision and reality - between aspiration and implementation. While the earlier sections of the G50SP articulate long-term goals, guiding land use policies, and desired outcomes, this chapter translates those ideas into concrete, actionable steps. It answers the essential questions of who will do what, when, and how, ensuring that the plan does not remain a static document but becomes a dynamic roadmap for positive change and sustainability in Guam.

Implementation is where planning meets action. Implementation planning provides a framework for comprehensive plans (often called a general plan in some jurisdictions) to operationalize shorter-term, more action-oriented steps - including specific priorities, objectives, and initiatives. It focuses on implementing key goals within a shorter timeframe and often includes measurable performance indicators. It also assigns responsibility to specific agencies and partners, sets timelines for achieving outcomes, and outlines the tools, resources, and funding needed to move initiatives forward. By including measurable performance indicators and establishing a

framework for monitoring progress, the implementation plan fosters accountability and transparency. It also provides flexibility, allowing for updates and adjustments as conditions evolve. Ultimately, this chapter empowers stakeholders—village representatives, government agencies, community organizations, and island residents—to align efforts and work collaboratively toward a shared vision for a more sustainable, equitable, and resilient future.

8.1.2. The Importance of Collaboration and Accountability

Effective implementation of a comprehensive land use plan depends on strong leadership, clear accountability, and coordinated action across government agencies, community stakeholders, and the private sector. On Guam, land use planning and development intersect with a diverse network of agencies, each playing a vital role in shaping how land is managed, developed, protected, and restored. The success of this plan hinges on the ability of these institutions to work in alignment, guided by shared goals and a commitment to sustainable, culturally rooted development.

Key agencies such as the Bureau of Statistics and Plans (BSP) and the Department of Land Management (DLM)—alongside the Guam Land Use Commission (GLUC) and the Municipal Planning Council in each village—provide essential leadership in setting policy direction, regulatory oversight, and long-term planning. The Department of Public Works (DPW), Guam Waterworks Authority (GWA), Guam Power Authority (GPA), and the Guam Environmental Protection Agency (GEPA) are critical in ensuring that infrastructure development, environmental protection, and utility services align with land use decisions. Meanwhile, agencies such as the Department of Agriculture (DOAG), the CHamoru Land Trust Commission (CLTC), and the Guam Ancestral Lands Commission (GALC) safeguard land stewardship, access, and equity for future generations. The Department of Parks and Recreation (DPR) also plays a key role in maintaining open spaces and supporting community well-being through recreational land uses. Figure 8.1 presents the main government agencies involved in aspects of land use planning and regulation currently, including how they may network in relation to the development review process.

Accountability is strengthened by assigning clear responsibility for each implementation action that may be contemplated for the G50SP, setting measurable outcomes, and committing to regular progress reviews. A successful implementation process must also be adaptive, with mechanisms in place to track performance, evaluate changing conditions, and revise strategies as needed. This includes regular updates to the plan to the Governor, Senators, and Congressional delegate, coordinated inter-agency check-ins, and public reporting on achievements and challenges.

Community engagement is equally essential throughout the implementation process. Ongoing input from village residents, cultural organizations, landowners, and youth will ensure that implementation remains rooted in local priorities, cultural values, and lived realities. As stewards of the land and sea, the people of Guam must remain partners in the process—not just

in planning, but in monitoring, decision-making, and holding institutions accountable. A transparent, inclusive, and collaborative approach will ensure that the vision laid out in this plan is realized over time in ways that reflect and serve the people of Guam.

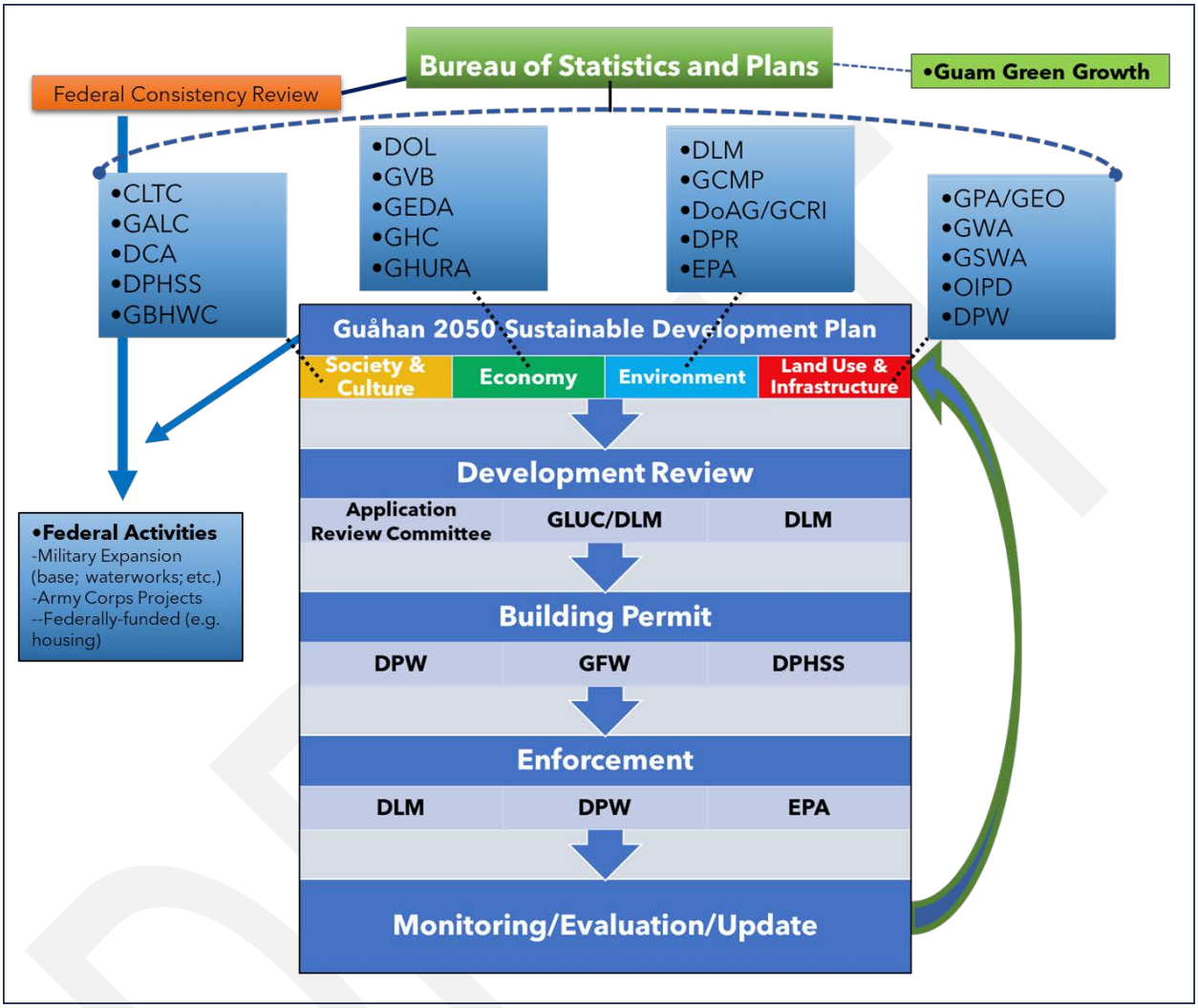

Figure 8-1. Agency Coordination of G50SP Implementation.

8.1.3. From Vision to Action: Linking Principles to Implementation

The implementation strategy is the operational heart of the Guåhan 2050 Sustainability Plan. It ensures that the broad vision, values, and land use priorities expressed throughout the plan are translated into real and measurable actions—over the next five years, the next 15, and the next 25, all the way to 2050. This chapter thus provides the framework for action, rooted in the legislative mandate of Public Law 35-110, which calls for a renewed comprehensive development plan that embraces the principles of sustainability and the needs of both present and future generations of Guam.

The law specifically requires that land use planning in Guam consider economic, environmental, and cultural sustainability through a long-term lens. These three pillars are reflected in the five organizing themes of the G50SP—*Sustainable Communities, Prosperous Economy, Thriving Environment, Vibrant Culture, and Village Sustainability*—and are guided by the five core sustainability principles: *Limits, Balance, Renewal, Equity, and Engagement*. These principles are not abstract; they are practical values that inform the actions and priorities of this implementation plan. For example, the principle of *Limits* guides policies to avoid overdevelopment in aquifer recharge zones, while *Equity* informs the prioritization of affordable housing, village-scale services, and inclusive public engagement.

Implementation also aligns Guam with global sustainability efforts. The G50SP is designed to help realize the United Nations Sustainable Development Goals (SDGs)—a universal set of targets that include climate action, clean water, affordable housing, sustainable infrastructure, and reduced inequality. By embedding the SDGs into the planning framework, Guam is not only responding to local challenges but contributing to a global sustainability agenda tailored to the unique conditions of island communities. The Guam Green Growth (G3) initiative, launched by executive order in coordination with the University of Guam, is a key local mechanism for activating the SDGs through partnerships and innovation.

The implementation plan is structured to guide actions across multiple timeframes:

- **Short-term (2025–2030)** actions prioritize immediate infrastructure upgrades, affordable housing, hazard mitigation, and foundational governance improvements.
- **Mid-term (2030–2040)** strategies include expanding mixed-use redevelopment, restoring natural habitats, scaling village-level tourism, and aligning zoning codes with sustainable land use goals.
- **Long-term (2040–2050)** actions ensure resilience to climate change, intergenerational equity in land access, and full realization of compact, vibrant, and walkable communities across the island.

In order to succeed, implementation must be coordinated and consistent across agencies. Core government entities such as the Bureau of Statistics and Plans (BSP), Department of Land Management (DLM) and the Guam Land Use Commission (GLUC), Department of Public Works (DPW), Guam Environmental Protection Agency (GEPA), Guam Waterworks Authority (GWA), and Guam Power Authority (GPA) must work in concert to integrate land use, infrastructure, and environmental protection. Equally critical are the roles of the CHamoru Land Trust Commission (CLTC), Guam Ancestral Lands Commission (GALC), Department of Agriculture (DOAG), and Department of Parks and Recreation (DPR), whose work touches on land tenure, food security, recreation, and cultural preservation.

This implementation framework is not static. It is a living system that must be regularly updated, tracked, and responsive to community input and changing conditions. Public Law 35-

110 envisioned a plan that is not only forward-looking but adaptive, supported by meaningful community engagement and accountability mechanisms. The road to 2050 will be shaped by decisions made now—and by how faithfully those decisions reflect the values, priorities, and policy commitments outlined in this plan.

8.2. Implementation Framework

8.2.1 Implementation Goals and Guiding Principles

The Guåhan 2050 Sustainability Plan (G50SP) is grounded in a set of integrated goals, legislative mandates, and guiding principles that collectively define its implementation vision. As required by Public Law 35-110, the plan must serve as both a short and long-term blueprint for Guam's sustainable development, addressing economic, cultural, environmental, and infrastructure challenges in a holistic and equitable way. This includes meeting Guam's needs in housing, transportation, water, energy, public health, recreation, heritage preservation, and more—through land use decisions that are responsible, inclusive, and future-ready.

The plan is aligned with the United Nations Sustainable Development Goals (SDGs) and the Small Island Developing States (SIDS) framework, offering a global context for local action. These goals inform planning across all sectors—emphasizing poverty reduction, resilient infrastructure, biodiversity protection, and climate adaptation.

To translate these commitments into effective implementation, G50SP is guided by five interlocking sustainability principles:

- **Limits**: Recognizing ecological thresholds and constraints on growth.
- **Balance**: Integrating environmental, cultural, and economic needs.
- **Renewal**: Fostering regeneration of natural and social systems, including redevelopment of existing developed areas.
- **Equity**: Promoting fairness in access to land, resources, and opportunities.
- **Engagement**: Ensuring meaningful public participation and inclusion.

These principles frame key land use planning objectives of the plan, including: concentrating development in suitable areas, protecting natural and cultural resources, encouraging agriculture and food security, ensuring housing affordability, implementing watershed-based planning, promoting right-sized economic development, designing for walkability, and protecting historic sites and cultural landscapes.

8.2.2. Implementation Over Time: Agencies, Tools, and Processes

The implementation of G50SP will unfold in three interconnected phases:

- **Short-term (2025–2030):** Focused on establishing foundational systems, adopting key reforms, launching priority projects, and aligning agency budgets and plans with the G50SP.
- **Mid-term (2030–2040):** Scaling implementation across agencies and sectors, further refining zoning and regulatory frameworks, integrating land use and climate adaptation tools, and expanding infrastructure aligned with sustainability priorities.
- **Long-term (2040–2050):** Achieving full realization of the plan's sustainability vision, including compact urban growth, restored ecosystems, clean energy transformation, and equitable access to land and services.

Implementation will span multiple sectors—land use, infrastructure, environment, economy, housing, heritage, and agriculture—and involve a network of core agencies. These include the Bureau of Statistics and Plans (BSP), Department of Land Management (DLM) and Guam Land Use Commission (GLUC), Department of Public Works (DPW), Department of Agriculture (DoAg), Guam Environmental Protection Agency (GEPA), CHamoru Land Trust Commission (CLTC), Guam Ancestral Lands Commission (GALC), Guam Waterworks Authority (GWA), Guam Power Authority (GPA), and Department of Parks and Recreation (DPR).

Implementation tools include:

- Planning and zoning updates
- Development permitting and review processes
- Land use monitoring systems and GIS mapping
- Performance tracking dashboards
- Regulatory enforcement
- Public education and engagement
- Programmatic and capital improvement planning
- Agency-specific sustainability initiatives
- Village-level and thematic plans (e.g. watershed or coastal zones)

Integration will occur not only through formal plan updates every five years, but also via the budgeting, permitting, and infrastructure development processes. Capital Improvement Plans (CIPs), environmental assessments, and permitting reviews (as outlined in the *2022 Guidebook to Development Requirements on Guam*) will be key channels for aligning agency actions with the G50SP. Community engagement will remain a continuous thread across all phases, building trust and ensuring responsiveness to evolving needs.

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8.2.3. Governance and Institutional Reforms for Integrated Implementation

For the Guåhan 2050 Sustainability Plan to be effective, clear leadership, consistent coordination, and systemic reform are essential. The Bureau of Statistics and Plans (BSP) will serve as the coordinating, plan implementation, interagency alignment, and policy reform lead agency.

Following adoption of the plan by the Legislature, a Governmental Task Force on Sustainability Plan Implementation will be established within the first year. This task force will:

- Define agency-specific implementation roles and timelines.
- Identify coordination protocols across the Application Review Committee (ARC) and other interagency bodies.
- Initiate a review of existing laws and regulations to identify needed reforms for G50SP implementation.

This legal and regulatory review will assess consistency between the plan's land use policies and the current zoning law, permitting processes, agency mandates, and executive orders such as E.O. 78-37 (Land Use Policies). The goal will be to recommend legislative updates and process reforms that strengthen plan conformity and reduce duplication, fragmentation, and conflict among agencies.

In line with recommendations from the previously-conducted agency engagement and roundtable discussions, reforms will prioritize:

- Elevating planning consistency in all land use approvals.
- Front-loading plan compliance into early permitting stages, such as through a pre-application development screening process.[24]
- Enhancing transparency and public access to the land use process.
- Providing clear performance standards and enforcement mechanisms.
- Strengthening village-level engagement and service delivery.

The Application Review Committee (ARC)—composed of BSP, DLM, DPW, GEPA, DoAg, DPR, GWA, and GPA—will be a key implementation mechanism. BSP will coordinate and lead ARC

[24] For an example: https://opd.gov.mp/library/etc/sw-plan-docs/a6-cnmi-smart-safe-growth-guidance-manual.pdf).

reviews with respect to the G50SP requirements, to ensure that agency comments and land use decisions are directly tied to G50SP principles and land use designations. *Existing authorities and plans will remain in effect to the extent that they do not conflict with the mandates of the G50SP.* Where necessary, institutional reforms such as agency Memoranda of Understandings (MOUs), cross-agency data systems, and formal compliance reporting requirements will be developed to support accountability.

Plan Alignment and Integration

A cornerstone of successful implementation is ensuring plan alignment—that is, integrating the Guåhan 2050 Sustainability Plan with the many sectoral, agency, and regional plans that have been developed over the past several decades. The G50SP is designed to serve as a coordinating framework that unifies and builds upon these efforts, not to duplicate or override them. Guam's planning landscape includes a broad array of strategic and technical documents, ranging from the North and Central Guam Land Use Plan and the Guam Transportation Improvement Plan, to environmental strategies like the Guam Coral Reef Resilience Strategy and cultural planning efforts such as the Guam Historic Preservation Plan. These plans represent significant investments of time, data, and stakeholder engagement and contain valuable insights that can strengthen and inform implementation. The G50SP was developed partly based on these many plans, in order to maximize the alignment of the G50SP with existing and on-going planning work on Guam.

As such, one key governance priority is to establish formal mechanisms for inter-plan consistency and cross-referencing. During Year One of implementation, the BSP-led task force will inventory and analyze the goals, standards, and recommendations of existing plans to ensure they are either incorporated into, or aligned with, the G50SP, to the extent that this has not already been addressed or taken into account. This effort will include mapping overlaps, identifying gaps, and proposing methods to resolve inconsistencies—whether through agency guidance, legislative amendments, or updates to existing planning documents. Moreover, as agencies prepare updates to sectoral plans such as the GHURA Consolidated Plan, GWA Water Resource Master Plan, or the Guam Forest Action Plan, BSP will provide coordination support to ensure these revisions reflect the land use, sustainability, and community design goals articulated in the G50SP.

In this way, the implementation process will help to create a more coherent and connected planning system for Guam—one in which diverse strategies are not working at cross-purposes, but advancing a unified vision of sustainable island development.

8.3. Implementation Action Strategy

8.3.1. G50SP Implementation Action Matrix

The following Implementation Action Matrix provides a detailed, action-oriented framework for realizing the goals, policies, and principles of the Guåhan 2050 Sustainability Plan. Organized by

thematic chapters of the plan—including governance, land use, economic development, environmental protection, cultural vitality, and village sustainability—the matrix outlines specific strategies to be carried out by lead agencies in collaboration with partner institutions and community stakeholders. It is a practical tool to coordinate efforts across sectors and ensure that the vision of G50SP is advanced through timely, accountable, and measurable steps.

Each action listed in the matrix is tied to a major policy area within the plan and includes key implementation details: the responsible agency, supporting partners, timeframe for execution, necessary resources, and clear performance indicators. This format supports transparency, monitoring, and adaptive management—allowing the Government of Guam and its partners to track progress, adjust priorities, and ensure continuous alignment with the plan's five sustainability principles and overarching goals. The matrix will also guide annual and five-year progress reviews, informing future budget allocations, program development, and policy updates needed to maintain momentum and remain responsive to emerging challenges.

Table 8-1. Sustainability Plan Action Matrix.

Topic / Policy	Action / Strategy	Lead Agency	Partners	Time	Resources Needed	Performance Indicators
GOVERNANCE						
Implementation Leadership	Establish a Sustainability Plan Implementation Task Force to coordinate agency roles and responsibilities.	Bureau of Statistics and Plans (BSP)	Governor's Office, DLM, GEPA, DPW, CLTC, GWA, GPA	Year 1	Staff time, administrative support, executive order or legislation	Task Force formed; agency roles defined
Legal Framework	Initiate a comprehensive review of existing land use and environmental laws to identify any inconsistencies with G50SP policies and propose necessary amendments of existing authorities.	BSP/Task Force	Office of the Attorney General, Legislature, Regulatory Agencies	Year 1–2	Legal staff, consultants, public review process	Review completed; draft amendments proposed

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Topic / Policy	Action / Strategy	Lead Agency	Partners	Time	Resources Needed	Performance Indicators
Plan Consistency	Establish formal policy to ensure all agency and legislative land use decisions are reviewed for consistency with G50SP.	BSP	DLM, Land Use Commission, Legislature	Year 1	Policy drafting support, training for decision-makers	Consistency review policy adopted and implemented
One-Guam GIS Land Use System	Develop and implement an integrated Land Use GIS system for Guam.	BSP	GovGuam land use agencies	Years 1-3	Technical staff, training, dedicated funding	Completion of GIS system
Plan Alignment	Review GovGuam and other applicable plans for alignment with G50SP. Create a plan update and alignment strategy.	BSP/ Task Force	GovGuam agencies with missions affecting land use	Years 1-2	Staff time, agency commitments	Completion of Plan alignment strategy
Sustainability Strategic Financing Plan	Create an integrated financing strategy for the Guåhan Sustainability Plan	BSP	GovGuam agencies with missions affecting land use	Years 1-2	Staff time, agency commitments, Governor's office support	Completion of Financing Strategy. Funding allocated to G50SP implementation
GovGuam - U.S. Govt Planning Task Force	Establish a task force to coordinate and integrate GovGuam and U.S. government planning objectives, including financing and impact mitigation strategies	Governor, BSP	Legislature	Year 1	Executive commitment, U.S. govt support	Creation of Task Force. Coordinated planning decisions and investments
SUSTAINABLE COMMUNITIES						
Land Use	Designate urban growth areas and enforce urban-rural boundaries to concentrate development.	BSP/Dept. of Land Mngt. (DLM)	DPW, GEPA, CLTC, GWA	Years 1–5	Planning staff, updated land use maps, community consultation	Urban growth boundaries adopted and used in permitting

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Topic / Policy	Action / Strategy	Lead Agency	Partners	Time	Resources Needed	Performance Indicators
Public Services	Prioritize infrastructure investment in designated urban centers.	Dept. of Public Works (DPW)	GWA, GPA, BSP	Years 1–10	Capital improvement planning, interagency coordination	Infrastructure CIP alignment with land use map
Housing	Expand zoning for multifamily and affordable housing in urban areas.	DLM	GHURA, CLTC, BSP	Years 1–5	Zoning update process, stakeholder input	Zoning changes approved; # of affordable units permitted
Commercial, Industrial, Priority Development	Encourage mixed-use and pedestrian-scale development along key commercial corridors.	DLM	DPW, GEDA, Municipal Planning Councils	Years 2–10	Design guidelines, public-private partnerships	Mixed-use zoning applied; projects approved
Rural and Agricultural Lands	Implement Transfer of Development Rights (TDR) program to protect rural lands.	BSP	CLTC, DoAg, DLM	Years 3–8	TDR policy design, GIS mapping, incentive program	TDR program launched; acres protected
Natural Hazards	Develop and implement neighborhood-scale climate adaptation plans.	BSP	GEPA, Guam Homeland Security, Mayors Council	Years 1–10	Hazard mapping, planning grants, community input	# of villages with adaptation plans in place
PROSPEROUS ECONOMY						
Commercial Redevelopment and Mixed Use	Identify and incentivize redevelopment zones in existing commercial centers with infrastructure upgrades.	Guam Economic Development Authority (GEDA)	DLM, DPW, GWA, GPA	Years 1–5	Incentive programs, infrastructure funding, zoning changes	Redevelopment zones designated; # of projects initiated
Agriculture and Rural Development	Expand protections for prime agricultural land and promote access to land for small-scale farmers.	Dept. of Agriculture (DoAg)	CLTC, BSP, UOG-CIS	Years 1–6	Agricultural planning staff, lease programs, education	Acreage preserved; # of leases to local farmers

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Topic / Policy	Action / Strategy	Lead Agency	Partners	Time	Resources Needed	Performance Indicators
Tourism and Cultural Enterprise	Support village-based eco- and cultural-tourism initiatives including artisan markets and trails.	Guam Visitors Bureau (GVB)	GPT, Mayors Council, SHPO, DPR	Years 2–10	Marketing support, grants, local business partnerships	# of village tourism projects; visitor metrics
Right-Sized Economic Infrastructure	Align economic development infrastructure (ports, telecom, energy) with land use and resilience goals.	GEDA	GPA, GWA, BSP, Guam Power Authority	Years 1–10	Infrastructure master plans, climate resilience funds	Projects approved and aligned with land use plan
THRIVING ENVIRONMENT						
Healthy Ecosystems	Manage stormwater, promote green infrastructure practices such as permeable surfaces, rain gardens, and green roofs in new developments.	Guam EPA	DPW, DLM, GWA, BSP	Years 1–5	Technical guidance, incentives, training programs	# of developments incorporating green infrastructure
Watershed Protection	Implement stricter land use controls in the Northern Guam Lens Aquifer protection zone.	GEPA	DLM, BSP, GWA	Years 1–4	Zoning overlays, environmental assessments	Land use controls adopted; # of permits reviewed
Habitat Conservation	Designate and map critical terrestrial habitats and adopt new Resource Conservation land use designation.	BSP	DoAg, SHPO, DLM	Years 1–3	Habitat studies, GIS mapping, land designation process	Acres designated; baseline biodiversity assessments
Coastal and Marine Resources	Strengthen enforcement and permitting for shoreline development to protect reefs and public access.	GEPA	BSP, SHPO, Dept. of Parks and Recreation	Ongoing	Monitoring staff, legal authority, signage and public education	# of enforcement actions; protected shoreline segments
VIBRANT CULTURE						

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Topic / Policy	Action / Strategy	Lead Agency	Partners	Time	Resources Needed	Performance Indicators
Cultural Preservation	Support expanded documentation and protection of cultural heritage sites, including oral histories and traditional place names.	Guam Preservation Trust (GPT)	SHPO, ALC, UOG, Community Groups	Years 1–6	Archivists, cultural liaisons, community workshops	# of sites documented; # of cultural maps produced
Land Justice and Access	Support land return, equitable land access, and stewardship programs for displaced or underserved families.	Ancestral Lands Commission (ALC)	CLTC, BSP, Legislature	Years 1–10	Legal review, land transfer mechanisms, outreach	Acres returned or made accessible; # of families supported
Community Health and Well-being	Integrate cultural and public health goals in village-level plans and capital improvement projects.	Department of Public Health and Social Services (DPHSS)	Mayors Council, BSP, DPR, Guam Behavioral Health	Years 1–5	Public health data, community design input	# of village plans with health-cultural integration
VILLAGE SUSTAINABILITY						
Village Planning and Design	Support the development of village-scale land use and infrastructure plans aligned with G50SP.	BSP	Mayors Council, DPW, DLM, GWA, GPA	Years 1–5	Technical assistance, GIS tools, community visioning	# of village plans completed and adopted
Resilient Infrastructure	Improve walkability, drainage, and energy systems in villages through coordinated capital projects.	DPW	GPA, GWA, GEPA, Mayors Council	Years 2–10	CIP funding, climate hazard maps, engineering support	Projects completed; hazard risk reduction metrics
Community Engagement and Governance	Establish formal channels for village input in regional land use and sustainability decision-making.	BSP	Municipal Planning Councils, Mayors Council, Legislature	Years 1–3	Facilitation staff, engagement platforms	# of formal consultations held annually; policy influence tracked

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8.3.2. Five-Year Priority Actions and Financing Opportunities

Effective implementation of the Guåhan 2050 Sustainability Plan (G50SP) begins with a clear, coordinated focus on priority actions to be launched in the first five years of the plan.[25] These near-term actions are foundational steps that set the stage for long-term transformation. They include governance and policy initiatives, critical land use and infrastructure planning, environmental protection measures, and community-based programs aligned with the core sustainability principles of the plan. The actions selected for early implementation are those that are high-impact, time-sensitive, and logistically feasible within current institutional and funding capacities. Actions range from establishing a Sustainability Plan Implementation Task Force and completing a legal review in Year 1, to expanding affordable housing zoning, enhancing green infrastructure, conserving critical habitats, and encouraging mixed-use redevelopment in subsequent years.

A diverse portfolio of financing options will be necessary to support these early actions. Potential funding sources may include options discussed below, though the federal funding landscape is evolving as of this writing, with many reductions in federal programs occurring or potentially occurring.

- **Federal Infrastructure and Resilience Grants** offer substantial opportunities for infrastructure modernization, energy and water resilience, and climate adaptation.
- **Defense-related funding** from the Department of Defense (DoD), which continues to invest significantly in Guam's infrastructure as part of its Indo-Pacific strategy. These funds can support infrastructure upgrades, hazard mitigation, and environmental protection in areas adjacent to military bases that may benefit the larger community sustainability interests of Guam.
- **Technical Assistance and Capital Grants** through the Department of the Interior's Office of Insular Affairs (DOI/OIA), which can support planning, capacity-building, cultural preservation, and implementation of sustainability programs at the agency or community level.
- **Public-Private Partnerships (PPPs)** that allow the government to leverage private capital for public infrastructure, housing, renewable energy, or village-scale redevelopment projects. These partnerships can be structured to align private returns with public goals through tools like tax incentives, joint ventures, or leaseback agreements.

[25] P.L. 35-110, § 1211. Plan Implementation and Financing. (a) The Plan shall contain a schedule of programs and projects to be implemented annually. Funding for such programs and projects shall be identified in the Plan by the project's or program's principal or administering government agency or instrumentality.

- **Local Revenue Mechanisms**, including development impact fees, infrastructure assessments, or targeted tax measures that generate dedicated revenue for sustainability programs, capital improvements, and plan administration.

Identifying and securing these funds will require coordinated grant writing, stakeholder engagement, and alignment with broader federal and territorial policy objectives. For each priority action, lead agencies should be tasked with identifying the best-fit financing opportunities, initiating applications, and developing internal mechanisms to manage, report, and evaluate the use of funds. Through proactive pursuit of funding and creative financing strategies, Guam can launch a strong implementation phase that turns planning into tangible outcomes, ensuring long-term sustainability, resilience, and equity for the island and its people.

Table 8-2. Five-Year Priority Action Schedule.

Year	Priority Action	Lead Agency/Partner	Potential Funding Sources
2026	Establish Sustainability Plan Implementation Task Force	BSP / Governor's Office, Agencies	DOI, PPP/GHURA Fund
2026	Conduct Comprehensive Legal Review	BSP / Legislature, OAG, Regulatory Agencies	DOI, Local
2026	Designate Urban Growth Areas	DLM / BSP, DPW, GEPA, CLTC	BIL, Local
2026	Promote Green Infrastructure	GEPA / DPW, DLM, GWA, BSP	BIL, PPP
2027	Identify Redevelopment Zones	GEDA / DLM, DPW, GWA, GPA	PPP, Local
2027	Document Cultural Heritage Sites	GPT / SHPO, ALC, UOG, Community Groups	DOI, Local
2027	Develop Village-Scale Plans	BSP / Mayors Council, DPW, DLM, GWA, GPA	DOI, Local
2028	Expand Affordable Housing Zoning	DLM / GHURA, CLTC, BSP	PPP, Local
2028	Implement Watershed Protection Measures	GEPA / DLM, BSP, GWA	BIL, DoD
2028	Support Eco-Tourism Initiatives	GVB / GPT, SHPO, DPR, Mayors Council	PPP, DOI
2027-30	Ensure Plan Consistency	BSP / DLM, Legislature	Local

Year	Priority Action	Lead Agency/Partner	Potential Funding Sources
2029	Enhance Resilient Infrastructure	DPW / GPA, GWA, GEPA	BIL, DoD
2029	Conserve Critical Habitats	BSP / DoAg, SHPO, DLM	DOI, Local
2030	Protect Agricultural Lands	DoAg / CLTC, BSP	DOI, Local
2030	Support Land Justice Programs	ALC / CLTC, BSP	DOI, Local
2030	Encourage Mixed-Use Development	DLM / DPW, GEDA	PPP, Local

Funding Source Key:
BIL – Bipartisan Infrastructure Law
ARPA – American Rescue Plan Act
DoD – Department of Defense
DOI – Department of the Interior (Office of Insular Affairs)
PPP – Public-Private Partnerships
Local – Local Revenue Measures (e.g., impact fees, taxes)

8.3.3. Detailed Financing and Funding Assessment - Five-year Priorities

The previous section presents strategic actions for the next five years to implement the G50SP across infrastructure, energy, environment, economy, housing, and climate resilience. This section identifies past and potential future funding sources and financing strategies by sector/policy area, including program descriptions, relevance to Guam, and connections to the G50SP priority actions. Significant changes have occurred in the federal government funding landscape, and the following discussion will need to updated as the status of prior programs becomes more clear.

Infrastructure and Utilities

- **Bipartisan Infrastructure Law (BIL) – Federal Infrastructure Grants:** The 2021 BIL (Infrastructure Investment and Jobs Act) injected billions into roads, bridges, ports, water systems, broadband and more. Guam is slated to receive significant formula funding and grants under the BIL. For example, over five years Guam expects about $96 million for highways and bridges and at least $70 million for clean water projects. As of 2023, $173.9M in BIL funds had already been announced for Guam, including $18.4M in

highway upgrades and expansions of rural internet access.[26] BIL-funded programs relevant to Guam's 5-year priorities include: Federal Highway Administrative funds to improve roads and traffic flow, Department of Transportation grants for safer streets, EPA's State Revolving Funds to upgrade water/wastewater infrastructure, and Federal Aviation Administration Airport Infrastructure Grants (e.g. $3.2M to Guam's airport for a solar-ready roof).[27]

Relevance to G50SP: These funds help modernize critical infrastructure – aligning with G50SP calls for reliable transportation and utilities. Near-term plan actions like repairing roads, expanding wastewater facilities, and improving village infrastructure can be tackled with BIL support. **Under Review – may not be available**.

- **American Rescue Plan Act (ARPA) – Territory Fiscal Recovery Funds:** In the past Guam received substantial ARPA funds which weredeployed for infrastructure and utilities. Notably, in 2025 Guam invested $35.4 million of ARPA funds to construct a new power substation in Mangilao, bolstering grid reliability for the island's fastest-growing area and its planned new hospital.[28] This ARPA-funded project improves redundancy (two substations instead of one) and speeds power restoration after storms.

  Relevance to G50SP: Hardening the power infrastructure and ensuring reliable electricity for critical facilities addresses the plan's 5-year resiliency goals (e.g. "build a stronger, more resilient Guam" through upgraded utilities). Guam can continue to allocate ARPA or other federal recovery funds to priority utility upgrades (water, sewer, energy) identified in the plan. **Under Review – may not be available**

- **Department of Defense (DoD) Contributions – Defense-Related Infrastructure:** Guam's role as a strategic military hub means DoD is investing heavily in the island. As discussed in Chapter 2, billions in military construction is planned on Guam.While most funds build on-base facilities (Marine Corps Base Camp Blaz for 5,000 Marines, etc.), DoD also supports civilian infrastructure impacted by the buildup. For example, DoD's Defense Access Roads program and other partnerships address road improvements near bases, and DoD's Office of Local Defense Community Cooperation (OLDCC) provides grants for off-base utilities and schools. The Readiness and Environmental Protection Integration (REPI) program is another DoD funding source that has been working on habitat conservation projects Guam (FY21–23) to buffer military lands and protect habitats. Guam received over $5.7 million in REPI funds and partner

[26] bidenwhitehouse.archives.gov,
[27] transportation.gov.
[28] governor.guam.gov

contributions recently for conservation easements and watershed management[29] – supporting water resources and land resilience. Prioritize funding to the Department of the Army for Engineering with Nature for Guam projects.

Relevance to G50SP: These defense-linked funds can be leveraged to upgrade roads, ports, and utilities that both serve the military and advance Guam's civilian needs. For instance, as Marines relocate, federal dollars are flowing for port upgrades and highway expansions (the plan notes federal military expansion will invest "maybe more than $7 billion in the next five years" in services that support growth). G50SP's priority to harden critical infrastructure against disasters can align with DoD projects (e.g. jointly undergrounding power lines or expanding water capacity for both base and villages – a "One Guam" approach). As contemplated in G50SP Policies IP-3 and IP-4, DoD funding opportunities should be addressed through coordinated sustainability planning between the Government of Guam and the DoD.

- **DOI Office of Insular Affairs (OIA) – Capital Improvement & Technical Grants:** OIA administers annual Capital Improvement Project (CIP) funds and technical assistance for territories. Guam was awarded $7.08 million in FY2024 CIP funding, used for projects like a new youth facility and renovating the Chamorro Village marketplace.[30] In addition, Guam entities received $2.59 million in FY2024 Technical Assistance Program (TAP) grants for various purposes including modernization of customs systems, public safety equipment, and training. OIA also runs the Energizing Insular Communities program (covered under Energy below) and provides other grants for infrastructure planning.

  Relevance to G50SP: CIP funds can support public facility upgrades, e.g. expanding healthcare or emergency facilities, improving wastewater plants, etc., which are part of the plan's near-term infrastructure agenda. Technical Assistance grants can fund planning studies, capacity building, or pilot projects needed to implement new sustainability policies. Guam should continue pursuing OIA grants annually for priorities like modernizing utilities, improving solid waste management, and enhancing public buildings (all cited in the plan's 5-year action lists).

- **USDA Rural Development – Water, Waste, and Community Facilities:** As a rural community by federal definition, Guam is eligible for USDA loans/grants. USDA has financed Guam's water and sewer improvements and community facilities in the past. For example, USDA's Water and Waste Disposal program and Community Facilities

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29 https://www.repi.mil/Portals/44/Documents/State_Fact_Sheets/Guam_StateFacts.pdf#:~:text=Total%20Acres%20Protected%2C%20Managed%2C%20or,DOD%20personnel%2C%20contractors%2C%20and%20their.

30 governor.guam.gov.

program have provided funding (in one recent period, Guam received ~$916,000 in community facility grants along with CNMI and American Samoa).[31] USDA also offers Emergency Community Water grants post-disaster and Rural utilities loans that Guam Waterworks Authority (GWA) can apply for for system upgrades.

Relevance to G50SP: The plan's priority to "eliminate septic systems and expand sewer lines" and improve drinking water infrastructure can be supported by USDA's low-interest financing. Likewise, building new community health centers or resilience hubs (social infrastructure) could utilize USDA Community Facilities loans. Guam should coordinate with USDA's Pacific Region office to package projects (e.g. village water pipeline extensions or a new public market facility) for these funding opportunities.

- **Public-Private Partnerships (PPP) and Concessions:** Engaging private sector capital through PPPs is a viable strategy for large infrastructure in Guam. The island's first large PPPs are emerging in energy (IPPs building solar farms – see Energy section), but PPPs could also finance infrastructure like waste management facilities (e.g. a private waste-to-energy plant under a long-term contract) or port expansions. Private concessionaires can design-build-operate infrastructure in exchange for user fees or availability payments. Guam law allows issuance of Private Activity Bonds (tax-exempt bonds for private-led public projects) which GEDA can utilize.[32]

  Relevance to G50SP: If public funds are insufficient for big-ticket projects (a modern wastewater treatment plant, a transit system, etc.), PPPs can fill the gap. They align with 5-year actions requiring major capital – for instance, a PPP could help deliver a new solid waste facility or transit hub sooner, with private financing repaid by fees. The plan's adaptive management goal of securing ongoing funding for infrastructure suggests exploring innovative financing like PPP to augment government budgets.

- **Local Funding Mechanisms – Impact Fees and Special Districts:** Guam can enact local financing tools via legislation to fund infrastructure. One mechanism is developer impact fees – one-time charges on new development to pay for expanding water, sewer, roads, parks, etc. Guam already has a form of impact fee through GWA's System Development Charge (SDC) on new water/sewer connections (required by law via the Island Water & Wastewater Infrastructure Fund).[33] Expanding impact fees to cover roads or schools in high-growth areas (like Mangilao or Dededo) could generate revenue to implement the plan's growth management and infrastructure upgrades. Another tool is Special Assessment Districts – for example, establishing a business improvement district in

[31] https://www.doi.gov/sites/doi.gov/files/uploads/12-USDA-Economic-Development-Loans-and-Grants-COMBINED.pdf#:~:text=,Guam%2C%20CNMI%20and%20American%20Samoa.
[32] https://www.investguam.com/geda-grant-programs/#:~:text=,Fiscal%20Reports
[33] https://www.guamccu.org/.

Tumon Bay where hotels pay an extra fee dedicated to street, lighting, and pedestrian improvements in the tourism zone. Similarly, a stormwater utility fee could be levied on property owners based on runoff contribution, creating a fund for much-needed drainage projects (aligning with the plan's call to improve drainage and flood management).

Relevance to G50SP: These local financing mechanisms would directly support 5-year priority projects: e.g. impact fees on new housing developments could fund nearby road widenings or sewer lines (ensuring growth "pays for itself" as the plan envisions), and a stormwater fee would bankroll priority drainage fixes to reduce flooding in village centers. Legislative action to enable tools like Tax Increment Financing (capturing rising property taxes in redevelopment areas) or bond financing for utilities (see Resilience/Green Bonds below) would greatly enhance Guam's ability to implement infrastructure commitments in the plan.

Renewable Energy and Energy Resilience

- **U.S. Department of Energy (DOE) Grants – Grid Resilience and Innovation:** New federal energy programs are targeting grid hardening and clean energy – crucial for Guam's renewable energy goals. Under the BIL, DOE's Preventing Outages and Enhancing Resilience (Section 40101d) program is granting Guam about $864,000 per year for 5 years to reinforce its electric grid. In 2023 DOE awarded $1.7 million (first two years' funds) to Guam Power Authority (GPA) to underground critical power lines serving Guam Waterworks facilities. This will protect water and wastewater services from typhoon damage by hardening transmission lines.[34] DOE has also funded microgrid development in Guam: in 2024 GPA received ~$917,000 from the DOE Office of Electricity for a modular microgrid control project to improve reliability in remote areas.[35] Guam is an ideal candidate for further DOE grants (e.g. Solar Energy Technology grants, energy storage pilots, etc.), especially with its aggressive renewable target of 50% by 2035 and 100% by 2045.

  Relevance to G50SP: The plan prioritizes energy resilience and renewable projects in the near term – e.g. deploying solar plus battery storage, grid modernization, and village-level energy independence. DOE funding directly supports these actions by financing solar microgrids, hardening the distribution network, and integrating more renewables. GPA's 5-year action plans (like new solar farms and storage to replace aging oil-fired

[34] https://www.tdworld.com/intelligent-undergrounding/article/21278904/guam-power-authority-to-invest-in-grid-resilience#:~:text=Dec.
[35] https://www.facebook.com/GuamPowerAuthority/photos/gpa-awarded-916885-from-usdoe-for-microgrid-advancement-partners-with-national-l/989913763144784/#:~:text=Guam%20Power%20Authority%20,to%20develop%20a%20Standardized.

plants) can be accelerated with these grants, helping meet the G50SP policy of affordable, reliable power for all communities. **Under Review – may not be available**

- **DOI Energizing Insular Communities (EIC) Grants – Territorial Clean Energy:** DOI's EIC program annually funds sustainable energy projects in U.S. territories. In FY2024, Guam was awarded $5.47 million in EIC grants. Key projects include $3M for "Guam 100" (a roadmap to 100% renewable energy), over $2.03M for solar PV + battery systems at Guam Community College (making campus buildings net-zero), and $335k to replenish Guam's local EV rebate program for electric vehicles. These grants explicitly support Guam's self-determined energy goals and reduce reliance on imported fuel.[36]

  Relevance to G50SP: The Sustainability Plan emphasizes transitioning to renewable energy and promoting clean transportation. EIC-funded projects like campus solar microgrids and EV incentives are directly in line with 5-year actions to increase solar energy adoption and electrify transportation. For instance, the plan calls for renewable energy in new development and community education on clean energy – the EIC grants help implement such priorities on the ground (solar installations, EV adoption). Guam should continue pursuing EIC funding for initiatives like expanding rooftop solar in villages, energy efficiency in public buildings, and purchasing electric buses, all of which would advance G50SP energy and climate objectives. **Under Review – may not be available**

- **Inflation Reduction Act (IRA) – Clean Energy Tax Credits (Direct Pay):** The IRA of 2022 created huge incentives for renewable energy and made them accessible to Guam's public entities. IRA allows territorial governments, utilities, and nonprofits to receive direct cash payments for the full value of federal clean energy tax credits (through a "direct pay" mechanism).[37] This means GPA, Guam agencies, or even non-profit hospitals can get 30%+ of a project's cost reimbursed for installing solar panels, battery storage, wind turbines, EV chargers, etc., even though they have no tax liability. For example, if GPA builds a $10 million solar farm, it can receive ~$3 million back from the IRS via direct pay of the Investment Tax Credit – effectively federal funding without a grant competition. IRA also expanded credits for renewable fuel projects, microgrid controllers, energy efficiency upgrades, and more, all eligible for Guam entities.

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[36] https://www.doi.gov/oia/press/OIA-Awards-%2410.7-Million-in-Energizing-Insular-Communities-Grants#:~:text=Agency%20or%20Office%2F%20Project%20Title,Vehicle%20Rebate%20program%2C%20previously%20funded

[37] https://www.energy.gov/sites/default/files/2024-08/Elective_Pay_Fact_Sheet_Territories_073124.pdf#:~:text=What%20is%20Elective%20Pay%3F%20Cash,application%20and%20allocation%3B%20see%20below

Relevance to G50SP: This is a game-changer for financing the plan's renewable energy projects. Guam can now plan solar and wind projects for public facilities (schools, water pumps, wastewater plants) and count on IRA credits to cover a significant portion, reducing local cost. The plan's 5-year priority to "incorporate renewable energy systems in new housing where feasible" could be facilitated by partnering with nonprofits or developers who utilize these credits (via direct pay or through third-party tax equity). Likewise, goals to expand community solar or install EV infrastructure can leverage IRA incentives (e.g. the Commercial Clean Vehicle credit direct-pay for government fleets). Maximizing IRA direct-pay opportunities will be critical for Guam to finance its transition to clean energy as outlined in G50SP. **Under Review – may not be available**

- **Private Sector Investment via Power Purchase Agreements (PPAs):** Guam has successfully attracted private investment for utility-scale renewable energy through PPAs. GPA contracts with independent power producers who finance, build, and operate solar photovoltaic farms in exchange for a fixed rate paid per kWh. For instance, the 25.5 MW Dandan Solar Farm and upcoming 60 MW solar projects were developed by private firms under long-term PPAs with GPA.[38] Investors (including global energy companies and infrastructure funds) are interested due to Guam's solar potential and guaranteed offtake. Similarly, private companies can invest in battery storage or wind projects, with GPA or GovGuam as the offtaker.

  Relevance to G50SP: Using PPAs means Guam can add renewable capacity without upfront public capital – the private sector carries the financing burden. This directly supports the plan's near-term renewable energy targets and energy security aims, as new solar farms and potential wind projects can come online quickly via private financing. The cost is paid over time through electricity rates (which are coming in lower than oil-based generation). In the plan's first five years, leveraging additional PPAs could enable Guam to reach interim renewable milestones (e.g. replacing retiring generators with solar+storage by 2030). Guam is already seeing results: two 60 MW solar PV projects (Hanwha Energy and KEPCO developers) were secured with PPAs to provide low-cost solar power. Continuing this model – potentially with battery or microgrid PPAs – will help fulfill G50SP's vision of affordable, clean energy for the community.

- **Green Bonds and ESG Financing:** As Guam pursues large-scale renewable and resilience projects, it can tap into green finance markets. Green bonds are debt instruments earmarked for environmental projects – for example, GovGuam or GPA could issue a Green Bond to fund a new wind farm or islandwide smart grid. Investors are attracted to green bonds for their sustainability impact; many jurisdictions have successfully raised

[38] https://www.pv-tech.org/guam-power-authority-sings-ppas-for-120mw-of-solar-projects/#:~:text=Guam%20Power%20Authority%20signs%20PPAs,Hanwha%20Energy%20and%20a

capital this way. A green bond functions like a regular government bond but is marketed to climate-focused investors and must fund eligible green projects.[39] Guam's power utility or government could also explore sustainability bonds or climate bonds (with third-party certification from Climate Bonds Initiative, etc.) to finance climate adaptation infrastructure. Additionally, ESG investors (Environmental, Social, Governance) might be interested in public-private investment funds for Micronesia renewable projects or emerging technologies (ocean energy, for instance).

Relevance to G50SP: Green bonds and related instruments provide upfront capital for projects that are urgently needed in the next five years – e.g. a bond issuance could fund a portfolio of solar-plus-storage installations at critical facilities, or widespread energy efficiency retrofits, all of which pay back through energy savings. By labeling it a Green Bond, Guam may achieve lower interest rates or access new investor pools.[40] Since the Sustainability Plan calls for clean energy transformation and climate resilience, financing these through dedicated green debt would ensure accountability and alignment with the plan's goals. Guam can develop a Green Bond framework tied to G50SP objectives and begin with a pilot issuance for a priority project (such as a "Resilience Bond" for upgrading the grid – see below).

- **Utility Surcharges and Energy Efficiency Funds:** Another local financing strategy is instituting small charges on utility bills to fund renewable and resilient infrastructure. For example, GPA could implement a Renewable Energy Fund surcharge – a few mills per kWh – that goes into a fund for solar installations on public schools or a rebate program for home solar water heaters. Guam Power Authority already has a fuel surcharge – Levelized Energy Adjustment Clause (LEAC); a reorientation of a portion toward a "Green Energy Fund" could generate millions annually. Similarly, a Demand-Side Management charge could fund energy efficiency upgrades and conservation programs (many mainland utilities collect such fees to support rebates for efficient appliances, home insulation, etc.). For water utilities, a watershed protection fee could be charged per gallon to fund reforestation and aquifer protection projects (keeping water resources sustainable).

  Relevance to G50SP: These surcharges create a steady local funding stream for the plan's energy and water initiatives without solely relying on grants. In the next five years, Guam could establish, for instance, an Energy Efficiency Fund that retrofits government buildings with efficient lighting/AC and rooftop solar – directly reducing costs and

[39] https://www.investopedia.com/terms/g/green-bond.asp#:~:text=A%20green%20bond%20is%20a,linked%20and%20backed%20by

[40] https://gca.org/what-are-resilience-bonds-and-how-can-they-protect-us-against-climate-crises/#:~:text=Resilience%20bonds%2C%20a%20sub,specifically%20for%20climate%20resilient%20investment

meeting plan targets for public sector sustainability. While politically sensitive (as it affects rates), even modest fees can be framed as investments in self-sufficiency that will save consumers money long-term (through lower fuel imports and improved service reliability). The plan's stress on adaptive management and recurring funding underlines that sustainable revenue mechanisms like these will be needed to maintain momentum on G50SP energy actions.

- **Solar for All Program:** The Government of Guam has been awarded $62.45 million through the U.S. Environmental Protection Agency's Solar for All program, part of a larger $7 billion Greenhouse Gas Reduction Fund established under the Inflation Reduction Act. The grant targets low- and moderate-income households, providing them with energy-efficiency audits, weatherization support, and access to solar installations via favorable loans, with potential grants or subsidies further lowering costs. Administered by the Guam Energy Office in coordination with the Guam Power Authority, the University of Guam Center for Island Sustainability, and the Guam Economic Development Authority, the program aims to help residents reduce monthly utility bills by approximately 20%, while empowering them to sell surplus electricity back to the local grid

  Relevance to G50SP: Beyond aiding individual households, the grant strengthens Guam's broader sustainability objectives. By improving energy infrastructure for disadvantaged communities, the program supports the island's commitment to renewable energy and environmental equity. It aims to reduce carbon emissions significantly and improve grid resiliency, a particularly vital goal for remote islands that rely heavily on imported fossil fuels and face high electricity costs Moreover, it creates local economic opportunity by fostering clean-energy jobs and partnerships with local businesses and nonprofits, reinforcing Guam's long-term transition toward 100% renewable energy by 2045.

Agricultural and Conservation Land Protection

- **USDA Natural Resources Conservation Service (NRCS) Programs – Sustainable Agriculture:** Guam's farmers and landowners can access NRCS programs such as the Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP). These provide technical assistance and cost-share grants for practices like soil conservation, drip irrigation, forest buffers, and invasive species control.[41] Through EQIP, producers in Guam can get funding to implement conservation measures

[41] https://www.nrcs.usda.gov/programs-initiatives/eqip-environmental-quality-incentives#:~:text=EQIP%20is%20NRCS%27%20flagship%20conservation,integrate%20conservation%20into%20working%20lands

that protect soil and water (for example, planting cover crops to prevent erosion on hillsides, which also reduces sediment runoff to reefs – a G50SP priority). NRCS also offers the Agricultural Conservation Easement Program (ACEP) which could help preserve Guam's prime agricultural land by compensating landowners who agree not to develop their land. Another USDA initiative is the Micro-Grants for Food Security Program (MGFSP), created by the 2018 Farm Bill specifically for territories and Freely Associated States. Guam's Department of Agriculture runs this program, giving small grants to families and communities to start gardens, aquaculture, and livestock projects to increase local food production.[42]

Relevance to G50SP: The plan emphasizes food security and preserving agricultural land in its first five years. USDA programs directly support these goals: EQIP and related NRCS grants can fund sustainable farming practices (aligning with the plan's call to support sustainable agriculture for food security and lower emissions), while MGFSP and other agriculture grants increase local food supply and community resilience. Guam should actively promote these federal programs among its farmers and utilize them to implement plan actions like restoring soil health, expanding community gardens, and protecting watersheds from agricultural runoff.

- **USDA Rural Development – Land and Community Investments:** Beyond farming-specific aid, USDA Rural Development offers grants and loans that indirectly benefit land conservation. The Rural Business Development Grants and Value-Added Producer Grants can help agriculture enterprises (e.g. a cooperative for local produce) which keeps land in productive, green use. The Community Facilities Program can fund agricultural fairs, educational farm centers, or farmers' markets infrastructure. Under the Inflation Reduction Act, USDA is also investing in climate-smart agriculture – e.g. grants to deploy agroforestry, restore forests, or capture carbon in soils. Guam could pursue these funds (should they remain available) to support the planting of climate-resilient tree species on degraded lands or promote regenerative agriculture techniques on island.

  Relevance to G50SP: Keeping Guam's rural landscapes intact and productive is central to the plan's environmental and cultural objectives. By leveraging USDA funding, Guam can implement 5-year actions like establishing an agricultural research/demonstration site for best practices, or improving irrigation infrastructure for local farms, or supporting young farmers – all contributing to preserving agricultural/open space and reducing reliance on imported food. These programs also promote equity, as they often

[42] https://doag.guam.gov/wp-doag-content/uploads/2024/05/MGFSP-4-Informational-Slides.pdf#:~:text=%5BPDF%5D%20Micro,gardening%2C%20herding%2C%20and%20livestock

target assistance to small-scale and indigenous producers, aligning with the plan's social equity focus.

- **Department of Interior (DOI) – Land and Conservation Grants:** DOI channels certain conservation funds to territories. For instance, Guam receives support through the Coastal Zone Management Act grants (administered by BSP's Guam Coastal Management Program) for habitat restoration, conservation planning, and public access to natural areas. Guam also is part of the Coral Reef Initiative, getting federal grants for reef conservation and watershed protection (often via NOAA but in coordination with DOI). In the past, DOI's OIA has funded invasive species removal (e.g. brown tree snake control programs) and the Insular Forest Restoration grants. Additionally, the Land and Water Conservation Fund (LWCF), a federal program, has historically provided money to Guam for outdoor recreation and conservation land acquisition – for example, creating parks or conservation areas.

  Relevance to G50SP: The plan identifies protecting Guam's limestone forests, wetlands, and reefs as a top priority for the next five years. DOI and NOAA conservation grants can be tapped to implement these actions: e.g. funding to establish new Marine Protected Areas or conservation reserves, to reforest watersheds (reducing flooding and sedimentation per plan goals), or to acquire ecologically sensitive lands for permanent protection. Guam should prepare shovel-ready conservation projects (like restoring the Southern Ridge watersheds or expanding the Guam National Wildlife Refuge overlay) and pursue these competitive grants. Success will mean both safeguarding natural heritage and meeting the plan's resilience targets (since healthy ecosystems also protect communities from storms and climate change).

- **Micronesia Challenge and International Partnerships:** Guam is a signatory to the Micronesia Challenge, a regional commitment to conserve at least 30% of near-shore marine resources and 20% of terrestrial resources. Through this initiative, an endowment was established (with contributions from The Nature Conservancy, Global Environment Facility, etc.) to fund conservation in Micronesian island.[43] The Micronesia Conservation Trust (MCT) manages these funds and provides small grants for local conservation projects in member jurisdictions, including Guam. While Guam as a U.S. territory also has U.S. funding sources, the regional partnerships bring additional resources, expertise, and visibility. For instance, MCT or Micronesia Challenge funds could support community-based marine conservation around Guam or environmental education programs. Other philanthropic organizations – e.g. the Waitt Foundation's Blue Prosperity program or Conservation International – may also offer grants or technical

[43] https://sdgs.un.org/partnerships/micronesia-challenge#:~:text=Micronesia%20Challenge%20,Environment%20Facility%2C%20with%20a

support for sustainable fisheries, marine protected areas, and ecotourism development in Guam.

Relevance to G50SP: The plan's five-year actions around coral reef protection, fisheries management, and expanding conservation areas dovetail with Micronesia Challenge targets. By engaging in these partnerships, Guam can secure philanthropic and international funding to execute projects like reef restoration, endangered species protection, and watershed rehabilitation – all key to the plan's "Thriving Environment" and climate resilience aims. These funds complement U.S. federal grants, filling gaps and enabling innovative community-driven projects that the plan encourages.

- **Local Conservation Financing – Preservation Trust & Green Fees:** Guam has local entities like the Guam Preservation Trust (GPT), which is funded by development permit fees and is tasked with protecting cultural and natural resources. GPT and similar bodies can be channeled to support land conservation (e.g. purchasing land or easements for conservation, or funding historic site restorations that maintain open space). Guam might consider establishing a dedicated Green Fund or Conservation Land Trust for the 2050 Plan, funded through creative means such as a "green fee" on tourists (for example, a $10 environmental fee per visitor that goes into a conservation fund – other island destinations have implemented such fees successfully). A transfer of development rights (TDR) program could also be explored: landowners in designated conservation zones could sell development rights to developers in growth zones, thus compensating them for leaving land undeveloped.

  Relevance to G50SP: These financing mechanisms ensure sustained local funding to "preserve Guam's most important environmental resources". In the near term, a tourism green fee could raise substantial revenue to kickstart priority conservation projects (reef recovery, boonie stomper trail maintenance, etc.) that enhance the very natural assets tourists come to enjoy. Likewise, empowering entities like GPT with more funding will help achieve the plan's land conservation targets within five years – for example, acquiring critical limestone forest tracts or coastline for public benefit. Legislative support for such tools will solidify Guam's commitment to its sustainability vision.

Economic Redevelopment and Tourism

- **U.S. Economic Development Administration (EDA) Grants:** The EDA (within the Dept. of Commerce) offers grants for public infrastructure and economic recovery projects that create jobs. Guam has had success securing EDA funds, particularly for disaster recovery and strategic planning. Notably, in 2021 EDA awarded $2.4 million to the Port Authority of Guam to build a disaster-resilient fuel pipeline system at the commercial

port.[44] This project (matched by local funds) improves fuel supply reliability post-typhoons and supports the broader economy and military by ensuring port operations can continue in disasters.[45] EDA also provided $1.2M in CARES Act funding in 2020 to Guam for economic recovery planning and diversification efforts.[46] Guam can pursue EDA's Public Works grants for projects like industrial park expansions, vocational training centers, or tourism infrastructure (e.g. pedestrian amenities in Tumon). Additionally, EDA's Travel, Tourism & Outdoor Recreation grants could be targeted for Guam to help rebuild the tourism sector after COVID-19 (for example, funding the new Guam Cultural Center or upgrading parks and attractions).

Relevance to G50SP: The plan highlights the need for a resilient, diversified economy – reducing over-reliance on tourism while strengthening it, and leveraging federal investment (like the military buildup) for local benefit. EDA grants can directly fund many 5-year economic priority actions: e.g. constructing a small business incubator, rehabilitating the fishermen's co-op facility to bolster fisheries (food economy), or improving village market infrastructure to promote entrepreneurship. The port fuel pipeline EDA project also maps to the plan's resilience and economic security goals, demonstrating how "building back better" infrastructure supports both economic and sustainability outcomes. Guam should maintain an active Comprehensive Economic Development Strategy (CEDS) to stay eligible and align EDA proposals with G50SP projects (such as renewable energy tech jobs, agriculture industry development, etc.).

- **Tourism Recovery Funds (ARPA, etc.) and HUD Community Development:** To revitalize tourism and village economies, Guam can utilize funds from pandemic recovery programs. ARPA included State and Local Fiscal Recovery Funds that Guam allocated partly to tourism marketing and facility improvements (for example, enhancing parks or public restrooms in tourist areas). The U.S. Commerce Department's Economic Adjustment Assistance funds (part of ARPA) also had set-asides for tourism-related capital projects – Guam should ensure it avails these if still accessible. Meanwhile, HUD's Community Development Block Grant (CDBG) and related programs (CDBG-CV for COVID, CDBG-DR for disasters) can be used for economic revitalization of communities. Guam's annual CDBG entitlement (through GHURA) often funds infrastructure in low-income areas – this could include upgrades to public markets, community centers for

[44] https://sdgs.un.org/partnerships/micronesia-challenge#:~:text=Micronesia%20Challenge%20,Environment%20Facility%2C%20with%20a
[45] https://www.eda.gov/news/press-release/2021/06/10/us-department-commerce-invests-24-million-build-disaster-resilient#:~:text=the%20damage%20caused%20by%20Typhoon,%E2%80%9D
[46] https://www.eda.gov/archives/2022/news/press-releases/2022/06/21/barrigada-guam.htm#:~:text=U,CARES%20Act%20Recovery%20Assistance

workforce training, or facade improvements in historic village cores to encourage heritage tourism.

Relevance to G50SP: A key near-term plan focus is fostering vibrant village centers and supporting tourism at appropriate scale (especially ecotourism in southern Guam). Using recovery and community development funds to beautify villages, improve visitor amenities, and create business opportunities aligns perfectly. For instance, a CDBG-funded streetscape project in Hågatña or Inalåhan could stimulate small businesses and cultural tourism, fulfilling plan objectives for economic development that preserves culture. Guam's priority to diversify tourism (e.g. sports tourism, cultural festivals, eco-parks) might be jump started by one-time federal funds to build necessary facilities. Coordinating these funding sources can ensure that within five years, Guam's tourism is not just back to pre-pandemic levels but is more sustainable and community-oriented per the 2050 vision.

- **Guam Economic Development Authority (GEDA) Incentive Programs:** Guam has local tools to spur private investment in redevelopment and targeted industries. The Qualifying Certificate (QC) program, administered by GEDA, offers tax incentives (like abatements on corporate tax, property tax, or rebates on income taxes) to companies investing in priority areas – tourism facilities, affordable housing, renewable energy, etc. In return, QC beneficiaries often must contribute to community programs. For example, a QC beneficiary (Century Insurance) funded a Southern Sports Grant Program to support youth sports teams.[47] GEDA is leveraging QC contributions for community grants (education, healthcare, cultural projects). Another GEDA initiative is the Guam Opportunity Zone investments: under the 2017 federal Opportunity Zones program, Guam designated 25 zones across the island where investors can get capital gains tax deferral for equity invested in businesses or real estate. This has potential to channel private capital into projects like hotel redevelopment, new industries in Harmon or Tiyan, or renovation of blighted properties in the zones. GEDA provides guidance on Opportunity Zones to attract such investment. Additionally, GEDA can issue industrial revenue bonds or private activity bonds for projects (like solid waste facilities or affordable housing – see Housing section).

  Relevance to G50SP: The plan calls for redevelopment of derelict or underused sites, reinvigoration of village centers, and growth of new sectors (technology, aquaculture, etc.) for a robust economy. QC tax incentives can entice developers to undertake those projects that align with sustainability goals – e.g. a company building a solar farm or an eco-friendly resort could receive QCs (some QCs have been given for renewable energy

[47] https://www.investguam.com/geda-grant-programs/#:~:text=Southern%20District%20Youth%20Sports%20Grant,Program

installations before). Opportunity Zones cover many of Guam's central and southern areas, providing a tool to direct private capital into sustainable development – such as affordable housing in Dededo or a new industry at the Econo industrial park – without direct government spending. Over the next five years, using and perhaps refining these incentive programs will help achieve G50SP economic actions like creating jobs in renewable energy, encouraging investment in village economies, and guiding growth to the right locations (the plan emphasizes incentivizing development in already-built areas versus sprawl).

- **Small Business and Industry Grants/Loans:** Diversifying Guam's economy and supporting local entrepreneurs is a priority in G50SP's early years. Various funding opportunities exist: the Small Business Administration (SBA) offers microloans, 504 loans (for real estate/equipment), and recently, Community Navigator grants to support underserved entrepreneurs. Guam can bolster usage of SBA programs through outreach and potentially create a local matching fund. The U.S. Department of Agriculture Rural Business Grants can also assist businesses in aquaculture, fisheries, or farm product processing – sectors Guam wants to grow. Furthermore, private philanthropic grants (e.g. from the Asia-Pacific Islander Fund or global tech companies) could be sought to fund innovation hubs or digital economy training on Guam – tying into the plan's vision of a more knowledge-based economy (Guam is already working on a digital equity plan and better broadband, supported by federal BEAD funds for broadband expansion).

  Relevance to G50SP: Building local capacity and entrepreneurship – whether in traditional crafts, agriculture, or new fields – improves economic self-sufficiency and equitable growth, which the plan identifies as crucial. Seed funding and technical assistance for small businesses will help realize five-year actions like establishing village markets for local products, increasing participation in the digital economy, and expanding opportunities for Chamorro-owned businesses. Guam can create a "Sustainability Business Challenge" fund (potentially with ARPA or local funds) to grant small amounts to startups or cooperatives that address sustainability challenges (e.g. recycling businesses, sustainable farming ventures, renewable energy startups) – this would directly implement the plan's integrated approach to economic and environmental progress.

- **Tax Increment Financing (TIF) and Special Economic Zones:** For larger redevelopment projects (revitalizing a downtown area or developing an economic zone), Guam could utilize TIF if enabled by law. TIF would allow a portion of new tax revenue generated by a project to be reinvested into infrastructure for that project. For example, designating a TIF district in Hagåtña could help finance street improvements, utilities, and public spaces as new private developments (offices, housing) come in – essentially self-funding the rejuvenation. Tumon could also benefit from such financing to support refurbishment or removal of dilapidated buildings. Guam could also consider special economic zones with tailored incentives – perhaps a "Green Industrial Zone" where

sustainable industries (recycling, solar equipment assembly, etc.) get tax breaks and expedited permitting. While not direct funding, these mechanisms make projects financially viable.

Relevance to G50SP: The plan likely includes a five-year action to create an implementation framework for the Hagåtña Master Plan or other village redevelopment. TIF is commonly used in the States for that purpose and could be replicated. Within five years, Guam could pilot a small TIF for a project like the Guam Fisherman's Wharf area or the DFS area redevelopment. The increase in business activity would generate taxes that pay for public improvements – a virtuous cycle that leaves the government with a revitalized economic center at minimal net cost. This aligns with G50SP's goals of efficient land use, economic vitality, and improved community design.

Affordable Housing and Social Equity

- **HUD Formula Grants – HOME, CDBG, ESG:** Guam annually receives funding from HUD aimed at housing and community development. The HOME Investment Partnerships Program (administered by GHURA) provides federal dollars to build, buy, or rehabilitate affordable housing and to provide direct rental assistance. Guam's HOME funds have been used to support developments like GUMA apartments and Habitat for Humanity projects. Community Development Block Grants (CDBG), as mentioned, can also fund housing-related infrastructure (site improvements, clearance of blighted structures, etc.) in lower-income areas. The Emergency Solutions Grants (ESG) help with homelessness prevention, shelter operations, and re-housing – relevant as Guam addresses homelessness and housing insecurity. In addition, Guam has benefited from special HUD allocations: after major typhoons, Congress sometimes awards CDBG-Disaster Recovery (CDBG-DR) funds (e.g. Guam is hoping for CDBG-DR after Typhoon Mawar 2023 to aid long-term housing recovery). Also, HUD's Neighborhood Stabilization Program in the past helped GovGuam acquire and rehab foreclosed homes – a similar approach could be revived to tackle abandoned homes or convert them to affordable units.

  Relevance to G50SP: A core pillar of the plan is "Sustainable, Affordable and Safe Housing" for all Guam residents. HUD funding is the backbone of Guam's affordable housing efforts. In the next five years, Guam can deploy HOME funds to partner with non-profit or private developers on new affordable housing projects (rental apartments or homeownership programs) – directly implementing the plan's call for more housing stock that is resilient and affordable. CDBG can be used to improve infrastructure in public housing neighborhoods or to support facilities like daycare or job training centers that benefit low-income families (promoting social equity). ESG and related funds will help achieve the plan's priority actions on homelessness (e.g. expanding emergency shelter and transitional housing). Maximizing and properly planning the use of these

HUD grants each year, in line with G50SP objectives, will ensure steady progress on housing goals.

- **Low-Income Housing Tax Credit (LIHTC) Program:** LIHTC is a critical financing tool for affordable rental housing development. Guam, through GHURA, is allocated LIHTCs which it awards to developers of qualified affordable housing projects. LIHTC attracts private equity investment by providing investors a dollar-for-dollar reduction in federal tax liability over 10 years. Guam's first LIHTC projects have already been built – Summer Town Estates in Dededo (240 units for low-income seniors) was financed with LIHTC and was the island's first senior LIHTC community.[48] That $64M project was part of a larger revitalization including a commercial center financed by New Markets Tax Credits.[49] More LIHTC projects (Ironwood Estates, etc.) have followed, delivering hundreds of affordable homes.

  Relevance to G50SP: LIHTC is perhaps the most powerful tool Guam has to create new affordable housing at scale, which is a clear five-year priority in the plan (addressing the shortage of decent, affordable units). By supporting GHURA in efficiently allocating credits and helping projects overcome hurdles (like high construction costs), Guam can ensure at least one LIHTC development starts each year. The plan's emphasis on "directing growth to already-urbanized areas" is exemplified by LIHTC projects which often revitalize existing neighborhoods (Summer Town Estates replaced derelict areas in Dededo with vibrant housing for elders). Additionally, the Project-Based Section 8 vouchers can be paired with LIHTC to make units deeply affordable – Guam did this for 112 units at Summer Town (converting tenant vouchers to project-based subsidy). In summary, continued use of LIHTC will be central to meeting G50SP's near-term housing production and rehabilitation targets.

- **American Rescue Plan Housing Programs:** ARPA created several one-time funding streams for housing: the Homeowner Assistance Fund (HAF) to help homeowners avoid foreclosure, the Emergency Rental Assistance (ERA) to help renters in COVID-related distress, and additional HOME-ARP funds specifically to develop housing or services for homelessness. Guam was allocated millions in ERA and has used it to pay rent/utilities for thousands of households during the pandemic. Guam's HAF (administered by GHURA or Dept. of Administration) is helping households catch up on mortgages and property taxes. The HOME-ARP tranche Guam received can be used to create affordable

[48] https://www.housingfinance.com/developments/development-is-the-first-lihtc-community-for-seniors-in-guam_o#:~:text=Summer%20Town%20Estates%20is%20the,on%20the%20island%20of%20Guam
[49] https://www.housingfinance.com/developments/development-is-the-first-lihtc-community-for-seniors-in-guam_o#:~:text=The%20%2464,Credit%20transaction%20on%20the%20island

rental units for people experiencing or at risk of homelessness, domestic violence survivors, etc.

Relevance to G50SP: While these are short-term programs, they address urgent needs and free up capacity to pursue longer-term solutions. By preventing evictions and foreclosures, ERA and HAF keep people housed – aligning with the plan's social equity commitment to reduce homelessness and housing instability. Moreover, if Guam uses HOME-ARP to say, convert a building into supportive housing or build a small shelter, that directly accomplishes a five-year action the plan likely has (to provide shelter and housing for vulnerable populations). The key is to integrate these ARPA-funded efforts into the broader plan implementation, ensuring they complement permanent programs like LIHTC or HUD HOME. For example, data from ERA can inform where rental assistance or affordable units are most needed for the long run, guiding plan implementation priorities.

- **Resilience Bonds for Housing and Infrastructure:** Mentioned earlier, Resilience Bonds could be applied in the housing sector as well – for example, to finance retrofits of homes for typhoon resilience (roof reinforcement, shutters, elevation in flood zones). Guam might explore a pilot resilience bond where investors provide capital to strengthen a set of public housing complexes or to build a resilient affordable subdivision, and the "rebate" comes from reduced insurance premiums or disaster recovery costs (this model ties into cat bond insurance mechanisms).[50] Similarly, Green mortgages or loan guarantees for green building could be sought via USDA or DOE to encourage private housing developers to include solar panels, rainwater catchment, etc.

  Relevance to G50SP: Housing must also be safe and climate-resilient as per the plan (e.g. built to withstand typhoons and floods). Financing mechanisms that lower the cost of resilient construction will further the plan's goals. If Guam can package a proposal for a resilience bond or find insurers willing to partner, it could unlock private financing to harden hundreds of homes in the next few years – thus meeting hazard mitigation and housing quality targets together. While innovative, these approaches show promise in other regions and could be tailored to Guam's needs (for instance, a Forest Resilience Bond model has been used in California to fund wildfire risk reduction[51] – Guam could adapt this concept for watershed protection to safeguard villages from landslides, flooding, and wildfires).

[50] https://www.brookings.edu/articles/financing-infrastructure-through-resilience-bonds/#:~:text=One%20way%20for%20cash,out%20how%20these%20would%20work
[51] https://www.blueforest.org/finance/forest-resilience-bond/#:~:text=Forest%20Resilience%20Bond%20%28FRB%29%20,the%20costs%20of%20forest

Natural Hazards Mitigation

- **FEMA Hazard Mitigation Grant Program (HMGP):** After federally declared disasters, FEMA provides HMGP funds to the affected area equal to a percentage of the disaster recovery costs, for projects that reduce future risk. Typhoon Mawar (2023) triggered significant HMGP eligibility for Guam – potentially tens of millions of dollars dedicated to mitigation projects. These funds can be used for projects like hardening public buildings (roof upgrades, generators), flood mitigation (culvert upgrades, floodwalls), undergrounding utilities, and even home retrofits. Guam's Office of Civil Defense and Recovery Office will be formulating a list of HMGP projects post-Mawar. In the past, HMGP was used in Guam for things like wind-resistant roofs on schools and storm shutters for public facilities.

  Relevance to G50SP: The plan emphasizes protecting communities from typhoons, flooding, and other natural hazards in the near term – e.g. fortifying housing, improving drainage, and safeguarding critical infrastructure. HMGP is a prime source to fund these protective measures. For instance, a G50SP five-year action to "assess and improve drainage systems to address peak storm events" could translate into an HMGP-funded project to rebuild culverts and storm drains in an often-flooded village. Similarly, if the plan calls for creating emergency shelters or safe rooms, HMGP can fund new resilient community centers or the hardening of school gyms to serve as shelters. It's crucial that Guam integrates the plan's mitigation priorities into the formal Hazard Mitigation Plan updates, so they are eligible for HMGP. With Mawar fresh in memory, this is a rare window to secure large mitigation investments that directly fulfill G50SP resilience objectives.

- **FEMA Building Resilient Infrastructure & Communities (BRIC) Program:** BRIC is FEMA's nationwide competitive grant program (replacing earlier Pre-Disaster Mitigation grants) aimed at innovative, large-scale resilience projects. Each year, billions are available, and small states/territories have set-asides (Guam can get an allocation or compete in the national pool). BRIC funding can cover projects like shoreline protection, floodplain restoration, seismic retrofits, and utility resiliency. Guam has applied for BRIC technical assistance and potential projects such as a proposal to develop a comprehensive underground utility plan and to construct nature-based coastal defenses could be strong candidates.

  Relevance to G50SP: Many big-ticket resiliency projects in the plan – such as "promote nature-based shoreline protection" to guard against coastal erosion, or establishing resilience hubs with solar microgrids in each village – could be funded through BRIC. Given Guam's exposure, a BRIC grant could be sought to, say, build a pilot living shoreline (mangrove and reef restoration combined with berms) to protect a flood-prone coastal community, achieving a plan action for ecosystem-based adaptation. Guam should develop competitive applications by packaging multiple benefits (e.g. ecological

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and societal) as BRIC values innovative, cost-effective risk reduction. Over five years, even one major BRIC award (potentially $10–50M) would dramatically advance Guam's resilience agenda as laid out in G50SP. **Under Review – may not be available**

- **NOAA and USGS Grants – Coastal Resilience and Hazard Research:** NOAA administers programs like the National Coastal Resilience Fund in partnership with National Fish and Wildlife Foundation (NFWF) and Regional Coastal Resilience Grants, which can support projects in Guam such as coral reef restoration for wave attenuation, or developing comprehensive flooding models. Guam's reefs are natural breakwaters; restoring them has hazard mitigation value. NOAA also supports the Pacific Islands Climate Adaptation Science Center (which Guam partners with) for research and tools – these can indirectly fund planning that informs on-the-ground actions (e.g. updated flood maps, coastal erosion monitoring). The USGS and FEMA have programs for earthquake and tsunami preparedness (Guam lies in a seismic zone). Grants for early warning systems, hazard education, and mapping high-risk areas (landslide susceptibility maps, etc.) all contribute to mitigation.

  Relevance to G50SP: The plan calls for science-based policies and adaptive management. Using NOAA and USGS resources will help Guam implement smart hazard mitigation strategies. For example, a five-year action to "protect new development from coastal storms and hazards" can be executed by first having good coastal inundation models – something NOAA grants could fund – and then using that data to shape zoning or construction standards. Additionally, NOAA's coral and fisheries grants can be leveraged to achieve both conservation and hazard mitigation (healthy reefs and mangroves = natural storm buffers, as noted in the plan). Guam should continue active participation in regional resilience networks (e.g. Pacific Risk Management Ohana) to access these federal resilience initiatives.

- **Insurance and Catastrophe Bonds:** In terms of financial mechanisms, Guam can explore transferring risk and financing recovery via insurance tools. Parametric insurance (paying out a set amount when a parameter like wind speed or rainfall threshold is exceeded in a storm) could provide immediate funds for disaster response and rebuilding, supplementing FEMA. Some Caribbean islands have joined multi-island catastrophe insurance pools – Guam might coordinate with other territories for a similar approach or join an existing pool. Meanwhile, Catastrophe Bonds (or resilience bonds, as discussed) could be issued by insurance or reinsurance markets with payouts to Guam if a disaster occurs, offsetting public costs. While these don't fund mitigation projects directly, they ensure financial resilience and could free up budget to invest in prevention (knowing that post-disaster funds are secured).

  Relevance to G50SP: Financial resilience is part of community resilience. The plan's adaptive management framework likely includes securing funding for both proactive and reactive needs. By the end of five years, Guam could aim to have a more robust disaster

risk financing plan – for instance, setting aside monies in a Resilience Bond structure that not only provides insurance but also rebate premiums into mitigation projects (the resilience bond concept).[52] Implementing such innovative financing would strengthen Guam's ability to bounce back from hazards, which is a cornerstone of the sustainability plan. It would also complement physical mitigation efforts by providing quick capital for recovery, thus shortening downtime for the economy and society after an event.

- **Local Mitigation Funds – Hazard Mitigation Fee or Trust Fund:** Guam might consider establishing a local hazard mitigation trust fund, possibly funded by a small surcharge on property insurance or a fraction of real property taxes. This fund could accumulate and then be used to match federal grants or fund smaller-scale mitigation (like clearing storm drains annually, maintaining sirens, trimming trees near power lines). Another idea is implementing developer requirements for mitigation – for instance, requiring large developments to contribute to a "Hazard Mitigation Fund" or directly install certain protective infrastructure (retention basins, fire breaks) as part of their permit.

  Relevance to G50SP: Making resilience a routine part of development and budgeting will ensure the plan's safety goals are met continually. A local mitigation fund could ensure that even if federal funds ebb, Guam can continue upgrading infrastructure (perhaps one village flood project per year, etc.). The five-year period could be used to seed such a fund (maybe with an initial injection from ARPA or a one-time legislative appropriation, as a legacy of the plan's launch). This creates a sustainable financing loop for hazard mitigation that lasts well beyond the initial plan implementation period.

Climate Adaptation and Community Resilience

- **EPA Climate Pollution Reduction Grants (CPRG):** The EPA's CPRG program (funded by the Inflation Reduction Act) provided planning grants to states and territories to develop climate action plans. Guam received a $1M planning grant and produced the Guam Priority Climate Action Plan (PCAP) 2024, which outlines strategies to cut greenhouse gases and adapt to climate impacts.[53] Guam will be eligible for implementation grants from the $4.6B pot of CPRG competitive funds in 2024–2025. These could finance projects that reduce emissions or increase resilience – for example, electrifying government vehicle fleets, establishing composting and waste diversion programs, or creating urban green spaces to mitigate heat.

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[52] https://www.brookings.edu/articles/financing-infrastructure-through-resilience-bonds/#:~:text=One%20way%20for%20cash,out%20how%20these%20would%20work

[53] https://www.epa.gov/system/files/documents/2024-04/guam-pcap.pdf#:~:text=Guam%E2%80%99s%20Priority%20Climate%20Action%20Plan,and%20the%20University%20of%20Guam

Relevance to G50SP: The PCAP complements the G50SP by focusing on near-term climate actions. CPRG implementation funds can directly support G50SP five-year actions, such as community education on climate resilience and demonstration projects for renewable energy and sustainable agriculture (all identified in the plan's climate policies). By aligning PCAP priorities with G50SP (which has been done through BSP's coordination), Guam can use EPA funds to kick-start high-impact projects like a pilot energy-efficient affordable housing development or a methane capture project at the landfill – achieving mitigation and adaptation synergy.

- **Community Resilience Hubs – Philanthropic and Federal Support:** A big focus in resilience planning is establishing resilience hubs – community centers that can serve residents year-round (providing services, workshops, internet access, etc.) and also support the community during disasters (as shelters, distribution points, charging stations). Guam could seek funding for resilience hubs from philanthropic sources (e.g. the Rockefeller Foundation has supported Resilient Cities initiatives; the American Red Cross and other NGOs have grants for preparedness). Federal programs such as FEMA BRIC (mentioned) or HUD could also fund multi-purpose community safe centers. For example, a new village resilience center could be funded by a combination of CDBG (for the community center aspect) and FEMA funds (for the safe room aspect).

  Relevance to G50SP: Strengthening community resilience and cohesion is woven throughout the plan – it calls for "full community education and engagement effort around climate resilience" and improving public health and safety infrastructure. Establishing resilience hubs in vulnerable villages within five years would be a tangible accomplishment of those goals. They would provide venues for climate education (as the plan mandates) and improve emergency preparedness. By leveraging a mix of funding – perhaps a grant from a foundation that focuses on climate justice, plus federal funds – Guam can pilot at least one or two resilience hubs (e.g. refurbishing a community center with solar + battery, communications equipment, and supplies). This also demonstrates an equitable approach, bringing resources to underserved communities, aligning with the plan's social equity principles.

- **Nature-Based Adaptation Funding:** Many adaptation strategies in Guam will rely on restoring natural systems (reefs, wetlands, forests). We've touched on conservation funding, but specifically for climate adaptation, there are emerging sources: The Resilient America Program (Administered by NOAA) and the Climate Ready Fisheries initiative can fund projects that help ecosystems and dependent communities adapt (such as helping fishing communities adjust to coral reef changes). The Global Environment Facility (GEF) and Green Climate Fund typically fund developing nations, but Guam (through regional partnerships like the Micronesia Challenge) sometimes indirectly benefits from such funds for regional resilience-building that includes Guam's

ecosystems.[54] Even the U.S. Army Corps of Engineers has authority for ecosystem restoration projects (e.g. under their Continuing Authorities Program, Section 1135 or 206 can fund restoration that also provides storm risk reduction). Guam could partner with USACE for a small coastal restoration project (which they largely fund).

Relevance to G50SP: Nature-based solutions are explicitly favored in the plan (e.g. using "green infrastructure in urban areas" and protecting reefs and wetlands as buffers). Capitalizing on these funding streams will allow Guam to implement, in the next five years, projects like planting mangroves in suitable coastal areas, stabilizing shorelines with vegetation, and enhancing reef resilience (through coral gardening or reducing land-based pollution). These efforts protect communities from storm surge and erosion, thus meeting adaptation goals. Additionally, they often have co-benefits for tourism (healthy reefs) and fisheries – tying back to economic and food security aspects of the sustainability plan.

- **Local Climate Resilience Bonds or Fees:** Finally, Guam can invest in resilience through local finance: issuing a Guam Resilience Bond (a government bond dedicated to funding climate adaptation projects). This could be structured as a general obligation or revenue bond, and labeled as a resilience bond to attract impact investors. The proceeds could fund a bundle of projects – for example, flood mitigation in northern Guam and drought mitigation (water reuse) in southern Guam. Another approach is a modest "Climate Adaptation Fee" on certain activities – for example, a levy on quarried aggregates or carbon-intensive products that goes into a climate fund. While novel, these could generate local matching funds to pair with federal grants.

  Relevance to G50SP: Many of the plan's community resilience projects will require matching funds or partial local funding. Establishing a dedicated resilience fund via bonds or fees ensures Guam has "skin in the game" and can fully execute projects instead of leaving federal money on the table for lack of match. It also institutionalizes the commitment to sustainability beyond political cycles. Within five years, Guam could float its first resilience bond to finance, for instance, the overhaul of the island-wide stormwater management system (a multi-year plan the bond could kickstart). The investment now would pay off by reducing future disaster costs – a point that can be communicated to the public as well as investors (some resilience bonds globally have quantified the future savings from risk reduction).[55] Aligning financial policy with climate resilience in this way would be a hallmark achievement of G50SP implementation.

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[54] https://sdgs.un.org/partnerships/micronesia-challenge#:~:text=Micronesia%20Challenge%20,Environment%20Facility%2C%20with%20a

[55] https://www.brookings.edu/articles/financing-infrastructure-through-resilience-bonds/#:~:text=The%20idea%20is%20to%20link,only%20payout%20when%20disasters%20strike

Mapping Funding to G50SP Priority Actions:

The above funding sources and financing tools correspond directly to the Guåhan 2050 Sustainability Plan's five-year priority actions across all sectors. For instance, federal infrastructure funds (BIL, FEMA) would enable upgrading wastewater systems and eliminating septic tanks in critical aquifer zones as called for in the plan. Clean energy grants and private solar investments could support the plan's push for renewable energy in new development and grid resilience. Conservation and agriculture programs fund watershed protection, reforestation, and sustainable farming initiatives that the plan identifies for food security and climate resilience. Economic and community development funds (EDA, HUD, QC incentives) help realize revitalized village centers, diverse tourism offerings, and new economic opportunities in line with G50SP's Prosperous Economy and Vibrant Communities elements. Housing and social programs (HUD, LIHTC, ARPA) are mapped to building affordable, typhoon-safe housing and reducing homelessness, meeting the plan's goals for equity and safety. Hazard mitigation and climate funds (FEMA BRIC/HMGP, NOAA, CPRG) address coastal protection, flood control, and community preparedness, which feature prominently in the plan's Climate Resilience and Safety priorities.

By cross-referencing the G50SP action items with these funding opportunities, Guam's Bureau of Statistics and Plans and partner agencies can develop a financing roadmap for each priority. For example, if a five-year action is to "Establish a nature-based coastal defense pilot project," the roadmap might pair NOAA resilience grant funding with local match from a tourist green fee. If another action is "Construct 100 new affordable housing units," the roadmap could combine LIHTC equity, HOME funds, and perhaps an EDA economic adjustment grant if the project also catalyzes construction jobs. This strategic layering of funding will be crucial.

Conclusion and Steps to Secure Funding: The path to Guam's sustainable 2050 runs through effective utilization of diverse funding sources – federal, territorial, private, and innovative financing mechanisms. Fortunately, as detailed above, Guam has access to many programs with a demonstrated track record (BIL, ARPA, DoD/OIA, HUD, USDA, EPA, etc.) and new emerging funds targeted at climate adaptation and infrastructure renewal. Coupled with local reforms (impact fees, green bonds, QC incentives), these resources equip Guam to kick-start the Sustainability Plan's priority projects immediately.

By mapping each dollar to the plan's action matrix, GovGuam can ensure that every grant or investment directly advances a G50SP goal, whether it's a solar array on a school, a coral nursery in the bay, a farmers' market in a village, or a fiber-optic broadband link to rural homes. The next five years present an unprecedented opportunity to leverage funding for transformative change – aligning policy vision with financing. In doing so, Guam will make tangible progress toward the 2050 vision of a prosperous, healthy, and climate-resilient island community, setting a model for sustainability in the Pacific and beyond. Implementing a financing strategy will be critical to success, and involves at least four steps:

1. **Identify Eligible Programs:** Align G50SP initiatives with the objectives of available federal and local funding programs such as those discussed above. **As discussed, a new review will be needed as the federal funding landscape has changed dramatically since the drafting of this plan.**
2. **Develop Comprehensive Proposals:** Prepare detailed applications that clearly articulate project goals, benefits, and alignment with funding criteria.
3. **Engage Stakeholders:** Collaborate with community organizations, private sector partners, and other stakeholders to build support and strengthen applications.
4. **Monitor and Comply:** Ensure adherence to grant requirements, timelines, and reporting obligations to maintain eligibility for future funding.

Capital Improvements for Sustainability

The action plan contemplates creating an integrated financing strategy for the Guåhan 2050 Sustainability Plan that would involve all relevant Government of Guam agencies and other entities. This is important to effect maximum leverage of existing funding opportunities focused on the shared objectives of the G50SP, especially for capital improvements and larger investments. This ongoing collaboration will be critical as new funding opportunities emerge.

For example, in December 2024, Guam secured over $500 million in federal assistance through the Community Development Block Grant-Disaster Recovery (CDBG-DR) program to aid in recovery from Typhoon Mawar. The allocation includes $435.5 million for addressing unmet needs and $65.3 million dedicated to mitigation efforts aimed at enhancing the island's resilience to future disasters (CDBG, 2025)

The Guam Housing and Urban Renewal Authority (GHURA) is tasked with administering these funds. Their responsibilities encompass distributing aid to affected families, overseeing infrastructure projects, and implementing mitigation strategies. To manage this substantial influx of funds, GHURA plans to hire 40 temporary, full-time employees. Additionally, approximately $25 million from the total allocation is earmarked for administrative costs associated with managing the recovery efforts.[56]

The CDBG-DR funds are versatile and can be allocated toward various initiatives, including:

- **Housing Reconstruction:** Repairing and rebuilding homes damaged by Typhoon Mawar.
- **Infrastructure Enhancement:** Upgrading public facilities such as sports complexes and community centers.

[56]https://www.facebook.com/story.php?id=100064441793883&story_fbid=1063539445804105&utm_source.

- **Economic Revitalization:** Supporting local businesses and stimulating economic growth in affected areas.
- **Disaster Mitigation:** Implementing projects designed to reduce the impact of future typhoons and other natural disasters.

While the primary focus of these funds is disaster recovery, there is potential for alignment with the objectives of the Guåhan 2050 Sustainability Plan (G2050SP). The G2050SP outlines a vision for Guam's sustainable development, emphasizing areas such as:

- **Sustainable Growth:** Managing population growth and development to ensure environmental preservation.
- **Affordable and Safe Housing:** Providing housing that is both affordable and resilient to natural disasters.
- **Prosperous Economy:** Diversifying Guam's economy to reduce reliance on tourism and military spending.
- **Thriving Environment:** Protecting natural resources and promoting environmental conservation.
- **Vibrant Culture:** Preserving and promoting CHamoru culture and heritage.

By strategically allocating portions of the CDBG-DR funds, GHURA can support initiatives that not only address immediate recovery needs but also contribute to the long-term sustainability goals outlined in the G2050SP. For instance, investing in resilient infrastructure and housing can mitigate future disaster impacts, aligning with the plan's emphasis on sustainable and safe housing. Furthermore, economic revitalization efforts can be directed toward diversifying Guam's economy, fostering resilience against external shocks.

To maximize the synergy between disaster recovery efforts and sustainability objectives, it is crucial for GHURA and other stakeholders to coordinate closely with the Bureau of Statistics and Plans (BSP), which oversees the implementation of the G2050SP. Such collaboration can ensure that recovery projects are designed and executed in a manner that advances Guam's long-term sustainability vision.

8.4. Plan Implementation Monitoring and Evaluation

Ongoing monitoring and evaluation are essential to ensuring the Guåhan 2050 Sustainability Plan (G50SP) remains a living, responsive document that drives real progress. The Bureau of Statistics and Plans (BSP), as the lead coordinating agency, will oversee a structured system of performance tracking to assess implementation of plan actions, measure outcomes, and adapt strategies as needed.

8.4.1. Annual Reports and Dashboards

Progress will be tracked through publicly available annual implementation reports, which will summarize agency activities, completed projects, and key performance indicators for each of

the plan's thematic areas. The BSP Director will provide updates to the Governor for consideration in the Annual State of the Island Address. These reports will be informed by data collected from lead and partner agencies and will help evaluate whether actions are being completed on schedule. To support transparency and community engagement, BSP will also maintain an interactive online dashboard with metrics updated in real time or annually where feasible. This dashboard will display performance indicators such as new affordable housing units built, renewable energy installed, or miles of sewer lines upgraded—providing a clear view of Guam's progress toward sustainability goals.

8.4.2. Scheduled Plan Reviews and Updates

To ensure long-term relevance, the G50SP will undergo a formal review and update every five years, in coordination with government agencies and public stakeholders. These reviews will re-evaluate goals, policies, and priorities based on progress achieved, changes in conditions, and emerging needs. A more comprehensive update may occur at the 10-year mark (2035), including new land use and development forecasts. BSP will prepare a status report as part of each five-year review to inform adjustments to the implementation strategy.

8.4.3. Adaptive Management and Course Correction

If monitoring shows that certain strategies are underperforming or that new opportunities or risks have emerged, the plan allows for adaptive management. This includes revising implementation actions, reallocating resources, and modifying timelines where necessary. The annual reporting cycle and agency coordination mechanisms—such as the Implementation Task Force—will serve as forums for evaluating challenges, sharing best practices, and revising course when needed. By linking plan implementation to data, community input, and agency performance, the monitoring system will help ensure that G50SP remains responsive, effective, and aligned with the island's evolving needs.

8.5. Public Engagement and Transparency

The success of the Guåhan 2050 Sustainability Plan (G50SP) depends not only on government leadership and interagency coordination, but also on sustained and meaningful community engagement. The plan's core principles of Equity and Engagement emphasize that all residents of Guam—across all ages, sectors, and regions—should have opportunities to help shape and sustain the island's future. This involvement must extend well beyond the planning phase and be embedded throughout implementation.

8.5.1. Community-Based Implementation and Feedback Loops

The Bureau of Statistics and Plans (BSP), in collaboration with agency partners, village mayors, and community organizations, will continue to engage the public through ongoing outreach, consultation, and education efforts. These may include regular community briefings, stakeholder forums, village-based implementation workshops, and issue-focused listening

sessions. Residents will help identify local priorities, monitor progress, and refine implementation strategies. Public input will be incorporated into annual implementation reports and five-year performance reviews, ensuring the plan remains grounded in community values and everyday experiences.

As a trusted convener and catalyst, Guam Green Growth (G3) will serve as a key partner in these engagement efforts. G3's community-based initiatives, circular economy programs, and education and innovation platforms offer dynamic opportunities for public participation. Through the G3 Conservation Corps, Makerspace and Innovation Hub, and UN Sustainable Development Goals (SDG) Alignment Activities, G3 can help bridge grassroots knowledge with institutional planning, fostering broad-based, community-driven implementation of G50SP.

8.5.2. Public Access to Progress and Performance

Transparency is essential to building trust and maintaining momentum. BSP will ensure open public access to implementation materials, including project updates, funding information, performance dashboards, and meeting summaries via an interactive online platform. Annual progress reports and five-year updates will clearly communicate the status of plan actions and identify emerging challenges or opportunities.

G3's communications and outreach infrastructure can support this work by helping translate technical data into community-relevant formats. Public art installations, social media campaigns, student-led storytelling, and accessible data visualizations will all play a role in bringing plan performance to life and keeping the public informed. Through collaboration with G3, BSP can broaden the reach and accessibility of sustainability communications, especially for youth, schools, and underrepresented communities.

8.5.3. Education, Youth Involvement, and Co-Design Opportunities

A thriving culture of sustainability must be nurtured across generations. The plan prioritizes outreach to schools, universities, and youth-serving organizations to build knowledge, skills, and shared ownership of Guam's sustainable future. Young people will be engaged through civic learning projects, innovation challenges, and resilience planning activities that connect local priorities with global goals.

Through its G3 Education Committee and Innovation efforts, Guam Green Growth provides a strong platform for engaging students, young professionals, and entrepreneurs in co-creating sustainability solutions. G3's Science, Technology, Engineering, Arts, and Mathematics (STEAM)-based learning, creative challenges, and career development programs align directly with the plan's goals to embed sustainability across education and economic development systems. Public agencies will also create co-design opportunities where residents can actively participate in shaping projects such as community parks, resilience hubs, village-scale planning, and cultural preservation programs.

8.5.4. Institutionalizing Engagement

Public engagement must not only be meaningful—it must be consistent and embedded in governance. Through the Sustainability Plan Implementation Task Force, agency working groups, and interagency coordination structures, mechanisms will be developed to institutionalize engagement in plan implementation. These may include community advisory boards, standing public comment opportunities, village planning liaisons, and participatory budgeting pilots that allocate funds based on resident input.

With its cross-sector reach and commitment to local empowerment, Guam Green Growth will play a vital supporting role in sustaining public participation, civic learning, and innovation throughout the lifespan of the plan. By cultivating shared ownership, transparency, and collaboration, G50SP aims to model inclusive governance that delivers real, lasting change. A sustainable, resilient, and equitable Guam will only be achieved with the full engagement of its people—and through partnerships that build capacity and shared purpose from the ground up.

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