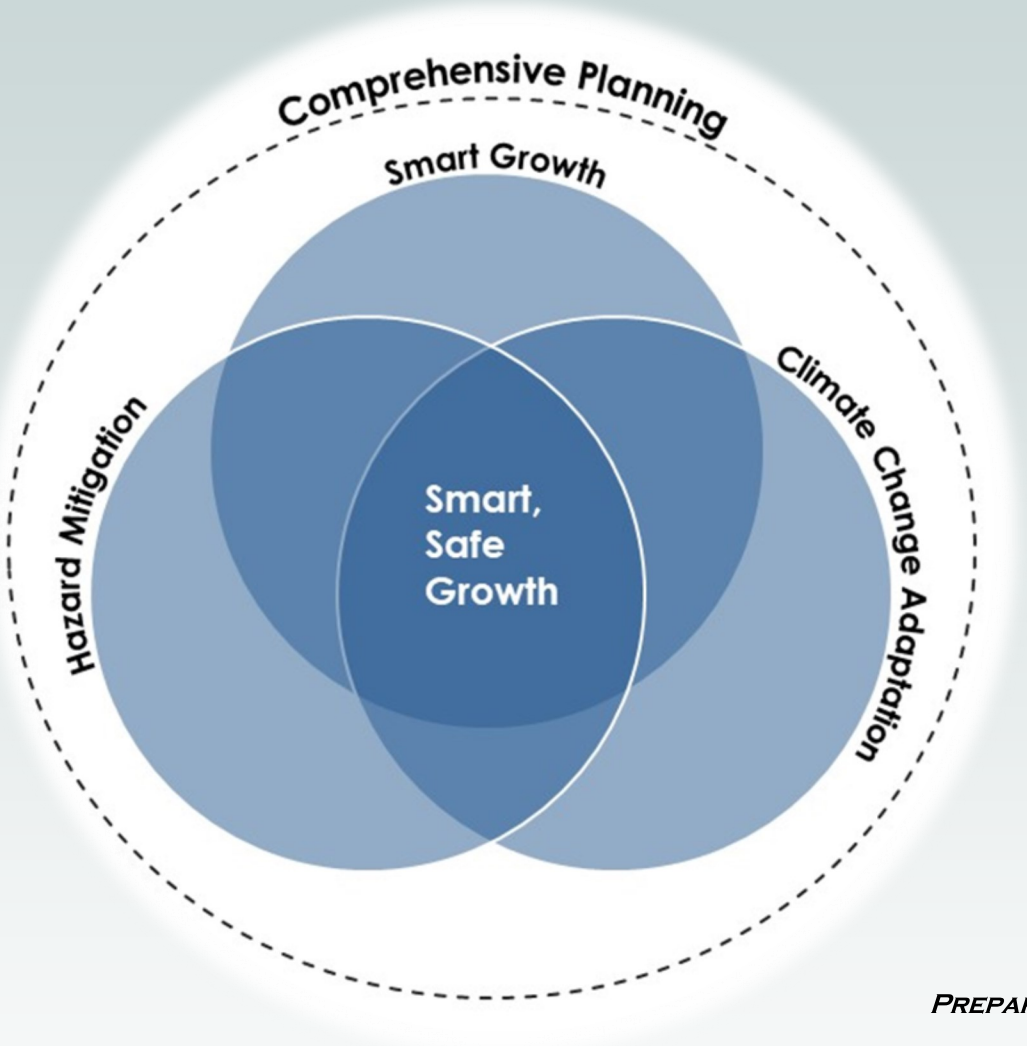
Guidance Manual

for

Smart, Safe Growth

Commonwealth of the Northern Mariana Islands



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FOREWORD

As we near the end of this second decade of the new millennium it is increasingly difficult to deny that we live in a period of rapidly changing climate conditions. We are experiencing a time of superlatives with regard to impacts on economies and community quality of life from weather- and climate-related phenomena. The number of impacted communities and magnitude of consequences of record-setting temperatures, extreme altered precipitation patterns, and weather- and climate-related natural disasters are greater for this twenty year period than for any comparable time on record. Compounding the impacts on society is that natural disaster events are crowding together closer in time. Costs to communities and governments soar as wildfires, tropical cyclones, droughts and floods occur with ever-increasing frequency and magnitude. Loss of property and economic opportunity, especially for the future, is alarming. The natural disaster of *Super Typhoon Yutu* that struck Tinian and Saipan in October 2018 followed closely in the wake of *Super Typhoon Soudelor* that destroyed so much of the Saipan homes and businesses and utility infrastructure just three years earlier. The cleanup and recovery from *Soudelor* is still underway. The burden of these overlapping natural disaster events is debilitating to socio-economic well-being in the Marianas. *Yutu* is a harsh reminder of the importance of planning and constructing for resiliency and recovery among the small islands and small economies of the tropical Pacific. Each recovery effort following each successive event is more costly, more difficult for people and governments, and less effective than the preceding one. It is imperative that we break this conventional cycle of disaster-recovery-repeated damage. How and where we rebuild following a disaster is key to altering this pattern. At the pace of climatic changes and disaster frequency the conventional response erodes our future well-being. This *Guidance Manual for Smart, Safe Growth* provides a point of departure from the prevailing planning and regulatory practices of Pacific Islands governments. The intent of this work is to help usher in a new era of thought and initiative among the Pacific Islands Countries and Territories for a sustainable approach to natural disaster preparation, response and recovery.

ACKNOWLEDGEMENTS

Preparation of this *Guidance Manual for Smart, Safe Growth* in the Mariana Islands was made possible through the vision and funding of the US Federal Emergency Management Agency. The work was administered by the US EPA Region IX Pacific Islands Office via Order No. EP-18-C-000003. Many thanks are extended to the many interested and engaged members from the CNMI government agencies who attended the on-site workshops to establish the framework for how "guidance" would be useful to regulatory and planning officical. Mr. Eli Cabrera, Administrator of the Bureau of Environmental and Coastal Quality, was key in coordinating workshop attendance and maintaining cohesion during the workshops week on Saipan. Mr. John McCarroll, Manager of the EPA Region IX Pacific Islands Office, provided workshop facilitation to maintain focus in a complex setting of many participants with multiple agendas among multiple agencies over multiple days. Technical and editorial commentary on the draft guidance was provided by Director Kodep Ogumoro-Uludong and Ms. Erin Derrington of the Office of Planning and Development, and by Ms. Emily Northrop and Mr. Richard Salas of the Division of Coastal Resources Management (BECQ). Ms. Derrington's comments were particularly comprehensive, in-depth, and insightful. The collective effort of these attentive reviewers added greatly to the quality of the work. Mr. Carl Goldstein, Senior Program Manager of the Region IX Pacific Islands Office, is credited with overall project success, exercising his leadership and managerial duties throughout with typical sagacity and competence.

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0.0 EXECUTIVE SUMMARY

Natural hazards pose greater risks to Pacific Islands communities and economies compared with continental regions because of small and isolated land masses and limited economic potential. Disasters caused by extreme weather and climate change are increasing with ever growing loss of property and recovery costs. Pacific Islands governments must increasingly respond to severe weather events, such as extreme winds and precipitation, wave inundation, extreme heat, and drought. These events threaten life and property and cause hundreds of millions of dollars in damage among the Pacific Islands each year. In 2015, *Super Typhoon Soudelor* caused over $20 million in damage on Saipan. The toll on Tinian and Saipan from *Super Typhoon Yutu* has yet to be reckoned. Natural disasters cannot be controlled; however, risks can be assessed and mitigation actions taken to reduce impacts and improve the resiliency and recoverability of communities, environment, and economies.

Smart, Safe Growth (SSG) is a set of development strategies focused on improving the resiliency of the built environment. Through SSG, Pacific Islands governments work to develop communities that maximize public health and safety, provide economic opportunity and life-style choices, and that can withstand changes in climate and extreme weather events to reduce societal and economic burdens of recovery.

Purpose

This *Guidance Manual* introduces SSG and discusses adaptation measures, recommendations for government action, planning resources, regulatory instruments, and tools to work towards SSG in the Commonwealth of the Northern Mariana Islands (CNMI). This *Guidance Manual* presents key issues and tools to facilitate leadership and action towards SSG. This *Guidance Manual* aims to help the CNMI Government evaluate planning and development initiatives for conformance with SSG Principles in a consistent and uniform manner. Information presented here can be worked into regular CNMI processes and policies such as updates to planning documents and regulations. This approach supports incremental change over the long-term and empowers CNMI communities to work toward SSG.

How to Use this Guidance Manual

This manual is foremost intended for use by regulatory authorities and government planning officials. As a subject matter reference document, this *Guidance Manual* will enhance staff capabilities for incorporation of SSG Principles into work product. This manual is to be used on a regular and frequent basis by the principal government agencies to facilitate work product that is consistent with the SSG framework. Language and concepts are provided to support improvements in sustainability of development that are essential to consider when preparing technical reviews for the file record, or when coordinating or editing planning documents. The suite of tools provided here is intended to be representative and is by no means exhaustive. It is expected that the user will follow-on with research for other available tools when necessary. This manual is also intended for use by developers and consultants. This manual informs developers and consultants on how to build more sustainable projects or plans and how these proposals will be reviewed by government officials with regard to SSG Principles. By using this manual, the developer and consultant communities of practice will have the same basis of literature, tools,

and regulations as government staff, for preparation of work products that incorporate SSG Principles.

How this Guidance Manual is Organized

Following an introduction on the fundamentals of SSG and the implications of a changing climate, Chapter 2.0 introduces the concept that SSG can emerge from the intersection of three key areas of practice – hazard mitigation, climate change adaptation, and smart growth. Chapter 3.0 provides a general overview of current climate science and the relationship between SSG Principles and climate change adaptation. The climate discussion is necessarily general, but links are provided for the user to access more detailed and current climate information. Chapter 3.0 underscores that changing climate conditions in the Marianas will require new approaches to building smart, safe communities and acknowledges there are many barriers, including uncertainty about future climate conditions that make working towards SSG challenging but critically necessary.

Having laid the SSG and climate change groundwork, the manual then presents four chapters specific to present-day conditions in the CNMI. Chapter 4.0 provides recommendations for CNMI Government actions to maximize successful implementation of SSG Principles in planning and development initiatives. Chapter 5.0 and 6.0 summarize existing planning and regulatory resources and provide recommendations for SSG Principle integration. Chapter 7.0 offers many tools and resources to integrate SSG Principles into CNMI planning and development initiatives. Some of the tools selected are ambitious (e.g., establish electrical smartgrids) to encourage planners and regulators to make determined strides towards SSG implementation.

The Appendices provide additional tools and useful information. Appendix A provides a checklist intended for use by CNMI agency staff to review and evaluate planning and development initiatives for conformance with SSG Principles and existing CNMI regulations. Appendix B provides an in-depth review of existing CNMI regulations and recommended changes to more effectively support SSG implementation. Appendix C is the master bibliography, which supplements the references provided in Chapter 9.0. Appendix D provides summary evaluations of selected works from the master bibliography for conformance with SSG Principles. Appendix E reports the proceedings from the SSG workshops held on Saipan during July 2018. Appendix F provides a glossary of key terms.

The progression of SSG will require strong leadership and commitment from the CNMI Government. Core government actions to promote Smart, Safe Growth include:

1) Adoption of a climate change policy that identifies plausible scenarios for projected climate change conditions as the basis for planning initiatives, and Office of the Governor mandate that requires centralized approval for all CNMI agency planning initiatives and establishes policies to encourage cross-agency planning that minimizes isolated efforts (i.e., stove pipes).
2) Revise regulations, permitting processes and land use planning for alignment with SSG Principles, regulatory authorities, and ensure project sequencing is coordinated with service providers (e.g., CUC, DPW, CHCC). It is especially important that utilities and services can meet demands of new developments;

3) Adopt long-range planning and funding horizons for utilities and services based on growth;
4) Revitalize and empower the CNMI Resilience Working Group; and
5) Fund and implement SSG through prioritization and alignment with federal funding opportunities and engagement with community stakeholders.

Currently, the CNMI lacks a comprehensive plan to guide land use for the development of communities and economic districts. Lacking government criteria, businesses and individual investors and developers are directing development circumstantially and incidentally, without centralized government guidance. The newly-formed Office of Planning and Development is tasked with rectifying this prevailing practice and is mandated to prepare the *CNMI Comprehensive Sustainable Development Plan*. Through planning, regulations and permitting the CNMI government will influence the pattern and pace of development. Incorporating SSG Principles into development-related regulations and major planning documents is an effective means to work toward achieving SSG.

Smart, Safe Growth is achievable for the CNMI over the long-term. There is no single plan or initiative that will achieve SSG. Persistent application of SSG Principles for planning documents and development projects, whether these be for government, utility, or private-sector, will create momentum towards Smart, Safe Growth. The shift from the present-day disaster-recovery cycle to a cycle of planning and building for resiliency will be incremental. It is not unreasonable to expect that several decades will pass before this shift is substantial. Daunting as the prospect of broad-scope change may seem, it is important to begin the groundwork. Government has the most important role. Leadership support, legislative action, regulatory consistency, and cohesion in government action are key. Leadership from the Office of Planning and Development is vital to create and maintain cohesion among government elements and stakeholder groups for the persistent and coordinated application of SSG Principles in order to culture resiliency into growth. Support from the community at large and CNMI leadership in ongoing planning and implementation efforts is critical. The benefits realized tomorrow are the results of actions taken today. Implementation of the strategies presented in this *Guidance Manual*, and the use of the various tools, to the extent practicable within budgets and staffing, will place the CNMI on a course towards Smart, Safe Growth.

1.0 INTRODUCTION

Natural hazards pose significant risks to communities as they develop and grow. Disasters caused by extreme weather and climate change are increasing with ever growing loss and recovery costs (Hoeppe, 2016; Smith & Katz, 2013). State and territorial governments must increasingly respond to severe weather events, such as extreme precipitation, wave inundation, extreme heat, drought, and wildfires. These events threaten life and property and cause billions of dollars in damage. The National Oceanic and Atmospheric Administration (NOAA, 2018) reports that in 2017 damages from natural disasters cost the US Government an estimated $300 billion. In 2015, *Super Typhoon Soudelor* caused over $20 million in damage to Saipan communities (Ridgell, 2015). Natural disasters cannot be avoided; however, risks can be assessed and mitigation actions taken to reduce impacts and improve the resiliency and recoverability of our communities, environment, and economy.

Smart, Safe Growth (SSG) is a set of development strategies focused on improving the resiliency of the built environment. Through SSG, state and territorial governments work to develop communities that maximize public health and safety, provide economic opportunity and life-style choices, and that can withstand changes in climate and extreme weather events to reduce societal and economic burdens of recovery after a natural disaster. This *Guidance Manual* introduces SSG and discusses adaptation measures, recommendations for government action, planning resources, regulatory instruments, and tools to work towards SSG in communities of the Commonwealth of the Northern Mariana Islands (CNMI).

This *Guidance Manual* incorporates information and assessments from the Climate Vulnerability Assessments for the Islands of Saipan (2014), Rota and Tinian (2015) and the CNMI *Standard State Mitigation Plan* (2014).

Climate change imposes new risks to communities. Adaptation to increases in extreme weather events and conditions of a changing climate will require a shift in current planning and policy instruments. The incorporation of SSG Principles into future CNMI development will improve community resiliency and mitigate recovery costs in the course of future events.

Purpose

The purpose of this *Guidance Manual* is to present key issues and tools for use by the CNMI Government agencies and officials to facilitate leadership and action in support of working towards SSG in the CNMI. Using the SSG Principles described in this *Guidance Manual* can help prepare CNMI for natural hazards and extreme weather events associated with a changing climate.

This *Guidance Manual* aims to help the CNMI Government evaluate planning and development initiatives for conformance with SSG Principles in a consistent and uniform manner. Information presented here can be worked into regular CNMI processes and policies such as updates to planning documents and regulations. This approach supports incremental change over the long-term and empowers CNMI communities to work toward SSG.

How to Use this Guidance Manual

This manual is foremost intended for regulatory authorities and government planning officials to assist them in their work. As a subject matter reference document, this *Guidance Manual* will enhance staff capabilities for incorporation of SSG Principles into work product. This manual is to be used on a regular and frequent basis by the principal government agencies that are identified herein to facilitate work product that is consistent with the SSG framework.

The fundamental work of regulators with respect to proposed development is to prepare authoritative documents that require/request technical changes to a proposal, or that ultimately deny/approve a submittal. Regulators are also the front-line reviewers and writers that propose revisions to regulations. This manual provides regulators with resources and a context with which to prepare work product in a Smart Safe Growth framework. Planners play a less direct role in managing development compared to regulators. Planners have a largely conceptual and visionary function for drafting planning documents, and a coordinating and editorial function for finalizing plans. However, planning and regulatory are most effective when synergies are created and the two functions work integrally. SSG concepts must be integrated into overall development visioning in ways that guide SSG implementation by regulators to specific projects and development trajectories as a whole. This manual provides a range of resources to support the incorporation of SSG into planning and development projects in the CNMI.

This manual provides the user with language and concepts to support more sustainable development that are essential to consider when preparing technical reviews for the file record, or when coordinating or editing planning documents. This manual offers the user ready references to a range of supporting literature for SSG. It is anticipated that the user will access this guide and additional literature to support technical determinations during project review. The literature may also lead the user to follow-on research. The suite of tools provided here is intended to be representative and is by no means exhaustive. It is expected that the user will follow-on with research for other available tools when necessary. The checklists for review of projects and planning documents provide an organizational tool, where concepts, notes, and criteria are recorded for later use when drafting or finalizing documents for the file record (Appendix A). This manual guides the planner or regulator on how to incorporate SSG Principles into their work product to move the CNMI towards resiliency of the built environment.

This manual is also intended as a resource for developers and consultants. This manual informs developers and consultants on how to build more sustainable projects or plans and how these proposals will be reviewed with regard to SSG Principles. By using this manual, the developer and consultant communities of practice will have the same basis of literature, tools, and regulations as government staff, for preparation of work products that incorporate SSG Principles. By using this manual, the regulated community can better understand government goals and criteria for moving the CNMI towards Safe, Smart Growth.

How this Guidance Manual is Organized

This *Guidance Manual* provides information to help users better understand how to plan, design and build communities that are less vulnerable to natural hazards and changing climate conditions and that increase community health, well-being and safety. To help users understand the layout

of this manual, a brief description of topics presented in each chapter and appendix is provided below.

Chapter 2.0 introduces the concept that SSG can emerge from the intersection of three key areas of practice – hazard mitigation, climate change adaptation, and smart growth. A discussion of key SSG benefits and a list of guiding SSG Principles is provided.

Chapter 3.0 provides a general overview of current climate science and the relationship between SSG Principles and climate change adaptation. The climate discussion is necessarily general, but links are provided for the user to access more detailed and current climate information. Chapter 3.0 underscores that changing climate conditions in the CNMI will require new approaches to building smart, safe communities and acknowledges there are many barriers, including uncertainty about future climate conditions, that make working towards SSG challenging but critically necessary.

Having laid that groundwork, the manual then presents four chapters specific to current conditions in the CNMI. Chapter 4.0 provides recommendations for CNMI Government actions to maximize successful implementation of SSG Principles in planning and development initiatives.

Chapter 5.0 and 6.0 summarize existing planning and regulatory resources and provide recommendations for SSG Principle integration. Table 6.1 provides a quick reference guide to current regulations that are of greatest importance for influencing CNMI towards SSG. A more thorough review of the regulations is provided in Appendix B where suggestions and recommendations for enhanced regulatory function are presented.

Chapter 7.0 offers many tools and resources to integrate SSG Principles into CNMI planning and development initiatives. Chapter 7.0 is subdivided into sections that provide specific tools to help integrate SSG into public and private areas of practice within the CNMI. Some of the tools selected are ambitious (e.g., establish electrical smartgrids) to encourage planners and regulators to make determined strides towards SSG implementation. Tools were selected based on the potential for successful implementation within the context of the CNMI.

Chapter 8.0 provides overall conclusions about working toward SSG in the CNMI and provides suggestions for next steps. Chapter 9.0 provides references used in the *Guidance Manual*.

Lastly, the Appendices provide additional tools and useful information. Appendix A provides a checklist intended for use by CNMI agency staff to review and evaluate planning and development initiatives for conformance with SSG Principles and existing CNMI regulations. Appendix B provides an in-depth review of existing CNMI regulations and recommended changes to more effectively support SSG implementation. Appendix C is the master bibliography, which supplements the references provided in Chapter 9.0. Appendix D provides summary evaluations of selected works from the master bibliography for conformance with SSG Principles. Appendix E reports the proceedings from a series of SSG workshops held in CNMI in July 2018. Lastly, Appendix F provides a glossary of key terms.

Abridged List of Key Terminology

Many of the terms used in this *Guidance Manual* are commonly used among several communities of practice, albeit with slightly varied meanings. To help the users of this *Guidance Manual*, an abridged list of key terms with definitions is provided here for convenience. A glossary of additional key terms and definitions is provided in Appendix F.

Climate Change Adaptation
A broad range of human policies and activities primarily intended to reduce the risks (realized and expected) posed by accelerated changes in climate.

Hazard Mitigation
Any sustained action taken to reduce or eliminate the long-term risk to life and property from hazard events. It is an on-going process that occurs before, during, and after disasters and serves to break the cycle of damage and repair in hazardous areas.

Resilience
The amount of stress the built environment can withstand before something breaks (i.e., how far can it bend). A resilient built environment can withstand current and future weather events with minimal damage.

Recovery
The amount of time and resources required to repair damage to the built environment and to restore essential services and community function.

Smart Growth
A set of strategies and principles aimed at creating great communities with increased economic and social opportunities, a range of lifestyle choices and personal freedoms, good return on public investments, a thriving natural environment, which together lead to increased community health and well-being.

Smart, Safe Growth
Smart, Safe Growth is a set of development and conservation strategies to improve communities, strengthen economies, protect the natural environment, and improve resilience and recoverability of the built environment.

Vulnerability
The degree to which a resource, asset or process is susceptible to adverse effects of natural disasters, including changes in climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, sensitivity, and adaptive capacity (IPCC 2014).

2.0 SMART, SAFE GROWTH

The SSG approach presented herein is complementary of three well-established communities of practice: 1) *smart growth*, 2) *hazard mitigation*, and 3) *climate change adaptation*. To achieve growth that is smart and safe, communities integrate SSG Principles into development-related policies and planning initiatives. Among the small land masses of the Pacific Islands Countries and Territories, the SSG approach is tailored for local and community-specific hazards and vulnerabilities. SSG is enhanced by combining and overlapping strategies from the three communities of practice and incorporation into planning and development documents (Figure 2.1).

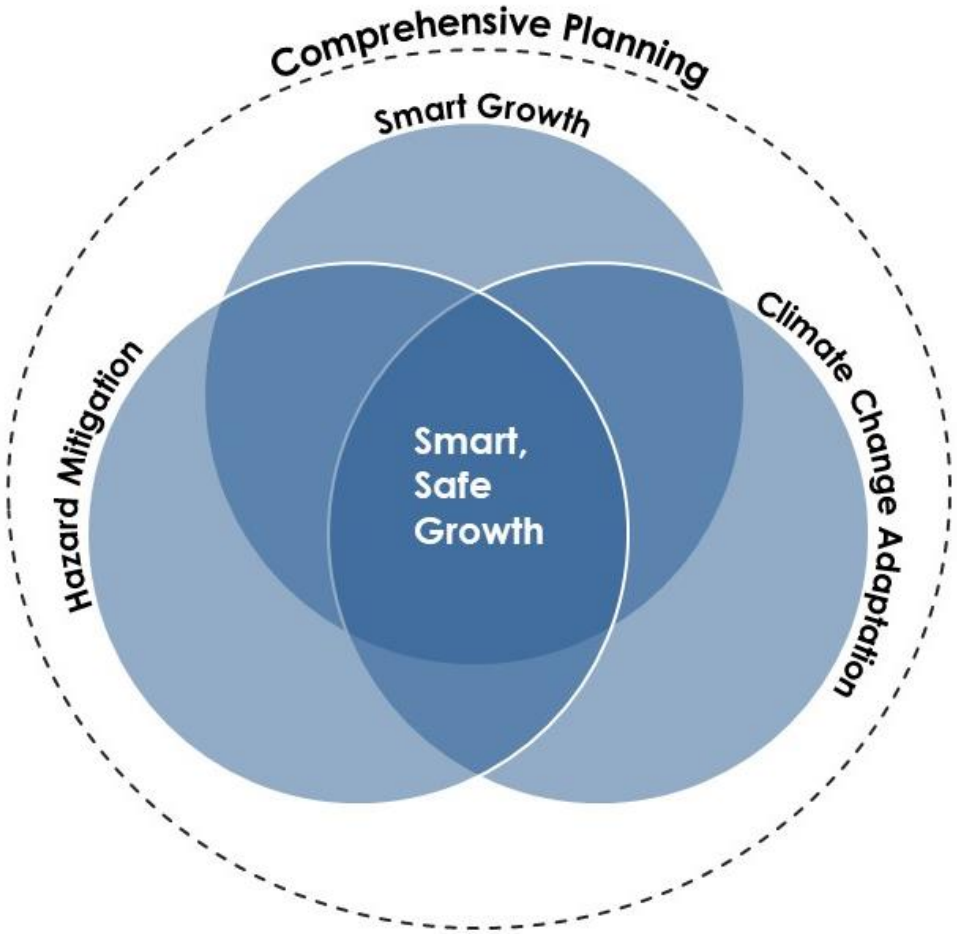


Figure 2.1 Smart, Safe Growth emerges from an overlap of strategies.

Smart Growth

Smart growth is a set of strategies and principles aimed at creating great communities with increased economic and social opportunities, a range of life-style choices and personal freedoms, good return on public investments, a thriving natural environment, which together lead to increased community health and well-being. Smart Growth strategies are flexible to address

community-specific challenges and desired end-states. Many government agencies and private organizations provide technical assistance and programs to assist communities with implementing Smart Growth. For example, in 2016 the Federal Emergency Management Agency (FEMA) and the Environmental Protection Agency (EPA) signed a Memorandum of Agreement to work in partnership to help communities become safer, healthier, and more resilient. Selected Smart Growth resources and tools are included in subsequent sections and in the master bibliography (Appendix C).

Climate Change Adaptation

The Earth's climate and weather patterns are changing. Over the past several decades, extreme weather events have occurred with increased frequency. These events endangered human safety and lives and caused billions of dollars in damage to the built environment. Climate change will affect weather-related natural hazards into the future. Identifying risks from short- and long-term impacts as well as building adaptive capacity of communities, the built, and the natural environment is central to building resilience and involves developing processes and capacities that enable continued response to a changing and uncertain climate over time. Planning for and implementing measures to adapt to conditions of a changing climate can help increase community resiliency to these events, reduce damage, and lower recovery costs.

Hazard Mitigation

Hazard mitigation seeks to reduce the risks from geophysical hazards, such as earthquakes and volcanic activity, as well as metrological hazards, like severe weather. Hazard mitigation is an incremental, long-term application of strategies to improve community resiliency by addressing and reducing vulnerability to natural hazards. Hazard mitigation aims to reduce loss of life and property by lessening the impacts of natural hazards, particularly severe weather events that result in disasters.

Because recovery costs are escalating, the Federal Government requires hazard mitigation planning for state and territorial governments as a condition to receive post-disaster financial assistance. Hazard mitigation plans are key to breaking the cycle of damage, reconstruction, and repeated damage, by empowering identification of high-hazard areas and encouraging development to concentrate in less vulnerable areas; thus, helping to reduce post-disaster recovery costs. Hazard mitigation is optimally supported by long-term mitigation planning efforts such as the CNMI *Standard State Mitigation Plan* (2014). Although Standard State Mitigation Plans work towards minimizing hazards over the long-term, FEMA regulations require updates at least every five-years to address, analyze and incorporate changing hazards, especially hazards intensified by a changing climate, and to explore alternative or new mitigation actions.

With climate change, the frequency of weather-related hazards is increasing, but the frequency of geophysical hazards has not changed (Hoeppe, 2016). Traditionally, hazard mitigation measures were based on existing climate conditions, but with climate change occurring, future climate conditions must be considered to effect enduring mitigation measures. For example, in the wake of Super Storm Sandy, New York City began considering 100- and 500-year sea level rise and flood scenarios, a planning effort that is anticipated to reduce mitigation costs by as much as 25 percent (Greenhalgh, n.d.). Because severe weather causes more loss of life and property

than geophysical hazards, the primary focus of this *Guidance Manual* is on severe weather and associated extreme events such as storm surge and flash flooding, and recognizing that climate change presents a new dimension to conventional weather hazards.

2.1 Moving towards Smart, Safe Growth

SSG is best realized through comprehensive planning efforts that are coordinated among government agencies. Through proactive planning, the CNMI government can select the right mix of structural solutions, such as retrofitting existing structures, and non-structural solutions such as land use measures to encourage development in less vulnerable areas. Many resources are available to help CNMI regulators and planners identify key natural hazards and anticipate the effects of climate change (see Sections 5.0 and 6.0). The current effort to develop the *CNMI Comprehensive Sustainable Development Plan* is a critical entry point to incorporate SSG Principles in a cohesive and uniform manner across the government. Comprehensive planning is the blueprint that integrates hazard mitigation, smart growth, and climate change adaptation strategies so that SSG can emerge (Figure 2.1). Regulatory and planning instruments are the drivers that will help incorporate SSG Principles into CNMI's planning and regulatory processes.

2.2 Smart, Safe Growth Benefits

Resilient communities that result from incorporation of SSG Principles are planned and built to withstand current and future weather events and natural hazards with minimal physical damage or community disruption. It is recognized that implementing SSG measures proactively may increase near-term costs. However, if planning, design, and construction practices do not adjust for climate change, damages and recovery costs will eventually outpace the cost of implementing SSG actions.

Source: FEMA 2017.

Although it is often difficult for fiscally-constrained governments to invest in long-term strategies, FEMA says that every dollar invested in mitigation activities today will save $6 on future post-disaster recovery costs. So, prioritization of fiscal resources today can be made with confidence in eventual benefits of reduced loss and damage to property and communities as a whole when disasters occur.

SSG measures and investment in hazard mitigation can yield additional economic benefits arising from reduced weather-related impacts on the built environment. There is a significant reduction in the need and cost for disaster recovery actions, such as debris management, emergency response for fire safety, search and rescue, medical operations, disaster management, and other related services, when planning and impact mitigation and prevention measures are implemented. Also, when the built environment is damaged less, business disruption and revenue loss are reduced, which facilitates the speed and effectiveness of community economic recovery.

In addition to helping to prioritize investments in hazard mitigation for existing buildings and infrastructure, SSG maximizes public health, safety, and welfare by siting new development in less vulnerable areas. Less vulnerable means more resilient. Resilient infrastructure sustains less damage from natural hazards and leads to fewer disruptions to public services such as power and water distribution and medical services. Providing system redundancy for critical infrastructure and recovering critical facilities and services quickly minimizes social disruptions following natural disasters and creates conditions for people to remain in their communities to support recovery efforts and maintain community cohesion.

SSG provides environmental benefits such as open space preservation for recreation, agriculture, reestablishment of native habitat, and provision of other ecosystem services. In anticipation to projected changes in CNMI rainfall patterns, watershed preservation is critical to allow adequate water infiltration to recharge and maintain groundwater supplies for drinking and agriculture and support nearshore water quality. Applying SSG Principles can reduce per capita water demand and energy consumption as well as reduce air pollution from energy-generation emissions, lessening use pressures on natural resources and the built environment. Moreover, resilient infrastructure requires less energy and materials to repair following natural hazard events and less damage will reduce the amount of material entering the landfill. When interconnected resiliency objectives are included in planning new development and prioritizing maintenance and mitigation investments for existing structures, SSG Principles can support more sustainable development and the well-being of social, economic, and environmental systems.

2.3 Smart, Safe Growth Principles

The list of SSG Principles was derived from the extensive literature of practice for smart growth, hazard mitigation, and climate change adaptation (Table 2.1). The principles express the practical aspects of SSG. The purpose and intent of incorporation of SSG Principles is to enable well-informed development decision-making that reduces exposure to avoidable risks and enhances project and community resilience. CNMI can work toward SSG by incorporating these principles into policy and planning instruments. A range of potential instruments are presented and discussed in Section 5.0.

Figure 2.2 Land managers and public volunteers revegetate the Talakhaya watershed on Rota.

The SSG Principles are organized by short-name followed by an expanded definition.

Table 2.1 Smart, Safe Growth Principles.

	Principle	Definition
1	Climate Change	Consider long-term climate change impacts of sea level rise, coastal inundation, increased storm intensity, variabilities in precipitation, and drought in planning, design, and cost determination for infrastructure and development projects as well as natural area preservation and enhancement planning.
2	Retreat	Plan to retreat from the areas of highest risk by discouraging or regulating development in these areas and promoting alternative uses of high-risk land, such as walkable public waterfront parks and recreation areas.
3	Retrofit	Retrofit existing structures and infrastructure located in hazard-prone areas to reduce vulnerabilities.
4	Critical Facilities Location	Locate new critical facilities (e.g., water and sewer systems, roads, hospitals, power plants, transmission and communication lines, and public safety facilities) outside of high-risk zones.
5	Development Incentives	Utilize regulatory and financial incentives to locate new development away from high risk areas into lower risk areas or to areas where risk can be reduced through management measures.
6	Sustainable Development BMPs	Establish regulatory policies that recommend/require the use of "*CNMI Sustainable Development Manual: Best Management Practices*" for commercial/public/multifamily developments.
7	Ecosystem Services	Maintain sufficient key natural resource areas (e.g., coral reefs, wetlands, mangroves, riparian zones, and vegetated slopes) that support and enhance ecosystem services, to protect infrastructure investments and developed areas.
8	Green Infrastructure	Encourage green infrastructure, soft stabilization measures and living shoreline alternatives at development sites, island open spaces and infrastructure deployment.
9	Development Decision Process	Ensure that development decision processes are predictable, fair, and transparent.
10	Early Collaboration	Encourage early-stage government agency collaboration and stakeholder engagement in development planning and decision making.
11	Knowledgeable SSG Communities	Promote a community of leaders and networks knowledgeable in the principles of smart, safe growth.
12	Adaptive Management	Integrate adaptive management approaches to smart, safe growth development and incorporate lessons learned into future planning and development efforts. Periodic assessments and updates to be scheduled and funded.

3.0 ADAPTATIONS TO NATURAL HAZARDS IN THE CNMI

Natural hazards will continue to impact the CNMI. Extreme weather, especially tropical cyclones like *Super Typhoon Soudelor* (2015) and *Super Typhoon Yutu* (2018), have caused disruptions to businesses and communities and cost millions of dollars for recovery efforts (Figure 3.1). As climate change alters the patterns of severe weather, the processes for planning, design and construction must adjust accordingly or costs to repair poorly-sited or constructed development will continue to escalate.

Figure 3.1 Storm-damage to the power distribution system from *Super Typhoon Soudelor* (left) and wreckage from *Super Typhoon Yutu* (right).

To address the vulnerability of CNMI's communities, it is essential to work toward SSG. The aim of adaptation is to avoid or withstand impacts from current and future climate-enhanced weather events. Altering policies and planning processes to address changing natural hazards can help safeguard CNMI communities and public investments. The approach to SSG and adaptation is an iterative process. This is best accomplished under a long-term plan that identifies the strategic vision of the CNMI Administration and overarching direction, goals, and objectives for SSG. Equally important is to establish policy that identifies specific climate change scenarios that establish the range of likely future climate conditions on which to base long-term planning, and to recommend regulation and code updates.

Strong leadership and political will is required to implement adaptation actions. Therefore, public and leadership awareness of climate issues and the potential impacts from associated extreme weather events in the CNMI is critical to the success of SSG. This section begins with a brief discussion about the status of climate science at the global and the Western North Pacific (WNP) regional scales. Approaches and challenges to adaptation are discussed and the section ends with an emphasis on the need to act now despite uncertainty about future climate conditions.

3.1 Status of Climate Science

Climate change is occurring and is scientifically supported by multiple lines of evidence (Intergovernmental Panel on Climate Change (IPCC), 2013). Physical indicators of climate change include: surface temperature, sea level, ocean acidification, ice, precipitation and severe weather events. Not all physical indicators of climate change are important to the CNMI at this time. Extreme weather events are the principal concern; these are increasing and the long-term trend in global natural catastrophes is rising (Hoeppe, 2016). Severe weather events pose significant risk to expanding development and urbanization. The costs of storm-related losses continue to escalate because vulnerable, and often high-value, development regularly incurs increased damage. The following climate discussion is distilled from IPCC (2013), the Fourth National Climate Assessment (NCA4) of the US Global Change Research Program (2017), Green and Skeele (2014), Keener et al. (2012) and (Keener et al., 2013). For more in depth climate change information, consult the IPCC website (click here), the NCA4 website (click here) as well as the other listed references.

Scientists use many models to evaluate how different climate variables (temperature, moisture, atmospheric gases) and processes react to different stressors. They use these models to make projections about future climate conditions. Despite recent advances in climate science there is still a plausible range of future climate projections (i.e., the uncertainty range). Uncertainty in climate projections arises from the climate models due to imperfect representation of the Earth's complex climate processes. Uncertainty also arises from natural climate variability and uncertainty about how the climate will change due to future greenhouse gas emissions. Moreover, natural variability is an important factor shaping climate at regional and sub-regional scales; climate change can interact with natural climate variability to strengthen or weaken extreme weather events resulting in unprecedented events (Greene & Skeele, 2014).

Because the status of climate science includes a range of possible future states, plausible scenarios for variables of interest (e.g., sea level rise or precipitation) need to be selected to guide SSG planning and adaptation efforts. Down-scaled climate models are available for the Western North Pacific (WNP) region, which includes Guam, CNMI, Republic of Palau, Federated States of Micronesia, and the Republic of the Marshall Islands. However, down-scaled climate models are not available for most climate variables for the CNMI due to the extreme difficulty of modeling complex natural systems at such small geographic scales (Greene & Skeele, 2014).

A brief discussion on global climate trends for key climate indicators is presented below followed by regional climate trends for key climate change hazards for the WNP and CNMI. Global trends are important because they influence regional patterns.

The Changing Global Climate

Scientists use Global Climate Models to simulate climate processes and to project future conditions. The models are run using a range of values for greenhouse emissions coupled with a range of levels of population growth, socioeconomic conditions, and technical advances to produce a range of future climate scenarios. When selecting climate scenarios for planning purposes, it is important to understand the assumptions and the confidence level underlying the selected climate scenarios. The following global trends are based on findings from the IPCC

emission scenarios A1 and B2. For more information visit the IPCC (n.d.) Emissions Scenarios website (click here).

Global Mean Surface Temperature

Ample evidence from multiple lines indicate that the globe has warmed over the past century with the three most recent decades being each successively warmer (IPCC 2013). The Fourth National Climate Assessment (NCA) reports that there has been a rapid increase in the average temperature of the United States over the past several decades. While data is not well developed for the Pacific Islands region, NCA models predict that by mid-century temperatures may increase on average between 3.8˚ F under Rrepresentative Concentration Pathways (RCP)4.5 to 4.8˚ F under RCP8.5. These ranges reflect uncertainty in the course of human action in addressing greenhouse gas emissions, not in the models themselves, which reflect 95% confidence in these warming trends. Regional variation will likely influence the rate of change in temperature for any specific location.

Global Extreme Weather and Precipitation Changes

More extreme weather is anticipated. As mean surface temperature increases, more extreme high temperatures and less extreme cold temperatures are expected. Periods of warm temperatures and/or heat waves will likely increase in frequency, duration, and/or intensity. Over many land areas, extreme precipitation events are expected to increase as well as the frequency, duration, and intensity of droughts. Changes in precipitation are one of the most important potential outcomes of a warming world because precipitation is integral to the very nature of society and ecosystems. These systems have developed and adapted to the past envelope of precipitation variations. Any large changes beyond the historical envelope may have profound societal and ecological impacts. Studies project that the observed increase in heavy precipitation events will continue in the future. Intensity and frequency of tropical cyclones is likely to increase in some regions.

Global Sea Level Rise

Increased global temperatures contributes to sea level rise (SLR) by increasing the volume of the ocean via heating and expanding ocean waters and heating and melting glaciers and ice sheets. Sea level is also influenced by variation in natural cycles, such as the Pacific Decadal Oscillation. Changes in sea level pose a significant risk to coastal development and natural resources including ground water, particularly for island environments. High sea levels combined with natural variation and other effects of climate change (e.g., extreme precipitation events or increased storm intensity) will likely result in new patterns of marine inundation and coastal flooding.

The global mean sea level (GMSL) gradually increased over the past century. Natural phenomenon, such as cycles in trade wind intensity, can exert great influence on regional sea level rise (SLR) and should be kept in mind when discussing regional trends. Based on the most recent GMSL projections by the IPCC, GMSL is expected to rise between 0.24 – 0.3 meters by 2065, and 0.40 – 0.63 meters by 2100. SLR scenarios for the CNMI are discussed in Section 4.2.

Global Wave Environments

Recent scientific evidence suggests that wave environments are changing and possibly intensifying due to climate change. Change in storm or wind patterns or intensity can affect wave environments potentially increasing frequency, duration, and intensity of wave action. Greater volumes of water and increased wave energy can increase erosion and inundation potential.

The Changing Climate of the Western North Pacific (WNP) and the CNMI

Regional climate projections for some climate variables are available for the WNP, but not specifically for the CNMI. Climate is changing in the WNP as indicated by rising atmospheric carbon dioxide levels, increases in air and sea temperatures, rising sea levels, and changes in precipitation patterns. Increasing temperature is the primary energy driver for climate change effects. In the WNP, surface air temperatures are increasing and are projected to increase another 2.7˚ to 5.1˚ F by 2090. Table 3.1 is adopted from the Climate Vulnerability Assessment for the Island of Saipan (Greene & Skeele, 2014) and summarizes expected impacts to the WNP climate. A brief discussion of significant climate variables relevant to the CNMI and SSG follows.

Table 3.1 Climate change variables relevant to the CNMI.

Climate Variable	Projection	Potential Impacts
Temperature	Steady increase, with seasonal extreme highs	Increase of extreme temperatures leading to stress on habitat and public health. Increase of potential storm energy in atmosphere and ocean.
Sea Level	Gradual increase, with interannual and decadal fluctuations.	Possible inundation of low-lying areas over extended periods of time, with increased flooding impact of short-term events such as storms. Damage to infrastructure, property, tourism.
Ocean Waves	Intensification in extratropical wave environments, and potential increase in overall storminess.	Exacerbated impacts from storm surge and sea level change. Short-term flooding and erosion. Potential hazard to public.
Precipitation	Small increase in average rainfall. Increase in extreme rainfall events. Wet season gets wetter; dry season gets drier.	Impact on overall freshwater supply uncertain. Potential for short-term flooding increased in rainy season.

Adopted from the Climate Vulnerability Assessment for the Island of Saipan (Greene & Skeele, 2014)

Regional Sea-Level Rise, Sea-level Change and Increased Wave Run-up

Between 1993-2003, the WNP experienced very high rates of SLR compared to the average GMSL rise. This regional trend was strongly influenced by natural climate variation, particularly strong trade wind fluctuations. The sea level in the WNP is expected to subside as trade wind patterns naturally weaken; however, these seasonal extremes in sea height, referred to as sea-level change (SLC), act synergistically with climate change-induced SLR to produce a greater risk of coastal inundation and flooding. As GMSL continues to rise, CNMI will likely experience higher than expected sea levels due to compounding effects of SLR and SLC. For example, in August

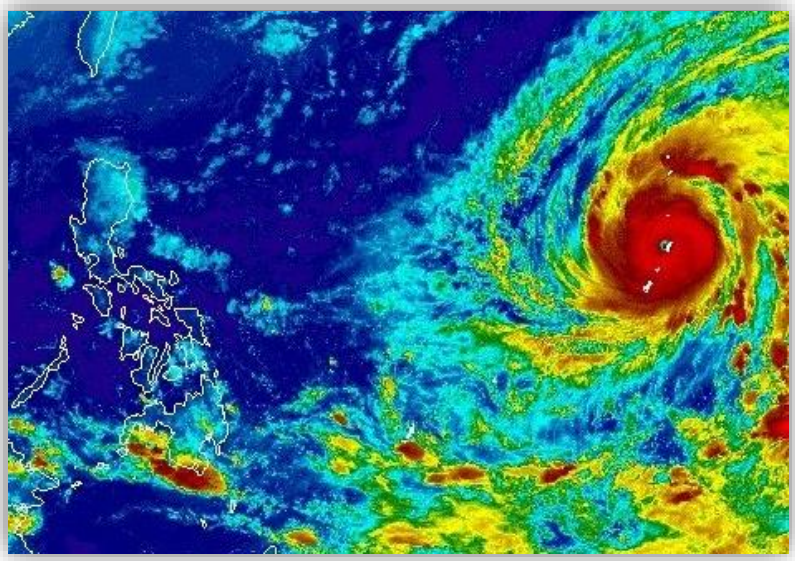
2018, higher than normal rainfall from *Typhoon Cimaron* coincided with a high tide causing wide-spread flooding on Guam and Saipan. Understanding the interactions of these factors is critical for evaluating risks and mitigating for future flood hazards, especially on the low-lying western plain of Saipan.

Waves caused by distant storms can increase sea-level and wave run-up, negatively affecting CNMI shorelines. Wave run-up is the most prevalent non-tidal change in sea level and poses a significant risk for coastal inundation. CNMI is particularly at risk for sea level changes due to wave run-up because of the frequent and intense tropical storms and cyclones in the region.

The *Climate Vulnerability Assessment for the Island of Saipan, CNMI* (Greene & Skeele, 2014) provides a technical assessment of several scenarios to explore how SLR and storms interact to influence coastal inundation. For SSG and adaptation planning, a scenario must be selected to guide mitigation strategies. Emergent best planning practices support consideration of a range of scenarios to support specific planning outcomes. For example, the City of Charleston has elected to work with two scenario ranges – one for risk adverse infrastructure and development projects and another for more risk tolerant types of land use such as open spaces. In New York City, 100- and 500-year flood scenarios are considered in the context of "low", "medium", and "high" projections. New York City has adopted Policy 6.2 to "integrate consideration of the latest New York City projections of climate change and sea level rise (as published by the New York City Panel on Climate Change, or any successor thereof) into the planning and design of projects in the city's Coastal Zone". Their implementation guidance suggests that planners consider the range of the sea level rise projections appropriate to the project's timeline and expected useful life, as well as risk tolerance of a specific project. Scenario selection is critical to identify vulnerable areas to guide proactive land use plans and policies that prevent development in high-hazard areas, which are effective, low-cost mitigation strategies.

Regional Increased Tropical Cyclone Intensity

The WNP basin generates the greatest number of tropical cyclones globally with an annual average of 26 named storms between 1951 and 2010 (Keener et al., 2012). Tropical cyclones in the WNP are stronger during El Nino Southern Oscillation (ENSO) events due to elevated ocean temperatures (Wei et al., 2016). Recent models of tropical cyclones in the WNP between 1984 and 2010 suggest that the frequency of storms is declining, but the intensity of storms is increasing (Kang & Elsner, 2012).



Super Typhoon Yutu, October 2018. Source: NESDIS Satellite Services Division, NOAA.

Increased storm intensity is typically coupled with increased wind and wave energy and precipitation, which increases the risk of coastal inundation and flooding. High levels of rainfall may overrun stormwater management systems and transport sediment to nearshore waters. Higher levels of runoff may reduce water infiltration to ground water aquifers. Increased wave action and storm surge may change patterns or extent of marine inundation and swamp sewers and other stormwater infrastructure. Strong winds may contribute to high seas and push waves over protective reefs, potentially causing significant damage to development and infrastructure and posing a substantial risk to human safety.

Regional Changes in Precipitation Patterns

The effect of climate change on precipitation patterns in CNMI is difficult to distinguish from changes influenced by natural climate variation. Variation in rainfall between years is strongly linked to ENSO and CNMI typically experiences very dry conditions following ENSO. Without a better understanding about how climate change affects ENSO, an accurate projection for changes to CNMI precipitation is not available. However, overall rainfall patterns in the WNP suggest that wet seasons will be wetter and dry seasons will be drier. Longer dry periods pose a greater risk of drought and stress on ground water resources for agriculture and drinking.

3.2 Approaches to Adaptation

Extreme weather events associated with climate change will continue to impact CNMI communities. CNMI is particularly vulnerable to tropical cyclones, which have immense destructive potential. In the US, during the period 1980-2011, tropical cyclones caused an estimate $418 billion in damages (Smith & Katz, 2013). Tropical cyclones represented only 23% of the extreme weather events during this period, but they accounted for 47% of all damage (Smith & Katz, 2013). Although the frequency of tropical cyclones is projected to decrease in the WNP, the projected increase in storm intensity poses significant risks to island community food and water supplies, livelihoods, and health (Keener et al., 2012).

The CNMI Government will be required to fund emergency responses and recovery efforts, rebuild damaged infrastructure, withstand a period of diminished economic activity, and assist private citizens affected by disasters. Integrating SSG Principles into policy and planning instruments will assist the CNMI incrementally implement adaptations to prepare for these weather-related impacts.

Through adaptation, communities can aim to avoid, resist, or exploit current and projected climate conditions by decreasing vulnerabilities and increasing resilience. Identification and characterization of existing and anticipated hazards is an essential first step to work toward SSG and to implement adaptations. The CNMI *Standard State Mitigation Plan* (2014) and the Climate Vulnerability Assessments for the Islands of Saipan (2014), Rota and Tinian (2015) provide essential information about natural hazards specific to CNMI.

Integrating SSG Principles into planning and development processes can guide and enhance strategies to reduce the impacts of climate change. Adaptation is best achieved incrementally through long-term comprehensive planning efforts such as the current *CNMI Comprehensive Sustainable Development Plan*. Proactive planning allows the greatest flexibility to apply multiple

strategies to work toward SSG and adapt over time. This practice will maintain community-level adaptive capacity to respond to changing hazards.

There are many strategies to integrate adaptation with SSG. For this *Guidance Manual*, four adaptation strategies were selected from the community of practice literature and aligned with supporting SSG Principles: (i) respond, (ii) manage development and redevelopment, (iii) promote protective features, and (iv) improve structural resistance. These strategies were selected because they are the most practical and intuitive and applicable in the CNMI context. Response will always be a part of a natural disaster no matter the circumstances of the natural or built environment. To reduce the level of effort for response is a primary goal of SSG. The management of new development and redevelopment to limit the built environment in risk-prone locations is intuitively practical and efficient; risk avoidance is the best way to reduce the burden of disaster response. Greater structural resilience for the built environment is intuitive for structures and infrastructure that must remain in locations of risk. What is built stronger lasts longer. And finally, Natural protective features such as reefs, lagoons, beaches and vegetated strands are economical because they exist naturally, and thus present a no-cost and "no-regrets" practical solution.

Respond

Extreme weather will always be an aspect of life in the CNMI. This adaptation strategy entails reducing risk to life and property by evacuating or sheltering people and property during extreme weather events. This strategy is important to reduce impacts from localized and short-term extreme hazards such as typhoons, but has limitations to respond to and protect against weather-related events like drought. In alignment with SSG Principles, critical facilities for evacuation and sheltering as well as providing emergency support services should be located in less vulnerable areas to maximize public safety.

Manage Development and Redevelopment

Formulating and promoting policies to govern development and redevelopment in alignment with SSG Principles is the most efficient and least costly adaptation strategy to work toward SSG. CNMI policy makers and planners can implement SSG through regular policy updates to land use plans, zoning, building codes, regulations, and funding capital improvement projects in areas that will be less vulnerable under future climate conditions. Enforcement of existing regulations and adopted international building code standards is also essential to ensuring progress is made towards implementing SSG Principles as projects are executed.

Improve Structural Resistance

Development, including critical facilities, already exists in vulnerable locations in CNMI. Improving the structural resistance will increase the resiliency of development that will not be moved from vulnerable areas. Structural resistance can be achieved through a wide range of engineered applications. Elevated construction on columns, concrete construction rather than timber framing, buttressed retaining walls, and wind-rated windows and framing are just a few of the many engineered solutions for improved structural integrity. This strategy aligns with SSG Principles by reducing the vulnerability of vital infrastructure and key properties and lowering the potential for weather-related damage during severe weather events.

Figure 3.2 Inos Peace Park is an excellent example of an engineered solution to improve structural resistance for the former Puerto Rico Landfill, which is located in the vulnerable coastal zone.

Promote Natural Protective Features

Many natural features provide protective functions for the built environment. For example, in CNMI the coral reef helps protect shorelines from erosive wave-action. Sloping beaches with native vegetation and fringing reefs also dissipate wave energy. This strategy aligns well with SSG Principles, and is best achieved through land use planning to preserve open space and natural features. Regulatory efforts to control development in a manner to preserve natural protective features is another approach, but in most cases would likely take greater effort. Also, protecting natural resources and utilizing green infrastructure are often more effective than structural solutions and typically cost less to build and maintain.

Figure 3.3 Saipan's fringing coral reefs provide many natural protective functions as well as social and economic benefits. Source: BECQ Public Permitting App, 2018.

Table 3.2 summarizes strategies and alignment with the 12 SSG Principles. To best utilize this *Guidance Manual*, the reader should understand that the remainder of the document is presented in the context of the four strategies, with focus given to functional aspects of how to promote strategies effectiveness in the short- and long-term.

Table 3.2 Alignment between Adaptation Strategies and SSG Principles.

Adaptation Strategy	SSG Principles	Benefits
Respond (evacuate or shelter)	P*4*	Critical facilities, such as shelters and hospitals, in safe locations maximizes public safety and community recovery.
Manage development and redevelopment	P*1*, P*2*, P*4*, P*5*, P*6*, P*8*, P*9*, P*10*, P*11*, P*12*	Managed development and redevelopment decisions can reduce community vulnerability to natural hazards and lower the impacts of climate change.
Improve structural resistance	P*1*, P*3*, P*6*, P*9*, P*11*, P*12*	Increases resiliency of existing structures and reduces damage and recovery costs.
Promote natural protective features	P*1*, P*5*, P*7*, P*8,* P*12*	Key natural resources and protective features buffer and protect the built environment from weather impacts (e.g., barrier reef reduces wave energy and helps buffer the impacts of wave run-up).

SSG Principles: P*1*- Climate Change; P*2* – Retreat; P*3* – Retrofit; P*4* – Critical Facilities Location; P*5* – Development Initiatives; P*6* – Sustainable Development BMPs; P*7* – Ecosystem Services; P*8* – Green Infrastructure; P*9* – Development Decision Process; P*10* – Early Collaboration; P*11* – SSG Knowledgeable Communities; P*12* – Adaptive Management

3.3 Challenges to Adaptation

Improving public safety and increasing community resilience to the impacts of natural hazards are issues that concern everyone. However, building political will and community support to implement adaptation measures can be challenging due to many factors. Many local governments and communities encounter common barriers to implementing adaptation as they work towards SSG. Awareness of barriers to adaptation, common to many communities and specific to CNMI, can help leaders and decision-makers address barriers as they are encountered and adjust strategies for planning and developing smarter, safer communities in the CNMI.

Barriers due to Climate Change Acceptance

Adaptation planning is often hindered by differing opinions regarding climate change. Climate science is complex, and reports are often not written for those without a science background. Not having access to high-quality, reliable, and easy-to-understand climate science information for local areas, puts government decision-makers at a disadvantage. Lack of information and the natural uncertainty in climate science can lead to the politicizing of climate issues. Although 97% of climate scientists have concluded that human-caused global warming is happening some politicians and community leaders continue to doubt the science. The climate debate centers

around causes, and the validity of climate projections, and the promotion of forestalling actions that communities need to take immediately to safeguard communities and public investments from potential impacts of future climate conditions. When climate issues are politicized, they become divisive and can make supporting climate initiatives politically risky, eroding much needed support for SSG from government officials. Without strong and informed political leadership, government agencies lack directives to invest the required resources into long-term, incremental changes to ensure resilience of the built environment under a range of possible climate scenarios.

On the other end of the political spectrum, if community stakeholders do not have reliable access to clear information about climate change, support for SSG and support for elected officials who propose adaptation strategies may be lacking. Working towards SSG is a collaborative process that requires leadership-community stakeholder engagement. Building a knowledgeable community with the capacity to understand and recognize the potential impacts to community resources from a changing climate, is vital for realizing SSG. Additionally, the trend in climate communications guidance suggests that focusing on impacts themselves instead of causes of climate vulnerability can provide a constructive political middle-ground that can enable long-term impact responsive planning in the face of a changing climate.

Barriers to Adaptation Implementation

Local governments face a variety of barriers to implementing SSG and adaptation projects. Because of the challenges with acceptance, local governments may lack consistent policies and regulations for addressing climate change. Decision-makers are often hesitant to act due to the uncertainty of climate change projections. Without a standardized climate change policy and strategic framework, agency planners and regulatory decision-makers lack the tools necessary to adjust planning, design, and construction processes and methods to account for changes in future climate conditions. Without official climate change standards for key variables, such as SLR, designing and selecting adaptation actions and prioritizing projects will remain challenging.

Another barrier to implementation stems from the uncertainty about whether selected adaptations will actually reduce vulnerabilities in the long-term. Future climate uncertainty is not like other routine civil planning uncertainties, such as planning for the rate of population growth. Population growth, economic expansion, inflation, recurrence of familiar weather phenomena are all deeply culturalized concepts in modern populations. Climate science and climate change, are not. For the CNMI, the Climate Change Vulnerability Assessments for the Islands of Saipan (2014) and Tinian and Rota (2015) provide regional climate scenarios to produce guidance for planning and development. At the same time these documents suffer from the stigma of *avant-garde*; new or experimental or unusual concepts or ideas that are typically not embraced by the mainstream.

Other implementation barriers stem from existing regulations and policies that may not support, and that sometimes hinder, the integration of SSG into planning and development initiatives. Overcoming these types of barriers requires policy-makers and legislators to identify needed changes. Equally important is engaging with government and public stakeholders to educate them on why regulations and policies require changes, to gather their input, and generate their support for solutions. Stakeholder engagement and transparent government processes early in planning phases can also garner community support for SSG projects and improve the chances

of successful implementation. For the CNMI, this *Guidance Manual* provides a comprehensive review of existing regulations and provides recommendations for improving the integration of SSG in future regulatory updates (Appendix B).

Existing planning and budget processes may also impede adaptation implementation. Planning processes tend to focus on short-term requirements rather than long-term threats. Funding to follow SSG Principles may not be readily available and decision-makers may lack support tools that help present cost-loss information to justify SSG in Territorial budget requests. Opportunities to fund SSG implementation may not be readily available or well-known. This *Guidance Manual* provides a range of tools in Section 7.4 to assist CNMI government personnel to identify funding opportunities.

Barriers to Adaptation Planning in the CNMI

In 2012, the CNMI Climate Change Working Group (CCWG) began an adaptation planning effort. The CCWG made significant progress in producing the Climate Change Vulnerability Assessments for the Islands of Saipan (2014) and Tinian and Rota (2015). However, progress in adaptation planning stalled due to several challenges. According to Okano, Skeele, and Greene (2015), the initial adaptation planning process was hampered by a lack of consistent, substantive support from the government which likely influenced a decline in CCWG participation by key agency officials on the planning team. Additionally, the authors noted that the effectiveness of the planning team was reduced due to a collective lack of experience with, and understanding of, climate change, especially local impacts to the CNMI. Moreover, additional climate efforts amounted to "unfunded mandates" for already over-burdened agencies. Lastly, high quality climate data and information and tools were often not available at an appropriate scale for use in the CNMI. The relationship between these factors was categorized into themes and the relationships are presented in Figure 3.4. These barriers should be considered and addressed to support further re-initiating and mainstreaming adaptation planning.

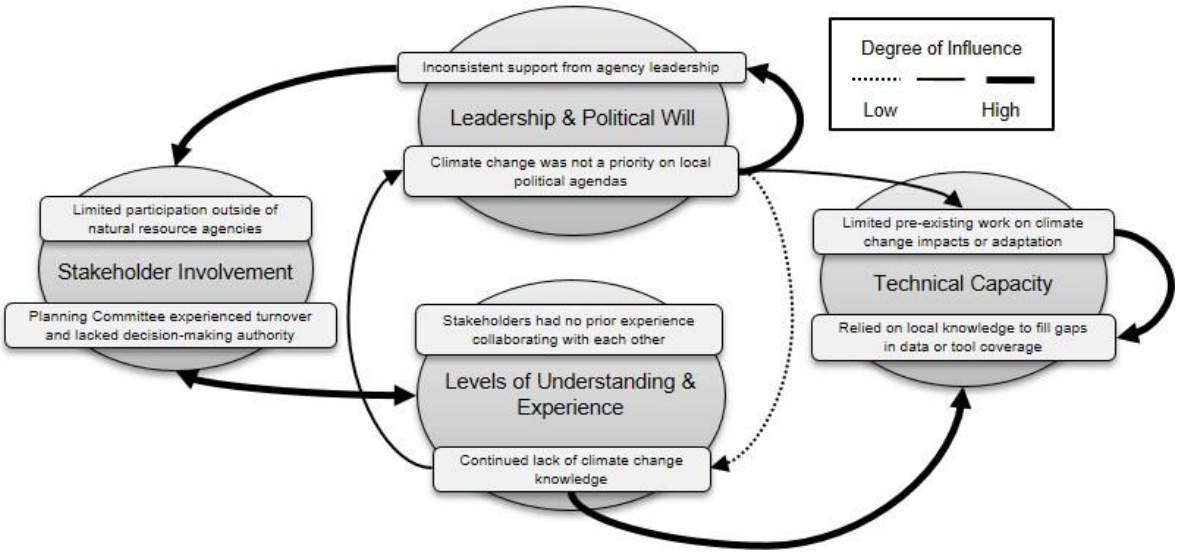


Figure 3.4 The relationships between adaptation themes in CNMI. Figure adopted from Okano et al. 2015.

In 2017, the CCWG re-emerged as the CNMI Resilience Working Group (RWG) as established by Governor's Directive. A discussion about the revitalization of adaptation planning via the RWG is presented in Section 4.4. Although some progress has been made to overcome some of the barriers to adaptation planning identified by Okano, Skeele, and Greene (2015), working group participants should be aware of the challenges and seek solutions to overcome them.

3.4 Uncertainty

Lack of understanding is the bane of climate change science and the greatest single factor that hinders cultural acceptance of projected climate change scenarios. CNMI Government agencies will face uncertainty when planning for SSG and climate change. Projected climate models for CNMI involve a range of potential impacts including varying scales and severity of impacts. The timing and duration of impacts is an added layer of uncertainty. Notwithstanding uncertainty, action is required.

CNMI should consider uncertainty as part of a risk management approach when addressing vulnerabilities to climate change. A flexible framework is needed to successfully implement SSG and climate change adaptation over the long-term in a way that is responsive to new information and lessons learned. One strategy to help CNMI to act decisively under uncertainty is to implement "no-regrets" or "win-win" adaptation measures. These are actions that will bring immediate benefit to CNMI and that will likely lower future climate-related vulnerabilities and contribute to SSG. Identifying beneficial, "no-regrets" strategies can help prioritize adaptation actions and provide a way forward in the face of uncertainty. CNMI should begin adaptation planning and implementation now, and address uncertainty by capitalizing on "no-regrets" opportunities that will have benefits beyond climate change considerations.

In the fiscally-constrained environment of the CNMI, balancing the implementation of climate change adaptation measures with more immediate, short-term needs of the islands will be important and challenging. The pursuit of these "no-regrets" actions, especially when they are mutually beneficial to multiple programs, can help with "mainstreaming" climate change adaptations into planned facilities upgrades and minimize debate and inaction over the vague threat of climate change.

Making decisions under uncertainty requires accepting the risk of possible errors. An adaptive management approach is suitable for working in complex natural systems with high-levels of uncertainty with multiple options to achieve management objectives. Setting clear and measurable performance objectives, monitoring results, and incorporating learning into future management decisions are the hallmarks of adaptive management.

Because climate change adaptation is inherently uncertain, flexible strategies that allow for adaptive management and the inclusion of up-to-date climate information will help ensure long-term reliability of the majority of adaptation actions. This flexibility allows decision makers the opportunity to adapt and modify strategies as new information becomes available. Adaptive management affords opportunity to adjust if actions fail and to seek new options based on new information and past experience.

4.0 RECOMMENDATIONS FOR GOVERNMENT ACTION

The progression of SSG will require strong leadership and commitment from the CNMI Government. Government action via legislation and regulations that incorporate SSG Principles will provide support and legitimacy and help ensure consistency among CNMI planning efforts, and cohesion in approach among agencies.

Core government actions to promote Smart, Safe Growth include:

1) Adoption of a climate change policy that identifies plausible scenarios for projected climate change conditions as the basis for planning initiatives, and Office of the Governor mandate that requires centralized approval for all CNMI agency planning initiatives and establishes policies to encourage cross-agency planning that minimizes isolated efforts (i.e., stove pipes).
2) Revise regulations, permitting processes and land use planning for alignment with SSG Principles, regulatory authorities, and ensure project sequencing is coordinated with service providers (e.g., CUC, DPW, CHCC). It is especially important that utilities and services can meet demands of new developments;
3) Adopt long-range planning and funding horizons for utilities and services based on growth;
4) Revitalize and empower the CNMI Resilience Working Group; and
5) Fund and implement SSG through prioritization and alignment with federal funding opportunities and engagement with community stakeholders.

4.1 Top-Down Driver for Planning Context; Official Climate Change Scenario

Comprehensive, long-range planning must consider likely environmental conditions to adequately adapt design and construction to reduce vulnerability to a changing future of natural hazards. Strong government leadership is needed to support and legitimize long-range plans to adapt to long-range climate change. Government leadership must establish a range of specific climate scenarios for key variables that are projected to have a local impact (e.g., SLR, changes in precipitation, increased storm intensity). Providing top-level government support will equip government decision-makers and planners with a framework in which tools necessary for mitigating and adapting to anticipated changes in climate impacts can be used. Establishing official climate change scenarios will promote consistency across CNMI planning efforts and provide a basis for amending regulations and land use plans. For more information on climate change scenarios visit the IPCC (n.d.) Emissions Scenarios website (click here) or NCA4 website (click here) or refer to (Keener et al., 2013).

Government Agency Incorporation of Sea-Level Rise for Infrastructure Expansion and Development Projects

Changing sea level is a serious threat to coastal development and infrastructure in CNMI. The combined effects of SLR and SLC will increase coastal flooding and marine inundation hazards, especially in western Saipan. Sea level changes will also increase the loss of coastal ecosystems

and beaches, which will have negative consequences for the CNMI tourism industry and economy.

Adopting government endorsed standards for coastal flooding based on SLR and SLC is strongly recommended. A government-supported standard is a critical foundation for legislative and regulatory action to reduce future vulnerabilities to coastal flooding by directing development away from future inundation zones. Planning for future sea level heights can happen incrementally and progressively over the long-term, but immediate action is recommended to establish the planning and regulatory framework to allow CNMI the time needed to adapt to higher seas.

In 2017, the Saipan SLR & Coastal Flooding maps were updated to show potential scenarios for future sea level heights (R. Greene, personal communication, August 2017). To generate the coastal flooding scenarios, both climate change-driven SLR and seasonal extreme SLC were analyzed using local and regional data. SLC was modeled using sea level data for 20-year and 100-year return intervals (i.e., an extreme value predicted to return every 20 or 100 years). SLR was estimated from National Oceanic and Atmospheric Administration (NOAA) data curves, which were refined using Guam tidal data in the US Army Corp of Engineers Curve Calculator tool. A "high" SLR curve was selected for modeling CNMI coastal flooding scenarios because of increased large-scale investment and development near the coast, especially in western Saipan. Once built, there is little flexibility or adaptative capacity to reduce vulnerabilities to development from future coastal flooding. See Greene (2017) for a detailed explanation of the data sources and analyses used to estimate SLR and SLC for the coastal flooding maps.

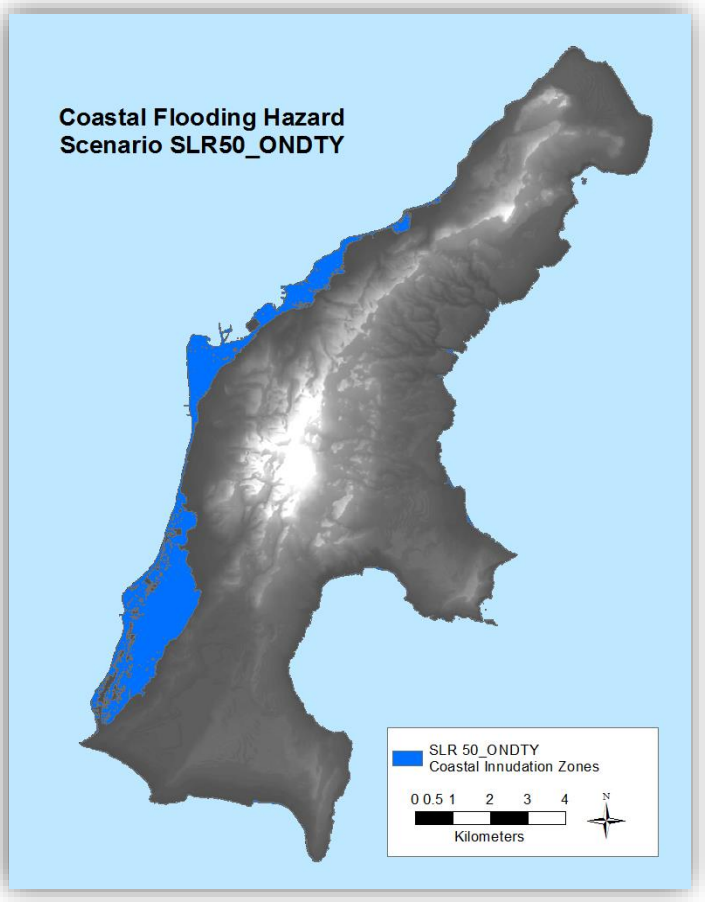


Figure 4.1 Projected coastal flooding hazard zones based on the selected SLR and SLC scenario SLR50_ONDTY.

An *ad hoc* sea level planning committee was convened by the Office of Planning and Development and facilitated by NOAA to select and agree on a recommended flood hazard scenario for new infrastructure and development. The committee recommended a scenario with a standard of cumulative sea-level change of 3.16 meters above the current level by the year 2067, which is based on both SLC and SLR. Estimates for SLC are based on seasonal extremes for CNMI between October and December (OND) for a 100-year return interval coupled with

higher seas due to tropical cyclone activity. SLR is estimated for 50 years of incremental increase. Based on current planning and land lease practices in CNMI, and risk aversion for new development investments, a 50-year planning envelope was used for this scenario.

Table 4.1 The CNMI proposed coastal flooding hazard.

Scenario	Seasonal Extreme (m)	Seasonal Extreme Description*	Sea Level Rise (m)	Sea Level Rise Description**	Cumulative Sea Level Change (m)
50 years SLR + OND Seasonal Typhoon Year (Typhoon Year)	1.85	Historically derived (1978-2003) maximum sea level for 100-year recurrence at Saipan Harbor, during the months of October - December including data from years with typhoon passage.	1.31	Sea level rise projection for 2067 based on NOAA 2017 "High" curve and US Army Corps sea level curve calculator for Apra Harbor tide gauge (local vertical land movement)	3.16

Adapted from R. Greene, personal communication, August 2017.
*See Chowdhury, Md. R., Chu, P., Zhao, X., Schroeder, T.A., and Marra, J.J. (2010). Sea level extremes in the U.S.-Affiliated Pacific Islands—a coastal hazard scenario to aid in decision analyses. Journal of Coastal Conservation. 14:1, pp 53-62.
**See http://corpsclimate.us/ccaceslcurves.cfm (Revised 2017) and U.S. Army Corps of Engineers (2011). Sea Level Change Considerations for Civil Works Programs. US Army Corps Circular 1065-2-212. http://corpsclimate.us/docs/EC_1165-2-212%20-Final_10_Nov_2011.pdf

Following the formal adoption of a coastal flooding scenario with standards for SLR and SLC, all CNMI agencies should incorporate the coastal flooding hazards into plans and regulations updates. Coastal flooding hazard maps are developed, updated, and maintained by the Bureau of Environmental and Coastal Quality and are available on line at: DCRM Maps.

Mandate for the Office of Planning and Development

CNMI Public Law 20-20 established the Office of Planning and Development (OPD) in 2017 to improve the planning process and improve effectiveness and coordination among CNMI agencies and Federal partners. This law also re-organized the Capital Improvement Program (CIP) Office under the OPD, which is now designated as the territorial agency for capital improvement planning purposes. The OPD is intended to be the clearinghouse for all information related to development, planning, and resource use in CNMI. By reviewing and appraising all CNMI plans, OPD can serve a coordinating function to ensure resources, such as power and water, are committed responsibly and that infrastructure can keep pace with development pressures.

An essential function of OPD is coordinating government-wide planning programs and projects to ensure coordinated and consistent approach to gradually implement SSG development over the long-term. OPD is the coordinating function that provides a “whole government” approach to SSG and adaptation. Taking this approach will require OPD leadership that is not easily swayed by

political shifts and institutional turnover and will require high levels of coordination among agencies.

In addition, OPD should lead the effort to identify and apply for funds to implement SSG projects. Currently, agencies may lack the capacity and expertise to fully participate in and take advantage of the many federal programs with funding available to improve resilience or to prepare for climate change. By having a position dedicated to the exploration and alignment of funding opportunities, OPD can persistently seek funds for high-priority projects and control the direction and pace of SSG development.

4.2 Government Agency Revision of Regulations for Land Use Practices to Accommodate SSG

The CNMI government is well situated to implement SSG because they exercise authority over resources through land use planning, zoning, capital investment programs, building codes, permitting, and deployment of utilities and transportation infrastructure. Updating regulation and land use plans to feature SSG Principles are "no-regrets" strategies that should be taken immediately. Proactive land use planning is one of the most cost effective actions to reduce future vulnerabilities and to maintain future adaptive capacity. As discussed in more detail in Section 6.0, the CNMI regulations are already robust, but could be improved by integrating SSG Principles to guide planning and development. For a summary of relevant CNMI regulations and recommendations for updates, see Appendix B.

In addition to updating regulations, the CNMI should incorporate SSG Principles into land use planning to begin adapting to future climate conditions. Through land use planning, OPD can leverage their authority to encourage and ensure that agencies and private developers work towards SSG.

In addition to OPD, the Departments of Public Works (DPW) and Public Lands (DPL) and the Commonwealth Utilities Corporation (CUC) could realize short- and long-term benefits to critical resources from the integration and implementation of SSG Principles. DPW can improve resiliency and recovery of critical CNMI infrastructure as well as meet mandates to address resiliency for some federal funding opportunities. DPL can adjust regulations and land use planning for shorelines and coastal properties to help develop SSG Principles in the tourism and coastal recreation sectors. CUC can consider opportunities to build system resilience and reduce dependency on fossil fuels. This *Guidance Manual* provides tools in Section 7.0 to assist with implementing SSG.

In conjunction with regulations updates, permitting authorities should be empowered to influence planning. Permitting authorities require the ability and authority to ensure projects proposed by private developers do not over-tax public services, such as power, drinking water, and wastewater. Moreover, permitting authorities need the ability to sequence projects to ensure CNMI agencies can provide adequate oversight and inspections and enforcement.

4.3 Planning and Funding Horizons for Utilities and Services

Planning horizons are governed by the durability of the planned structure and are often coupled with the capacity to serve an intended population over a period of projected growth. For example, the materials to construct a bridge may be selected to last 30 years and the number of lanes (bridge width) will be based on the expected population growth in the area over the same period. However, with the progression of climate change, planners will need to look at longer and more uncertain planning horizons to account for and adjust to changing natural hazards. In 30 years, the climate conditions may be increased precipitation or stronger storm winds and a bridge built today should be designed to manage those anticipated conditions. To protect today's investments the designs of today must address the hazards of tomorrow.

However, long-term planning is often hampered by short-term political and budget cycles. To support more SSG integrated and resilience planning outcomes, decision frameworks need to encompass at least 30-year horizons.

The current planning envelope in CNMI for buildings, utilities, and services ranges between 30 and 50 years with some large-scale projects aiming for a 75-year lifecycle. Land is often leased for 55 years, which can also influence planning horizons. The land use planning horizon in CNMI should be coupled with forecasts for coastal flooding through 2067 (50-year horizon). Additionally, designs and construction techniques should consider future climate conditions, such as an increase in high-intensity tropical cyclones.

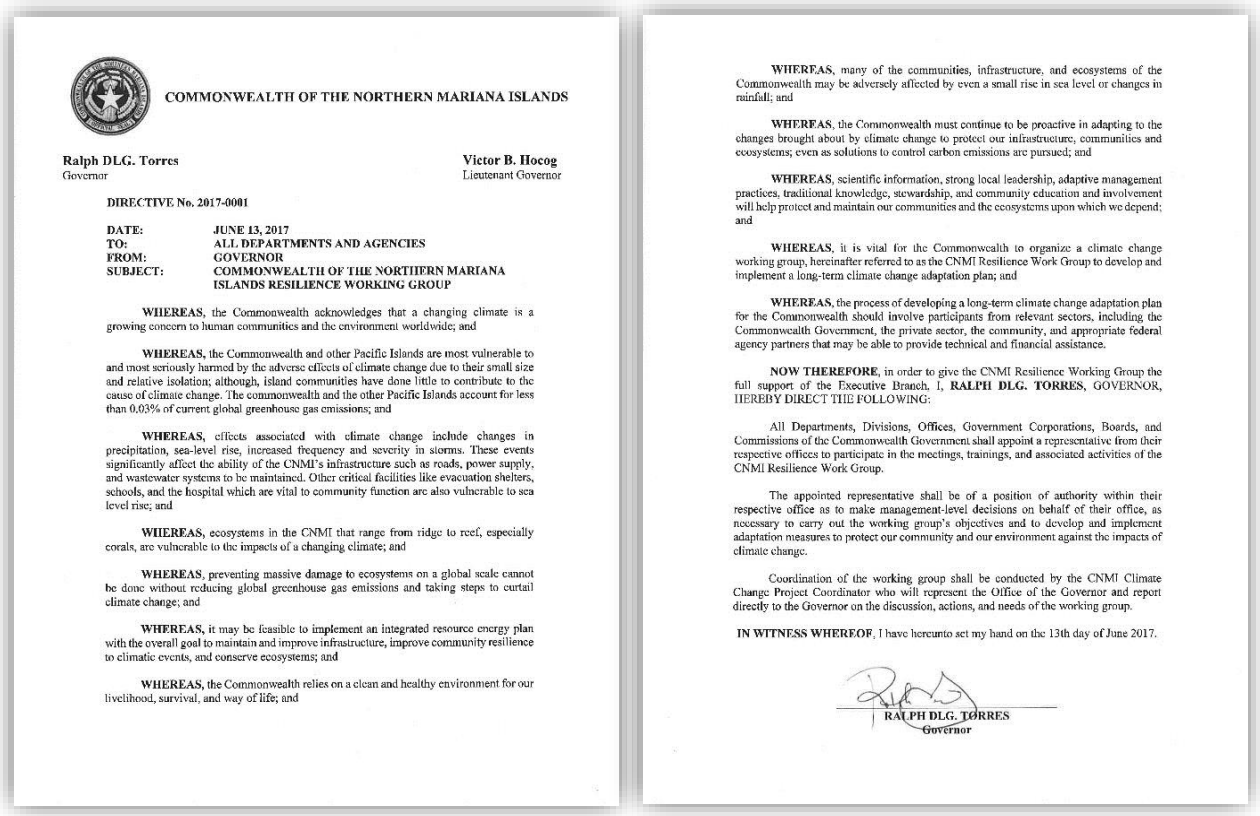
Figure 4.2 New CUC ferro-cement water storage tank will not rust.

4.4 Revitalization of the Resilience Working Group (formerly CCWG)

Since 2005, the CNMI Government has worked with other Pacific Island governments, via the Pacific Islands Framework for Action on Climate Change, to increase capacity to be resilient to the impacts of climate change.

In 2012, CNMI established the Climate Change Working Group (CCWG) to identify and assess vulnerabilities to climate change impacts. The working group was comprised of 33 participating CNMI and federal government agencies, business and tourism associations, and non-governmental organizations. The CCWG transitioned into the Resilience Working Group (RWG) and several workshops were held in 2016 and 2017 to increase agency coordination for climate-related issues. In 2017, the CNMI Climate Change Directive, issued by Governor Torres formally established the Resiliency Working Group and directed CNMI agencies to participate.

The RWG can provide essential entry points to integrate SSG into short- and long-term agency planning and construction efforts. Previously the Climate Change Project Coordinator position was funded by the Office of Insular Affairs; however, this funding expired in 2018 and was not extended. To support planning continuity, OPD is taking steps to establish a similar coordinator position to facilitate integration of SSG to address climate-related impacts in CNMI planning efforts. Agency leads that participate in the RWG can act as liaisons to present agency needs and to help integrate SSG into agency practice. Agency leads can also help identify critical gaps in knowledge such as inadequate hazard maps or tools to select, design, and build adequate adaptations. All agency leads participating in the RWG should receive adequate training in climate change science, be familiar with hazards identified in the CNMI *Standard State Mitigation Plan* (2014) and the Climate Vulnerability Assessments for the Islands of Saipan (2014) and Rota and Tinian (2015), and be familiar with SSG Principles, adaptation tools, and potential funding sources, to promote SSG. Because lack of funding and capacity were challenges identified in prior adaptation planning conversations, expanded support – financial and technical – from the Office of the Governor and the CNMI legislature as well as assessment of other potential sources of assistance, will further bolster the viability of the RWG efforts.



COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS

Ralph DLG. Torres
Governor

Victor B. Hocog
Lieutenant Governor

DIRECTIVE No. 2017-0001

DATE: JUNE 13, 2017
TO: ALL DEPARTMENTS AND AGENCIES
FROM: GOVERNOR
SUBJECT: COMMONWEALTH OF THE NORTHERN MARIANA ISLANDS RESILIENCE WORKING GROUP

WHEREAS, the Commonwealth acknowledges that a changing climate is a growing concern to human communities and the environment worldwide; and

WHEREAS, the Commonwealth and other Pacific Islands are most vulnerable to and most seriously harmed by the adverse effects of climate change due to their small size and relative isolation; although, island communities have done little to contribute to the cause of climate change. The commonwealth and the other Pacific Islands account for less than 0.03% of current global greenhouse gas emissions; and

WHEREAS, effects associated with climate change include changes in precipitation, sea-level rise, increased frequency and severity in storms. These events significantly affect the ability of the CNMI's infrastructure such as roads, power supply, and wastewater systems to be maintained. Other critical facilities like evacuation shelters, schools, and the hospital which are vital to community function are also vulnerable to sea level rise; and

WHEREAS, ecosystems in the CNMI that range from ridge to reef, especially corals, are vulnerable to the impacts of a changing climate; and

WHEREAS, preventing massive damage to ecosystems on a global scale cannot be done without reducing global greenhouse gas emissions and taking steps to curtail climate change; and

WHEREAS, it may be feasible to implement an integrated resource energy plan with the overall goal to maintain and improve infrastructure, improve community resilience to climatic events, and conserve ecosystems; and

WHEREAS, the Commonwealth relies on a clean and healthy environment for our livelihood, survival, and way of life; and

WHEREAS, many of the communities, infrastructure, and ecosystems of the Commonwealth may be adversely affected by even a small rise in sea level or changes in rainfall; and

WHEREAS, the Commonwealth must continue to be proactive in adapting to the changes brought about by climate change to protect our infrastructure, communities and ecosystems; even as solutions to control carbon emissions are pursued; and

WHEREAS, scientific information, strong local leadership, adaptive management practices, traditional knowledge, stewardship, and community education and involvement will help protect and maintain our communities and the ecosystems upon which we depend; and

WHEREAS, it is vital for the Commonwealth to organize a climate change working group, hereinafter referred to as the CNMI Resilience Work Group to develop and implement a long-term climate change adaptation plan; and

WHEREAS, the process of developing a long-term climate change adaptation plan for the Commonwealth should involve participants from relevant sectors, including the Commonwealth Government, the private sector, the community, and appropriate federal agency partners that may be able to provide technical and financial assistance.

NOW THEREFORE, in order to give the CNMI Resilience Working Group the full support of the Executive Branch, I, **RALPH DLG. TORRES**, GOVERNOR, HEREBY DIRECT THE FOLLOWING:

All Departments, Divisions, Offices, Government Corporations, Boards, and Commissions of the Commonwealth Government shall appoint a representative from their respective offices to participate in the meetings, trainings, and associated activities of the CNMI Resilience Work Group.

The appointed representative shall be of a position of authority within their respective office as to make management-level decisions on behalf of their office, as necessary to carry out the working group's objectives and to develop and implement adaptation measures to protect our community and our environment against the impacts of climate change.

Coordination of the working group shall be conducted by the CNMI Climate Change Project Coordinator who will represent the Office of the Governor and report directly to the Governor on the discussion, actions, and needs of the working group.

IN WITNESS WHEREOF, I have hereunto set my hand on the 13th day of June 2017.

RALPH DLG. TORRES
Governor

Source: CNMI Office of the Governor, Directive No. 2017-0001, CNMI Resilience Working Group.

GIS User's Group

Reliable access for all CNMI agencies to the same information base regarding existing and planned development, land use designations, and current and projected natural hazard zones, is essential to provide a consistent platform for unified decision-making and planning efforts. Sharing information across agencies can be challenging without a single agency mandated to

assemble, curate, and standardize data and information. Additional challenges may arise from conflicts in regulations regarding proprietary or sensitive information or agency authorities.

To improve coordination and transfer of knowledge between agencies, the CNMI should allocate resources to develop a centralized GIS and information database. Expanding the present system at the BECQ to create a CNMI-wide usable system may be the most efficient way forward. As the clearinghouse for all planning related information, OPD should administer these GIS information resources and provide technical assistance to develop, maintain, and utilize the GIS information. Several agencies such as BECQ and DPL have well-developed GIS data about natural hazards, land use practices, and several local government functions. Through OPD coordination and administration, GIS data from multiple agencies should be shared to establish comprehensive GIS collections to provide consistent and standardized geospatial information for planning, development, and construction activities.

4.5 Building SSG Capacity via Federal Funding Programs and Community Support and Actions

Federal agencies are mandated by Executive Order 13843 to address the resilience of federal infrastructure and operations, and several federal agencies have regulatory requirements to address climate change via state-level planning initiatives and grants programs. CNMI has the opportunity to leverage federally-required planning processes to align with SSG Principles, especially resilience, to prepare competitive, high-quality applications for federal grants and other funding opportunities. As previously recommended in Section 4.1, a position within OPD should be dedicated to identify federal programs and prioritizing and aligning funding opportunities for implementing SSG and improving resilience. Without dedicated attention, many funding opportunities to improve CNMI communities are missed or only pursued opportunistically without clear connection to larger planning trajectories and development goals. By developing competent staff and agency capacity, the CNMI can effectively compete for federal funds to implement SSG projects that increase resilience.

Figure 4.3 Smart, Safe Growth Workshop, 17 July

Building capacity among community stakeholders also is critical to work toward SSG. SSG support from political leaders and agency heads will help CNMI mainstream principles through new legislation, regulation updates, and resource management and development efforts. Community understanding and support for SSG initiatives can help influence political will and action. Moreover, informed and knowledgeable communities and individuals may take autonomous adaptation actions to protect vulnerable resources, such as voluntarily undertaking a shoreline or watershed revegetation project. Educating private-sector developers about potential cost-saving via environmentally friendly building designs can leverage their resources to further SSG Principles voluntarily or via the permitting process. Through expanding understanding and capacity, SSG Principles will be incorporated into multiple planning levels to support more resilient projects and communities in CNMI.

5.0 CNMI PLANNING RESOURCES

Comprehensive plans provide a framework for land development regulations, zoning, capital improvement projects, and other initiatives to guide overall growth and development over a long-term planning horizon. Currently, the CNMI lacks a comprehensive plan to direct land use for the development of communities and economic districts. Lacking government criteria, business and individual investors and developers are directing development circumstantially and incidentally, without the guidance of a comprehensive development plan. The CNMI Government recognized the need to improve the planning process to increase the effectiveness of government control over private actions, coordination between agencies and different levels of government, and resource allocation and use. This recognition led to the establishment of the OPD under Public Law 20-20. The OPD is charged with producing the *CNMI Comprehensive Sustainable Development Plan*.

The following sections provide overviews of CNMI plans that exist or are under development. These planning resources offer key opportunities for CNMI to proactively embed SSG Principles into new plans and existing plan updates and revisions. Many of the planning resources discussed in this section are plans required for federal programs and funding. Due to federal mandates, federal agencies increasingly require states and territories to include resilience considerations in required plans associated with federal programs and funding. The CNMI can meet these requirements by incorporating SSG Principles into planning resources.

CNMI planning resources were collected and inserted into the master bibliography included in Appendix C. A sub-set of key CNMI plans were reviewed for strengths and deficiencies in land use, resiliency, recovery planning, and economic and infrastructure development. Summaries are presented in Appendix D.

5.1 Comprehensive Sustainable Development Plan

With the support of the Advisory Council for Planning and Development, OPD is charged with developing a *CNMI Comprehensive Sustainable Development Plan* that will guide future long-range development. The Council is comprised of 15 officials from multiple public agencies as well as the chairs of the Saipan Chamber of Commerce and the CNMI Strategic Economic Development Council. This comprehensive planning effort will: use and improve existing plans, maps, and other resources; identify CNMI goals, objectives, policies, and priorities; determine and justify resource allocations; improve coordination of federal and CNMI plans, policies, programs, projects, and regulatory activities; and establish a system to coordinate and integrate all major CNMI and individual island activities. The comprehensive development plan provides an excellent opportunity to incrementally work toward SSG by incorporating long-term strategies to reduce climate change impacts from severe weather events.

The Director of OPD is responsible to implement comprehensive planning activities at all levels of government and to ensure that all planning programs and projects are consistent with the comprehensive plan. OPD will serve as the nexus for all CNMI planning efforts and is a logical gateway for incorporating SSG Principles in a consistent manner across all levels of government and among agencies. To work toward SSG communities, it is essential that the OPD director and

planners have adequate climate-change related training to select strategies to increase community resiliency to climate related impacts.

The *CNMI Comprehensive Sustainable Development Plan* will address social, economic, and environmental issues to guide development in the CNMI. Inclusion of SSG Principles in the comprehensive plan confers many benefits, including enhanced hazard mitigation strategies, reduced vulnerability to hazards, a framework for pre- and post-disaster decision-making, and reduced time to restore community function following impacts. The horizon of the comprehensive plan should be extended to 50-to-100 years to account for potential long-term impacts of climate change.

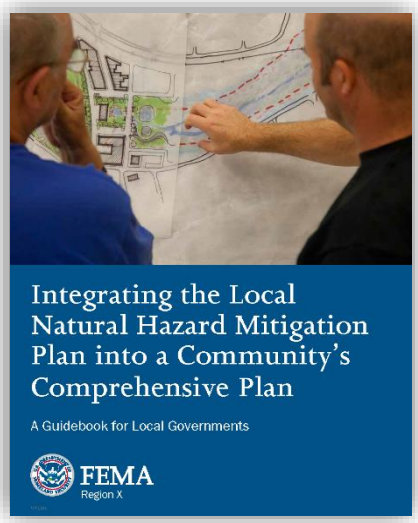
The *CNMI Comprehensive Sustainable Development Plan* will incorporate existing CNMI plans to ensure coordination among planning efforts and to integrate all major development activities in the CNMI. The coordinating function of OPD will help increase awareness and consistency between agencies and help to promote SSG in future plan updates and revisions. Presently, most CNMI plans do not address SSG to any significant degree.

Following is a brief synopsis of some key CNMI planning resources and how the inclusion of SSG Principles can improve community resilience.

5.2 Comprehensive Public Land Use Plan

CNMI Public Law 15-02, Public Lands Act of 2006, mandates the Department of Public Lands (DPL) to prepare a comprehensive land use plan for public lands and update it every 5 years. An update is currently being prepared to cover the next 5-year period. The plan aims to promote cultural and economic growth for the benefit of current and future generations through eight land use objectives. The plan summarizes existing land use condition, provides an economic forecast, and details land use plans for Saipan, Tinian, and Rota. The DPL maintains geographic information pertaining to public lands in a GIS which is regularly updated and maintained.

The Comprehensive Public Land Use Plan is a logical planning resource to integrate SSG Principles to maximize community, social, and economic benefits. Through proactive planning, CNMI can evaluate the intersection of development and hazards to reduce vulnerabilities and increase resiliency of development and the CNMI economy. However, the current draft of the plan does not consider SSG, hazard mitigation, or climate change. To effectively direct future development, it is strongly recommended that the DPL incorporate high hazard areas identified in the 2014 CNMI *Standard State Mitigation Plan* (SSMP) and the Climate Vulnerability Assessments for the Islands of Saipan (2014), Rota and Tinian (2015) into the Public Lands GIS to assess the suitability of areas for future development. It is further recommended that the OPD coordinate with DPL, the Office of Homeland Security and Emergency Management,



Source: FEMA 2013.

and other key CNMI agencies (e.g., CUC) to ensure that projects identified in the plan are sited and designed to withstand future impacts expected under conditions of a changing climate.

5.3 Standard State Mitigation Plan (SSMP)

Hazard mitigation is essential for advancing SSG. The CNMI SSMP identifies policies and actions that can be taken to reduce risk and future losses of property and life. Currently there is some overlap between the SSMP and the Climate Change Vulnerability Assessments for the Island of Saipan (2014), Rota and Tinian (2015). More thorough integration of the vulnerability assessments is recommended for the next SSMP update. The SSMP is essential for CNMI to access pre- and post-disaster hazard mitigation funds to implement SSG actions via FEMA funding programs.

Integration of the SSMP with the *CNMI Comprehensive Sustainable Development Plan* is also essential. Often State hazard mitigation plans are non-regulatory in nature, but comprehensive plans are usually considered policy documents that require a degree of consistency between zoning and development decisions. Mitigation addressed in state comprehensive plans is usually more effective. Addressing hazard mitigation in the comprehensive plan enhances opportunities to integrate mitigation measures and to leverage multiple resources to create synergies towards SSG.

Source: FEMA Hazard Mitigation Grant Program, 2017.

5.4 Vulnerability Assessments

The Climate Change Vulnerability Assessments for the Islands of Saipan (2014), Rota and Tinian (2015) provide a foundation to develop long-term climate change adaptation strategies for the CNMI. Vulnerability assessments are also conducted for hazard mitigation planning. The difference being that hazard mitigation planning typically bases hazard assessments on present-day climate conditions, whereas climate change vulnerability assessments consider a range of potential climate conditions.

The Climate Change Vulnerability Assessments aim to identify levels of potential impact, assess vulnerabilities of natural and built environments, and evaluate capacity to respond to the threats. Implementing climate change adaptations promotes SSG and is a long-term, incremental initiative that requires consistent attention from government officials, the public and community leaders, and resource managers. These assessments can serve as the basis for climate adaptation planning and implementation to work toward SSG and to keep the issue of climate change current and visible. Data gaps identified in the 2014 Saipan Vulnerability Assessment, which focused primarily on vulnerability to sea level rise and coastal flooding, as well as from the 2015 Tinian and Rota Vulnerability Assessment, which used a “climate analog” narrative approach to contextualizing potential impacts to present opportunities for continued information collection and

analysis. For example, lacking Lidar mapping of Tinian and Rota, inundation models have not been created for these islands. Expanded vulnerability assessments that consider localized precipitation and storm data, where it is available, and incorporate updated census data or conduct additional population-based data collection could greatly enhance the resolution of vulnerability assessment and therefore risk reduction planning in CNMI. As new information and funding opportunities become available, expanded vulnerability screening may be viable and appropriate.

5.5 Coastal Zone Management Act

The Federal Coastal Zone Management Act of 1979 established the National Coastal Zone Management Program to work with coastal states, including the CNMI, to implement improvements to state coastal management programs.

The CNMI Coastal Resources Management Act of 1983 established the coastal management program at the Commonwealth level. The Division of Coastal Resource Management (DCRM) administers the program and regulations, which are intended to balance wise use and conservation within the CNMI. The 1983 legislation articulated twenty-three policy goals for coastal resources management that range from planning, education, and inter-agency coordination to permitting and enforcement. These policies connect to SSG Principles by supporting habitat protection and enhancement, and limiting development in high risk coastal hazard and shoreline areas.

As part of the federal and CNMI coastal management programs, the CNMI is required to prepare an Assessment and Strategy Report to address priority enhancement goals for coastal resources. *The 2016-2020 Assessment and Strategy Report for the CNMI* (2016) is a key planning tool that provides a basis for coastal management program priorities and a strategy framework to ensure program progress. Management priorities and many recommendations, such as updating regulations to reduce erosion and to limit siting government facilities in coastal zones, align well with SSG Principles. Coordinating the management objectives within this plan with other land use planning initiatives could provide immediate “no-regrets” actions that work towards SSG.

The *Saipan Lagoon User Management Plan* (SLUMP, 2017) is another planning resource to help implement SSG. The SLUMP recommends twelve management actions to protect lagoon integrity. These management actions support SSG via protecting ecosystem services and promoting green infrastructure practices. The aims of the SLUMP and the recommended actions for protecting the critical coastal resources should be incorporated into comprehensive initiatives to ensure coordinated implementation with other coastal management initiatives.

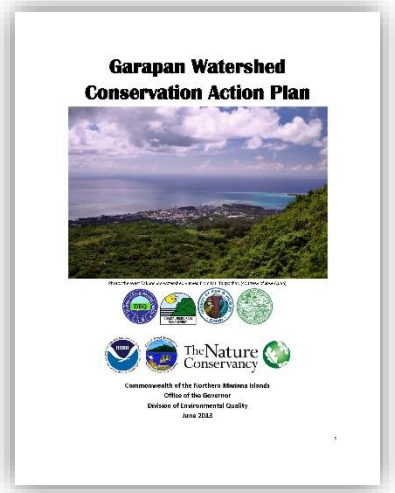
5.6 Other CNMI Planning Resources

Coastal Resources Plans

Multiple plans are available to address development in coastal zones. For this *Guidance Manual*, many of the existing plans were reviewed, summarized and evaluated for strength and deficiencies in land use, resiliency, and recovery planning and infrastructure and economic development. Summaries are available in Appendix D.

Watershed Conservation Action Plans

Watershed Conservation Action Plans are completed for the Laolao Bay, Talakhaya/Sabana, and Garapan regions. The plans include natural resources conservation strategies to protect the health and function of the watersheds while minimizing stormwater runoff and nearshore impacts to marine resources. These plans support SSG Principles via land use planning, protecting and improving ecosystem services, and the natural protective functions of the watershed and the coral reefs. Summaries are available in Appendix D.



Source: CNMI DEQ, 2013.

Power Generation Plans

The CUC provides electrical power in the CNMI. Electrical power is primarily generated in diesel-fueled power plants. Because CNMI relies almost entirely on imported diesel fuel for power generation, power supply and costs are vulnerable to fluctuations in the global oil market. Over the past 5 years, plans have been developed to explore options to increase energy security, improve operational efficiencies, and to lower power costs for the CNMI customers.

In 2013, the Office of Insular Affairs funded the development of a *CNMI Strategic Energy Plan* and a *CNMI Action Energy Plan* to investigate the feasibility of utilizing alternative energy sources to supplement diesel-fueled power plants. These plans offer several strategies and actions tailored for the CNMI to improve policies, the energy efficiency of buildings, viable renewable energy options, and other strategies to help increase energy security and lower the cost of energy. Summaries are available in Appendix D.

In 2015, a draft *Integrated Resources Plan* was developed for the CUC to explore various options for power generation. As part of the planning process, the CNMI intended to issue a Request for Proposals to private companies for power generation projects, including renewable energy and fossil fuel generation. However, the RFP was canceled in 2016 and the *Integrated Resources Plan* is still a draft. The draft plan does not consider disaster resiliency, or the potential effects of climate change and these factors should be considered when selecting the best power generation solution for the CNMI. A summary of this plan is available in Appendix D.

These CUC planning resources provide an opportunity to promote SSG by incorporating relevant Principles. This can lead to steps towards increasing, where feasible, renewable energy, improving efficiencies in power generation, distribution, and in buildings, and improving the resiliency of the generation and distribution systems via retrofit and retreat. Renewable energy sources and greater efficiency are arguably the most important initiatives for CUC to pursue for future planning horizons.

Housing Corporation 5-Year Consolidated Plan

The US Department of Housing and Urban Development require states to prepare Consolidated Plans to be eligible for HUD block grant programs. Territories must assess their affordable

housing and community development needs and to make informed decisions that fit local needs. Where low-to-moderate-income residents are vulnerable to natural hazards and the potential impacts of climate change, plans must consider how to incorporate hazard mitigation and resilience into their community planning and development goals, codes, standards, and how HUD funds will be used to accomplish these objectives.

The CNMI *5-Year Consolidated Plan* covers program years 2015-2019 and is due for an update. The current plan does not address hazard mitigation, climate change, or resilience. The update of this plan is an excellent opportunity to integrate SSG Principles. This is also a timely opportunity to use information from the SSMP, climate vulnerability assessments, and other land use planning documents to maximize the safety and resiliency of future CNMI community development. A summary of the current plan is provided in Appendix D.

Transportation Plans

Federal law and regulations require the US Department of Transportation to integrate resilience into transportation planning processes. Federal funding is available to CNMI for highways through the Federal Territorial Highway Program (THP). Funds obligated under the THP must follow the requirements and eligibilities of 23 U.S.C. 165 as amended by the Fixing America's Surface Transportation (FAST) Act, which requires the planning process to consider projects/strategies to improve the resilience and reliability of the transportation system and improve stormwater mitigation.

Recently the CNMI DPW submitted *The Territorial Transportation Improvement* Plan to the US Department of Transportation. Incorporating SSG Principles in future transportation plans may help CNMI secure federal funds to improve the resilience of the islands' transportation systems.

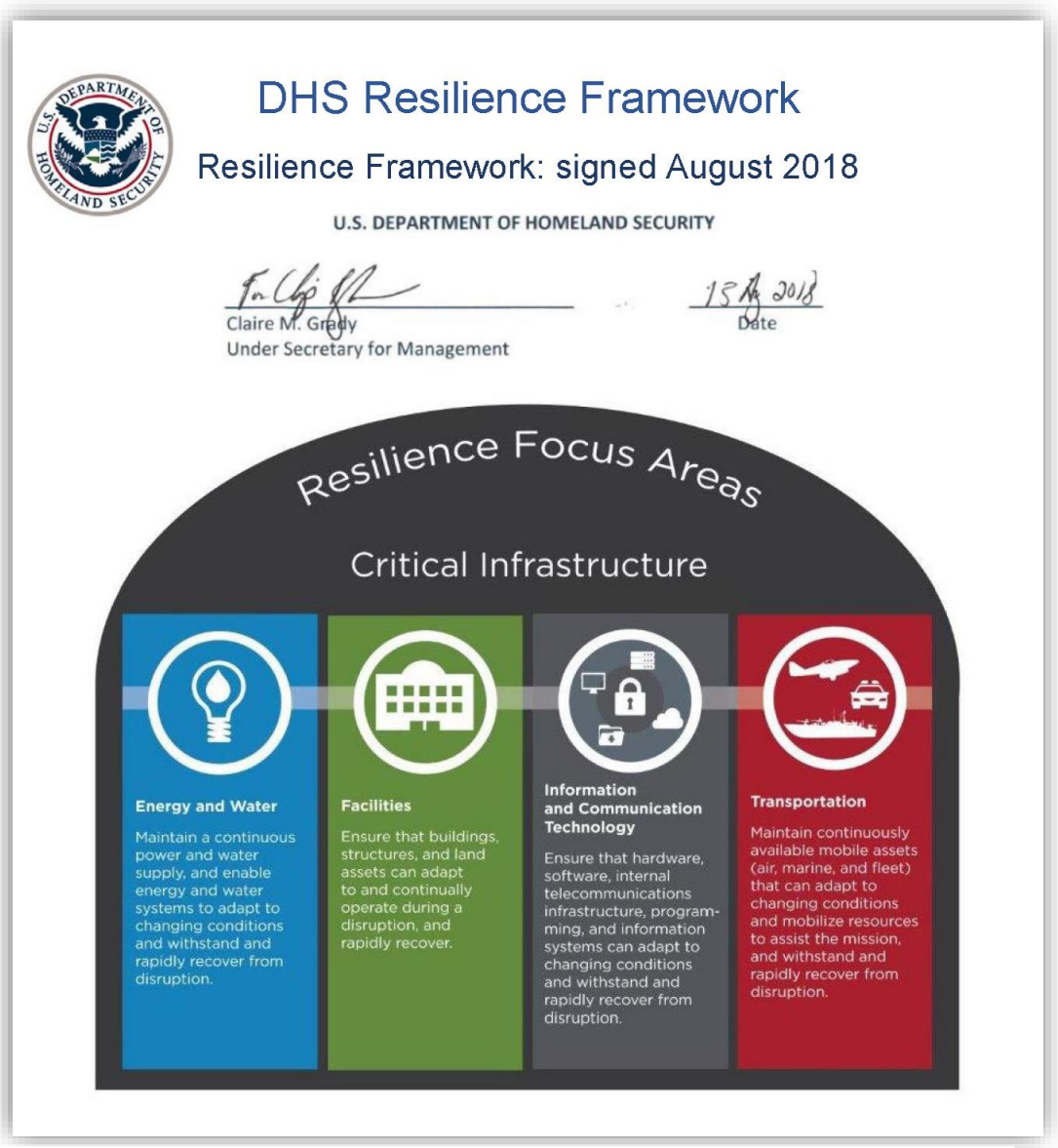
Comprehensive Economic Development Strategy

The US Public Works and Economic Development Act of 1965 and regulations for the US Economic Development Administration (EDA) require states (and Territories) to prepare a Comprehensive Economic Development Strategy (CEDS) to apply for investment assistance under EDA's Public Works or Economic Adjustment Assistance Programs. The CEDS is the backbone planning document for EDA funding including funding for post-disaster recovery under the National Disaster Recovery Framework. Federal regulations mandate that economic resiliency to natural and man-made disasters be incorporated into CEDS updates.

The *Comprehensive Economic Development Strategy* for the CNMI covers the operational period from 2016 to 2021. The approaching update presents an opportunity to incorporate SSG Principles. The plan provides a good summary of the CNMI economy and presents several strategies to bolster current economic conditions. However, the CEDS for the CNMI presently does not include discussions about economic resilience or economic recovery. Through the EDA, funds are made available to implement projects to improve economic resiliency and recovery that are identified in the CEDS following a disaster. EDA's requirements to address resiliency in the CEDS aligns well with SSG Principles. Incorporating SSG into the next update of the CEDS will help CNMI satisfy requirements to address resilience and provide access to funding.

Federal Mandate to Address Resilience

Federal agencies are required to enhance the resilience of Federal infrastructure and operations. Agencies, such as the Department of Agriculture and the Department of Health and Human Services have technical assistance and grant programs to assist state and territorial governments plan for and implement actions to address resilience and impacts from climate change. The OPD should investigate all federal programs for additional opportunities for technical assistance and funding to implement SSG actions. Dedicated staff as discussed earlier, is the key to maximizing funding assistance.



Source: US Department of Energy, Introduction to DHS Resilience Framework. 2018

6.0 CNMI REGULATORY RESOURCES

Through regulations and permitting the CNMI government influences the pattern and pace of development. Incorporating SSG Principles into development-related regulations is an effective means to work toward achieving SSG. Improved resiliency of the built environment can be achieved over time by altering land use plans, zoning regulations, and building codes to decrease vulnerability to future natural hazards. Embedding SSG Principles in regulations will help ensure uniform and consistent implementation across agencies. Regulations provide the tools for CNMI to require private-sector developers to incorporate and consider measures to work towards SSG.

6.1 Current Regulations and Proposed Regulation Revisions

A comprehensive review of current CNMI regulations was completed for preparation of this *Guidance Manual*. Each regulation was evaluated in detail for conformance with the twelve SSG Principles. A brief summary of SSG-relevant regulations is presented in Table 6.1. A comprehensive summary of findings and recommendations for integrating SSG Principles into regulation updates is in Appendix B.

Table 6.1 Summary of CNMI Regulations.

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Bureau of Environmental Quality – Titles 15 and 65			
Coastal Resources Management Rules and Regulations 15-10	1 CMC §§ 2081-2082 2 CMC §§1501-1543	Coastal Resources Management Act of 1983 (PL 3-47)	The DCRM regulations are intended to balance wise use and conservation within the CNMI. The 1983 legislation articulated 23 policy goals for coastal resource management that range from planning, education, and inter-agency coordination of permitting and enforcement. The policies connect to SSG Principles by supporting habitat protection and enhancements as well as limiting development in high risk coastal hazard and shoreline areas.
Aboveground Storage Tank Regulations 65-5	1 CMC §§ 2646-2649 2 CMC §§ 3101-3134	Commonwealth Environmental Protection Act of 1982 (PL 3-23)	These DEQ regulations are intended to protect against pollution from AST spills. The regulations connect to SSG Principles by supporting location of critical facilities and protection of ecosystem services, and to water quality, via DCRM as well as under Section 307 of the Federal Coastal Zone Management Act of 1972.

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Bureau of Environmental Quality – Titles 15 and 65			
Drinking Water Regulations 65-20	"	"	These DEQ regulations are intended to establish minimum standards and requirements to ensure safe drinking water. The regulations accommodate most SSG Principles.
Earthmoving and Erosion Control Regulations 65-30	"	"	These DEQ regulations are intended to regulate land disturbance activities and control non-point source runoff from human-related activities. These regulations connect to all SSG Principles.
Underground Injection Control Regulations 65-90	"	"	These DEQ regulations are intended to regulate the protection of groundwater resources from underground injection of hazardous waste. The regulations as written do not provide for application of SSG Principles under progressively changing climate conditions.
Underground Storage Tank Regulations 65-100	"	"	These DEQ regulations are intended to protect against pollution from UST spills. The regulations connect to SSG Principles by supporting location of critical facilities and protection of ecosystem services.
Wastewater Treatment and Disposal Rules and Regulations 65-120	"	"	These DEQ regulations are intended to regulate wastewater to protect public health and the environment. The regulations connect to SSG Principles by supporting location of critical facilities and protection of ecosystem services. However, these regulations as written do not provide for application of SSG Principles under progressively changing climate conditions.
Water Quality Standards 65-130	"	"	These DEQ regulations are intended to regulate surface and ground water quality and protect their uses and value for commerce. The regulations connect to SSG Principles by supporting location of critical facilities and protection of ecosystem services. However, the regulations as written do not provide for

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Bureau of Environmental Quality – Titles 15 and 65			
Title 65-130	"	"	application of SSG Principles under progressively changing climate conditions. Water quality standards are included as "enforceable policies" under Section 307 of the Federal Coastal Zone Management Act of 1972.
Well Drilling and Well Operations Regulations 65-140	"	"	These DEQ regulations are intended to regulate water well development and operations to promote the long-term capability of the CNMI to provide reliable potable water to the public. These regulations connect to SSG Principles. However, the regulations as written do not provide for application of SSG Principles under progressively changing climate conditions.
Commonwealth Utilities Corporation - Title 50			
Electrical Power Davison; Electrical Service Regulations 50-10	4 CMC §§ 8111-8158	Commonwealth Utilities Corporation Act of 2008 (PL 4-47)	These CUC regulations are intended to govern the distribution and management of electrical power. The regulations connect to SSG Principles. However, the regulations as written do not provide for application of SSG Principles under progressively changing climate conditions.
Sewer Division; Public Sewer Use Regulations 50-20	"	"	These CUC regulations are intended to govern the distribution and management of wastewater services. The regulations connect to SSG Principles. However, the regulations as written do not provide for application of SSG Principles under progressively changing climate conditions
Water Services Division; Water Services Regulations 50-30	"	"	These CUC regulations are intended to govern the distribution and management of water services. The regulations connect to SSG Principles. However, the regulations as written do not provide for application of SSG Principles under progressively changing climate conditions.

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Commonwealth Utilities Corporation - Title 50			
Interconnection and Net Metering 50-60 (Reserved, regulations not adopted)	"	"	These CUC regulations are intended to govern connection of discrete renewable energy sources (e.g., solar or wind) associated with individual residences or businesses to the CUC electrical power system, to reduce power generation demand and allow customers to receive monetary credit for generation of excess energy by the renewable resource. The regulations connect to SSG Principles. However, the regulations have not been adopted.
Department of Land and Natural Resources - Title 85			
Forestry Section; Forest Resources Protection Regulations 85-90	1 CMC §§ 2654	Public Lands and Natural Resources Administration Act of 1997 (PL10-57)	These DLNR regulations are intended to regulate the protection of public land forests and the value forests provide to biota and human populations. The regulations connect to SSG Principles by supporting ecosystem services and green infrastructure. However, the regulations as written do not provide for application of the other SSG Principles.
Department of Public Lands - Title 145			
Agricultural Homesteads Rules and Regulations 145-20.1	2 CMC §§ 4321-4328	Homestead Waiver Act of 1981 (PL 2-13)	These are procedural DPL regulations for agricultural homestead waivers. Value of lands with regard to SSG Principles should be considered before any public lands are transferred to private ownership.
Rota Agricultural Homesteads Rules and Regulations 145-20.2	"	"	These are DPL rules and regulations necessary to administer and implement the agricultural homestead program for Rota (never formally adopted). Value of lands with regard to SSG Principles should be considered before any public lands are transferred to private ownership.

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Department of Public Lands - Title 145			
Tinian Agricultural Homesteads Rules and Regulations 145-20.3	"	"	These are DPL rules and regulations necessary to administer and implement the agricultural homestead program for Tinian. Value of lands with regard to SSG Principles should be considered before any public lands are transferred to private ownership.
Village Homesteads Rules and Regulations 145-20.4	"	"	These are DPL procedural regulations for Village Homesteads. Value of lands with regard to SSG Principles should be considered before any public lands are transferred to private ownership.
Commercial Use of Managaha Island Rules and Regulations 145-30	1 CMC §§ 2801-2808	Public Lands Act of 2006 (PL 15-2 and 15-67)	These DPL regulations are intended to set forth restrictions on commercial activities on Managaha Island. Submergence of the island due to sea level rise may force retreat.
Land Compensation Claims Rules and Regulations 145-40	2 CMC §§ 4741-4751	Land Compensation Act of 2002 (PL 13-25, PL 13-39, PL 13-56, PL 14-29, and PL 15-2)	These DPL regulations are intended to provide for a comprehensive method of processing claims and distributing monetary compensation to landowners whose lands are taken by the Commonwealth for a beneficial public purpose. These policies connect to SSG Principles by supporting the redirection of development from high-hazard areas to preferred low-hazard areas.
Public Purpose Land Exchange Rules and Regulations 145-50	2 CMC § 4146	Public Purpose Land Exchange Authorization Act of 1987 (PL 5-33, § 1)	These DPL regulations are intended to provide for a comprehensive method of processing land exchanges between the government and a land owner whose lands are taken by the Commonwealth for a beneficial public purpose. These policies connect to SSG Principles by supporting the redirection of development from high-hazard areas to preferred low-hazard areas.

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Department of Public Lands - Title 145			
Submerged Land Rules and Regulations 145-60	2 CMC §§ 1201-1231	Submerged Lands Act of 1979 (PL 1-23)	These DPL regulations are intended to establish procedures and guidelines for leasing, licensing, or permitting use of CNMI submerged lands. These policies connect to SSG Principles by supporting location of critical facilities and protection of ecosystem services.
Temporary Occupancy Rules and Regulations 145-70	1 CMC §§ 2801-2808	Public Lands Act of 2006 (PL 15-2 and 15-67)	These DPL regulations are intended to provide for the use of public land for commercial purposes under permits and leases. These regulations as written may have a detrimental effect on government ability to utilize SSG Principles under progressively changing climate conditions.
Department of Public Works - Title 155			
Building Safety Code Rules and Regulations 155-10.1	1 CMC § 2404; 2 CMC § 7153	Building Safety Code of 1990 (PL 6-45, as amended)	These DPW regulations are intended to impose building and safety standards for protection of public health, safety, and welfare. These policies connect to SSG Principles.
Flood Damage Prevention Regulations 155-10.2	1 CMC § 2404; 2 CMC § 7148	"	These DPW regulations are intended to regulate land use and construction in areas established with potential hazards of flooding. The regulations aim to protect human life and health, minimize expenditure of public money for costly flood projects, minimize damage to public facilities and utilities, and ensure that those that occupy areas of special flood hazard assume responsibility for their actions. The regulations connect to SSG Principles. However, the regulations as written do not fully provide for application of SSG Principles under progressively changing climate conditions.

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Department of Public Works - Title 155			
Public Rights-of-way and Related Facilities Regulations 155-20.1	1 CMC § 2404; 2 CMC § 4134	Executive Branch Organization Act of 1978 (PL 1-8)	These DPW regulations are intended to protect public rights-of-way and to allow for government review of any proposed improvement or obstruction. The regulations connect to SSG Principles. However, the regulations as written do not fully provide for application of SSG Principles under progressively changing climate conditions.
Office of Homeland Security & Emergency Management			
None.		CNMI Homeland Security & Emergency Management Act 2013 (PL 18-4)	The Office of Homeland Security and Emergency Management is tasked to prepare the CNMI *Standard State Mitigation Plan* that identifies policies and actions that can be taken to reduce risk and future losses of property and life. Hazard mitigation is a major component of the SSG approach. The HSEM is not presently empowered with regulatory authorities.
Office of Planning and Development			
Under Development		CNMI Planning and Development Act 2017 (PL 20-20)	The purpose of the CNMI Planning and Development Act 2017 is to establish the Office of Planning and Development (OPD). OPD is tasked to prepare a *CNMI Comprehensive Sustainable Development Plan* that shall serve as a guide for the future long-range development of the CNMI. OPD is instrumental to promote SSG Principles in all planning initiatives and as technical guidance for all infrastructure and economic development projects.

Table 6.1 Summary of CNMI Regulations. (*cont'd*)

Chapter Title or Sub-chapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Summary
Saipan Zoning Board - Title 165			
Commonwealth Zoning Board Regulations 165-30.1	2 CMC §§ 7201-7255; 10 CMC §§ 3511-3517	Zoning Code of the CNMI of 1989 (PL 6-32)	These regulations are intended to implement the Saipan Zoning Law. The purpose of zoning is to promote the health, safety, morals, and general welfare of the community, to protect and conserve the value of buildings, and encourage the most appropriate use of the land. The regulations connect to SSG Principles. However, the regulations as written do not fully provide for application of SSG Principles under progressively changing climate conditions.

6.2 Commonwealth Zoning Board

CNMI Public Law 6-32, the CNMI Zoning Code of 1989, established the Commonwealth Zoning Board to administer a land use and zoning system and to promulgate regulations. The Board has seven members of which four are officers. The Zoning Office staff administer mandates of the Board by providing services to commercial and residential developers, property owners, and the business community to understand and comply with land use regulations. Staff provide essential outreach and education to CNMI communities about the zoning laws. The Zoning Office processes and issues permits for new development, non-conforming structures and uses, rezones or changes in district boundaries, subdivision plans, fences, and signs. The Zoning Office also provides enforcement of the zoning law.

An important mandate of the Zoning Office is to work collaboratively with other government agencies, such as the Resiliency Working Group (formerly the Climate Change Working Group) and the BECQ. The Zoning board also maintains a Zoning Database system to manage permit application and issuance. A Geographic Information System (GIS) helps Zoning Office staff link information in the GIS with as-built survey plans and the Zoning database to readily visualize the locations of proposed and existing development.

As with the DCRM Permitting Board, increased coordination and inter-agency cooperation between the Zoning Board and Office staff with other agencies can help ensure coordinated review of proposed development. Also, zoning regulations are a key entry point to incorporate SSG Principles into land use planning. Through the consistent application of zoning regulations CNMI can immediately begin to work toward SSG proactively.

6.3 CNMI Permitting Authority

CNMI Public Law 3-47, the Coastal Resources Management Act of 1983, established the Coastal Resources Management (CRM) Agency Board to support DCRM's (formerly CRMO) mission to administer Coastal Resource Management permit decisions, to provide feedback to DCRM, and to work with DCRM to update and adopt regulations and policies. Many DCRM regulations and policies are already consistent with SSG Principles. Recommended changes are summarized in Appendix B. The CRM Agency Board should explore more opportunities to include permit conditions that require private-sector developers to implement measures consistent with SSG Principles. Currently, the DCRM offers permit incentives to developers that use environmentally friendly development and building practices. See Section 7.5.

Figure 6.1 Abandoned houses stand in front of new development. CNMI has a significant inventory of abandoned structures. These could be used as a resource for development. Permitting incentives could play a major role.

The CRM Agency Board approves permits for all major development in the CNMI. Although the Board has inter-agency representation, the current permit review and approval processes are essentially done independently by each agency with little coordination (i.e., "stove pipes"). For example, the capacity or sequencing ability of CUC to provide essential services for all approved development permits is not considered by all Board members. The sheer volume of development project proposals and pressure for action make the situation more challenging. Increased inter-agency coordination and communication can help to ensure permit reviews and approvals consider and find solutions to second- and third-order effects of multiple, major development activities occurring simultaneously (e.g., disrupted or increased traffic, inadequate power or water, inadequate inspection support, etc.). Increasing cooperation within the Board will help to ensure development proceeds at a pace that protects CNMI's natural resources and limits stress on facilities and infrastructure.

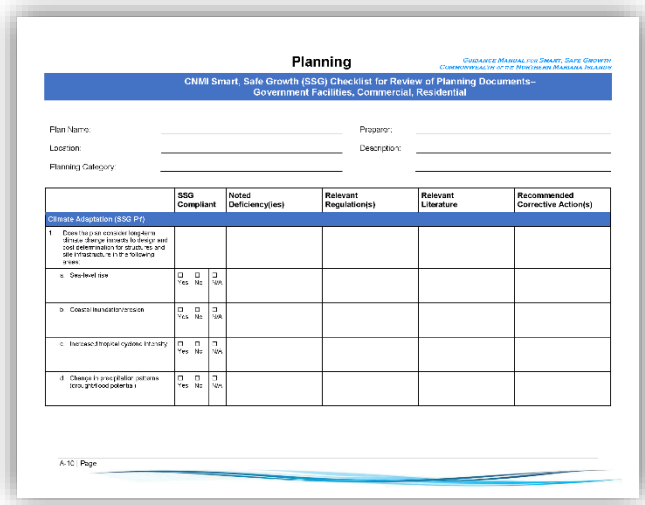
Figure 6.2 Abandoned since the 1990s, with progressive deterioration mainly from typhoons.

6.4 Review Checklists for Planning Documents and Proposed Project Technical Submittals

The approach to SSG requires many actions over the long-term. Incorporating SSG Principles into planning and development initiatives now can help change planning, design, and construction practices to withstand a range of future possible climate conditions. Because SSG Principles are a relatively new concept, a checklist tool is recommended to help integrate the principles into practice across the CNMI government in a uniform and cohesive manner.

The checklists in Appendix A are intended to assist CNMI agency staff to consider SSG Principles when drafting planning documents and during development project technical reviews. The intended outcome is that plans and projects will conform with SSG Principles to increasingly greater degree over time, as incremental changes take effect and agency staff become more accustomed to working within an SSG community of practice.

The checklists in Appendix A can be used in several ways. Government staff can print checklist pages from the .pdf file and use for note-taking during plans/project reviews. Under separate cover the checklists are also provided as the original Excel® files. The Excel® files provide drop-down menus to facilitate staff work, and can also be revised by government staff to meet evolving needs as the SSG framework for planning and development gains momentum. Finally, the Checklists, in abridged form, can also be submitted to planners in the consulting community and to technical consultants for developers, as a means to communicate the expectations of regulatory authorities.


Planning

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

Plan Name: Program:
Location: Description:
Planning Category:

	SSG Compliant	Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Climate Adaptation (SSG Pf)					
1 Does the plan consider long-term climate change impacts to design and cost determination for structures and site improvements in the following areas:					
a. Sea-level rise	☐ Yes ☐ No ☐ NA				
b. Coastal inundation/erosion	☐ Yes ☐ No ☐ NA				
c. Increased tropical cyclonic intensity	☐ Yes ☐ No ☐ NA				
d. Changes in precipitation patterns (drought/flood potential)	☐ Yes ☐ No ☐ NA				

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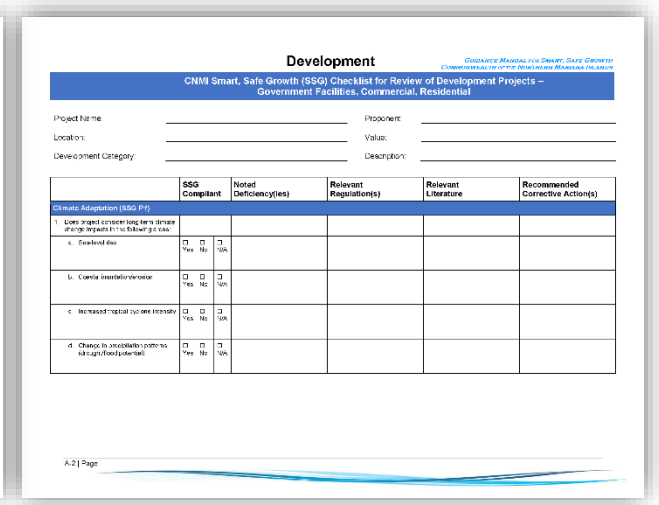
Development

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

Project Name: Proponent:
Location: Value:
Development Category: Description:

	SSG Compliant	Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Climate Adaptation (SSG Pf)					
1 Does project consider long-term climate change impacts in the following areas:					
a. Sea-level rise	☐ Yes ☐ No ☐ NA				
b. Coastal inundation/erosion	☐ Yes ☐ No ☐ NA				
c. Increased tropical cyclone intensity	☐ Yes ☐ No ☐ NA				
d. Changes in precipitation patterns (drought/flood potential)	☐ Yes ☐ No ☐ NA				

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Two checklists are provided in Appendix A to assist CNMI agency staff to incorporate SSG Principles into planning documents and to evaluate development project submittals for conformance with SSG Principles.

7.0 TOOLS FOR ADVANCING SMART, SAFE GROWTH

Extreme weather events will continue to impact the CNMI and threaten public safety. Escalating costs of post-disaster recovery is the present-day pattern and expectation. Through the persistent application of SSG Tools patterns and expectations can be changed. The CNMI government will continue to be the primary responder to severe weather events and natural disasters. Government action now to reduce vulnerability to future hazards is a sound investment in CNMI's economy and communities. The CNMI Government can best establish SSG goals and priorities via the *CNMI Comprehensive Sustainable Development Plan* that presents a framework to reduce vulnerabilities to current and future natural hazards particular to CNMI. Yet, there is no single plan or effort that will achieve SSG. To assist CNMI Government personnel to integrate SSG into planning and development initiatives at multiple levels of government, this *Guidance Manual* provides a wide-range of tools to integrate and implement actions that promote SSG.

The tools presented in this section were selected to address many considerations specific to the CNMI. Within tables, tools are grouped by theme and further resources or links are provided for some tools so that agency staff can pursue additional information as needed. A tool table reference key is provided in Figure 7.2.

At the outset of the tools section for SSG, Figure 7.1 depicts an excellent example of non-conformance with building and energy codes. This work-around might have been viewed as a Best Management Practice for what was achievable at the time. However, to achieve SSG, focused attention to codes and regulations, as well as enforcement, is critical to avoid situations like the one shown in Figure 7.1.

Figure 7.1 Insulator on steel fence at powerline contact. Not smart. Not safe.

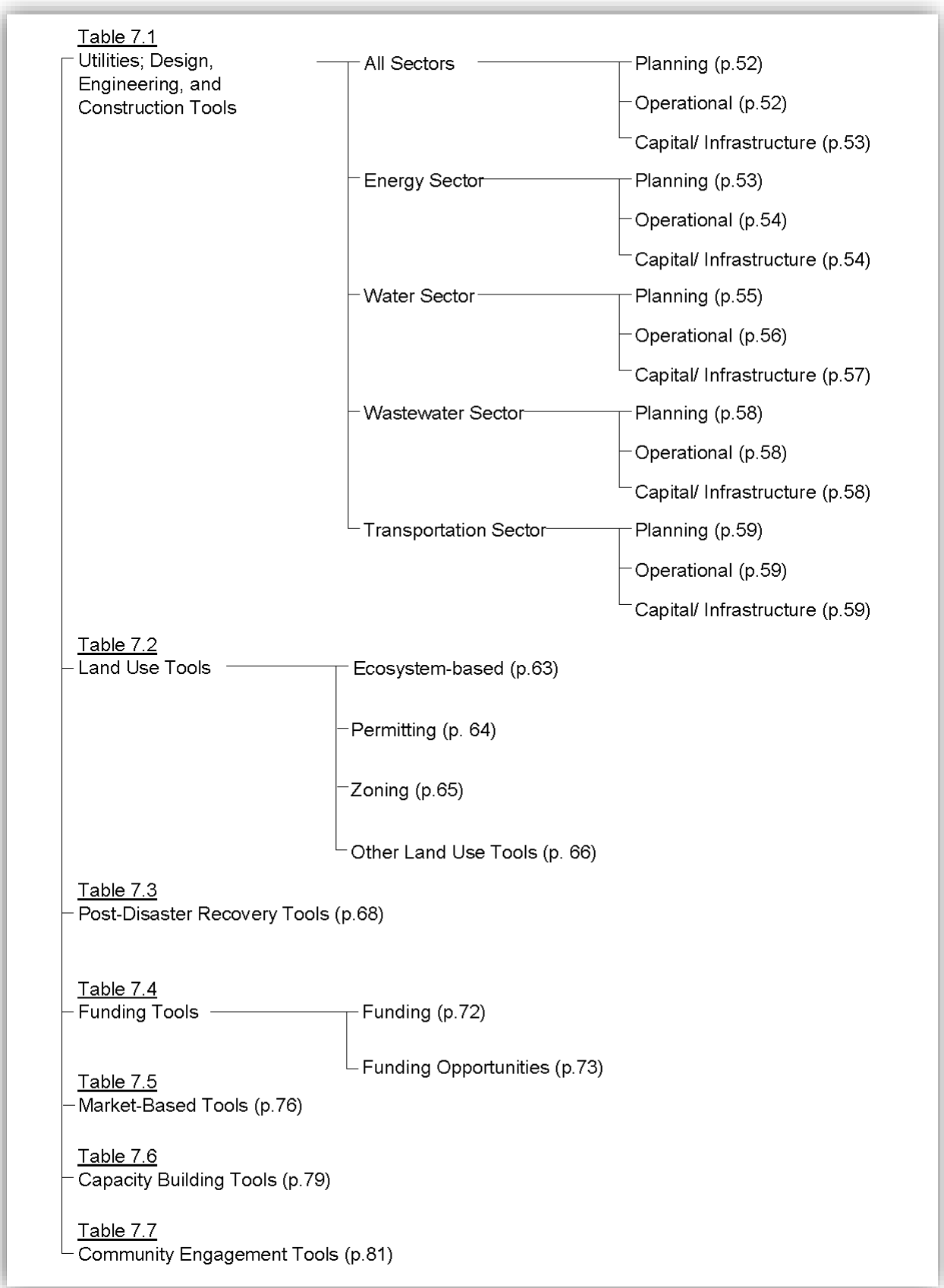


Figure 7.2 Tool Tables Reference Key.

7.1 Utilities; Design, Engineering, and Construction Tools

To grow smarter and safer, how utility infrastructure development is planned, sited, designed, constructed, and operated will need to be adjusted over time. Many SSG measures have significant co-benefits that justify infrastructure investment now, such as energy security, economic growth and job creation, and public safety. Including SSG Principles in early stages of utilities design can improve infrastructure attractiveness and support other community functions such as economic activity and public health.

Figure 7.3 CUC Diesel Power Plant No. 1.

Critical infrastructure located in high-hazard areas should be relocated to areas that are suitable to the respective uses. Flood mitigation and other retrofit protective measures to enhance the structural integrity, overall performance, and functionality of utility facilities that must be located in high-hazard areas should be undertaken. The goal is to ensure the continuity of operations of critical facilities and lifelines essential to helping residents remain in their homes following a disaster, and to facilitate and expedite community and regional post-disaster recovery.

saipantribune.com
CNMI'S DAILY ONLINE NEWSPAPER

SIS goes green, uses solar power

By Jon Perez | Posted on Jun 07 2018
Tag: Latte Stone, power, Saipan International School, SIS

Saipan International School became the first private learning institution in the CNMI that will be using a renewable source of energy after it teamed up with Micronesian Renewable Energy Inc. for a solar energy system.

The installation of three solar arrays for the 104.782 kW solar energy system was recently finished. Two are located at the central administrative building, while the other one is at the Tan Siu Lin building.

The solar energy system could save the school power costs of over $250,000 in a 20-year span, while harnessing the abundant power of the sun.

Latte Stone Solar personnel pose for a group photo after installing the solar panels in one of the buildings at the Saipan International School. (Contributed Photo)

Tools provided in Table 7.1 can assist the service providers to improve resiliency, and improve service quality. These tools also help CUC to work toward the goal to reduce energy costs as outlined in the 2015 Integrated Resources Plan.

Table 7.1 Utilities; Design, engineering and construction tools.

Tool Name	Tool Summary
All Sectors - Planning	
Emergency Response Plans for Utilities	• Develop emergency response plans that outline activities and procedures for utilities (all sectors) to follow in case of incident; from disaster preparation to post-disaster recovery.
Hazard areas inventory	• Inventory public facilities and infrastructure located within the proposed coastal flood zone for 50 years of SLR with seasonal extremes and storms (SLR50_ONDTY) and coastal high hazard areas. Including but not limited to sanitary sewers and sewage treatment facilities, solid waste management facilities, potable water supply treatment and distribution systems, power supply systems, and transportation systems. Identify vulnerable public facilities and infrastructure, prioritize, and analyze the potential for relocating, mitigating, or replacing.
Community plans	• Ensure all future community plans and studies that site critical infrastructure consult existing hazard mitigation and disaster risk reduction plans or studies, including climate change vulnerability assessments. Follow the proposed coastal flooding scenario for 50 years of SLR with seasonal extremes and storms (SLR50_ONDTY). This scenario projects that by the year 2067 (50 years) cumulative sea level change will be 3.16 meters higher.
Controls for CIP projects	• Integrate climate-related risks into all capital improvement plans. • Prioritize capital improvement projects and plans in areas designated as less vulnerable, thus providing incentives for developing in safer locations. • Require all public infrastructure projects that must be located within a sea-level rise inundation zone to adhere to sea level rise vulnerability and risk assessment guidance and include appropriate resilience strategies.
Insurance	• Adopt insurance mechanisms and other financial instruments. Adequate insurance can insulate utilities from financial losses due to extreme weather events.
All Sectors - Operational	
Resource audits	• Conduct an audit of water and power use in utility operations and commercial/public buildings and make improvements to energy and water use efficiency to optimize utility operations.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
All Sectors - Capital / Infrastructure	
Retreat / Relocate	• Where possible relocate critical infrastructure located in high-hazard areas. Use projected 3.16 meters cumulative increase by 2067, for site selection and design of new power plants and support facilities, rather than historic coastal flooding heights, wind speeds, and wave energy projections.
Retrofit	• Retrofit existing utility structures that must be located in high-hazard areas with resilient or flood and wind-proof modifications such as elevating structures, reinforcing roofs and doors, anchoring buildings to foundations, installing shutters on windows, replacing exterior building components with hazard-resistant alternatives, modifying structures to allow flood waters to enter and escape, and sealing structures to prevent water from entering. • Replace vertical walls along drainage banks with sloped sides to create increased channel area.
Shoreline protection	• Where required to protect critical infrastructure, harden shorelines with breakwaters, artificial headlands, bulkheads (anchored vertical structures constructed at the shoreline to block erosion), seawalls, or revetments that armor the slope face of the shoreline. DCRM requires that where hardening is proposed it must be demonstrated that "soft" / "green" interventions are not viable (see §15-10-101(c)(ii)). • To lessen the impact of coastal erosion, maintain and restore native beach vegetation, construct groins to capture and retain sand, install geotextile sand tubes to trap sand, build coastal berms to keep rock protection in place. Ensure that longshore dynamics are assessed before hardening is pursued. Possibly consider living shoreline measures. Early coordination with BECQ / DLNR and Army Corps is encouraged for shoreline protection projects.
Energy Sector - Planning	
Emergency Response Plan – Energy Sector	• Develop an emergency response plan that outlines activities and procedures for the CUC energy sector to follow in case of incident, from disaster preparation to post-disaster recovery. This plan could identify opportunities to incorporate SSG when recovering
Critical Facilities Energy Management Plans	• Develop energy management plans for key facilities.
Integrated Resources Plan	• Implement the 2015 CUC Integrated Resources Plan. This plan identifies energy supply options and determined that demand-side management and large solar installations are projected to be less costly than diesel generators.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Energy Sector - Operational	
Enhanced generation / transmission management	• Increase generation capacity and improve load management. • Increase power plant efficiency through integration of technologies with higher thermal efficiencies. • Reduce water use at power plants via dry and hybrid cooling systems. • Increase vegetation management near powerlines. • Speed up service restoration post disaster to critical customers via supply reconfigurations (e.g., install switches and other equipment along supply feeders). • Promote energy efficiency programs for customer (e.g., "Energy Scout") load control receivers that can control hot water heaters and air conditioners during critical periods. • Consider time-use rates for commercial and industrial customers that encourage large users to shift demand to off-peak times.
Energy Sector - Capital / Infrastructure	
Enhanced generation / transmission resiliency	• Relocate or elevate vulnerable facilities such as fuel storage tanks and loading docks. • Develop and utilize smartgrids, microgrids, controlled islanding, distributed generation, and technologies to maintain service and minimize system vulnerabilities. • Place transformers and other essential infrastructure in safer and more secure locations. • Selectively install underground transmission and distribution lines (critical corridors to maintain system supply). • Selectively install hardened utility poles. • Harden towers, substations, conductors, and transformers. • Build redundant and sectionalized circuits to prevent widespread outages on backbone lines. • Replace electromagnetic relays with micropressor-based relays. • Incorporate submersible transformers, switches, and pumps. • Require structures to have lightning rod grounding and encourage use of power surge protection devices.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Energy Sector - Capital / Infrastructure	
Alternative / renewable energy	• Increase development of alternative or on-site power supplies. "Off-grid" power sources include solar, wind, inline microturbines and biogas (i.e., methane from wastewater treatment). New and back-up electrical equipment should be located inland and designed to resist damage from flooding and high winds. • Configure grid system to allow for solar interconnection / Net metering. • Encourage construction of "green" buildings that use the LEEDS Rating System and other similar systems. Require "green" buildings for new construction of public buildings. • Consider solar gardens (small community installations that serve local customers who buy or lease shares) to let residents who cannot install photovoltaic panels on their homes to buy solar (renters, multifamily buildings, roofs unsuitable for solar installation, upfront cost of panels too high). Solar gardens can make good use of land that would otherwise be difficult to develop. • Replace electric hot water heaters with solar in existing buildings. • Adopt building code standards that mandate use of solar hot water heaters in newly constructed homes (provide tax credits). • Use green roofs or roofs that reflect sunlight away from buildings, add porches with roofs. Strategically plant shade trees. • Provide adequate shade / shelter and climate control for critical infrastructure and public utilities. Strategically plant shade trees.
Water Sector - Planning	
Emergency Response Plan for Water Sector	• Develop an emergency response plan that outlines activities and procedures for CUC Water Sector to follow in case of incident, from disaster preparation to post-disaster recovery.

Drought response	• Develop an Emergency Response Plan for severe drought conditions. Include drought stages and triggers, water use reduction goals, water use restrictions, and enforcement provisions.
	  ○ Establish a drought response team with utility staff knowledgeable in operations, communications, regulatory requirements, legal impacts and financial planning.
	  ○ "Practice the Drought" with the drought response team and external stakeholders to uncover operational difficulties.
	  ○ Develop criteria and codes for various phases and steps of drought. Limit water use, restrict use of public water for nonessential purposes. Prioritize water for emergencies such as firefighting.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Water Sector - Planning	
Drought response	○ At start of drought take immediate actions to maintain service by increasing storage and reducing water use. This involves ensuring water for essential services such as medical care, fire protection, and general health and sanitation. ○ During drought reduce pressure throughout all or part of the distribution system while maintaining necessary pressure for high-priority users such as hospitals and firefighters. ○ Develop frequent, frank, clear, simple and consistent drought communication using all available methods to get customers to understand the severity of the drought and to encourage them to reduce water use. ○ Adopt special drought rates
Water Sector - Operational	
Enhanced water supply management	• Look for ways to manage existing supplies through demand-management, or modify system operations to increase supplies. Leverage system operator's ideas to reduce initial project costs and long-term operating costs. • Increase monitoring frequency of water supply and well production to detect changes in supply availability and forecast availability. • Implement a rate structure that will stabilize revenues to cover fixed costs, but has conservation pricing (tiered and seasonal rates) to send a pricing signal to help reduce demand. • Base rate structure on metered use. Implement a universal metering program, including plans for meter testing, repair and periodic replacement. • Set up rebate, distribution or installation programs for Water Sense or ENERGY STAR certified high-efficiency toilets, urinals, clothes washers, shower heads, water heaters, commercial dishwashers, ice machines, irrigation technology or other water-saving appliances.. • Install water-saving appliances in all municipal buildings. • Finance and facilitate systems to recycle water. Recycling greywater frees up finished water for other uses and decreases wastewater discharge. • Reduce agriculture and irrigation water demand – install advanced equipment (e.g., drip irrigation systems with water linked controls).

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Water Sector - Operational	
Enhanced water supply management	• Promote water efficient landscape practices. Plant ornamentals and lawn covers that do not require large amounts of water. • Encourage industrial and commercial customers to harvest rainwater and to collect condensate from large cooling systems to be used for on-site irrigation and other non-potable uses. • Ensure fire hydrants are tamper proof to eliminate unauthorized consumption of water.
Enhanced aquifer management	• Model and monitor groundwater conditions: Understanding and modeling groundwater conditions will inform aquifer management and projected water quality changes. Incorporate monitoring data for aquifer water levels, changes in chemistry, and saltwater intrusion levels into models to predict future supply. • Use permeable surfaces in places such as driveways, parking lots, and other surfaces to reduce runoff and promote groundwater recharge.
Water Sector - Capital / Infrastructure	
Enhanced water supply resiliency	• Construct new wells and treatment facilities in low-risk areas and armor those in floodplains. • Provide and maintain backup generators to enable continued service. Strengthen installation with hardened (concrete) utility poles, generator houses, and underground conductors and switch gear. • Purchase potable water treatment units prior to emergency and plan for pre-approval, certification, operation, monitoring, siting, and utility interface.
Enhanced aquifer resiliency	• Retrofit water delivery systems: enlarge water storage capacity, eliminate breaks, leaks and water theft (current loss rate estimated at 200 million gal/month) • Build additional infrastructure for aquifer storage and recovery. Increasing the amount of groundwater storage available promotes recharge. • Build percolation basins and injection wells for aquifer recharge. • Provide matching funds ($3 million) needed to construct NRCS planned 70 MG reservoir for Kagman agriculture use and aquifer recharge.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Wastewater Sector - Planning	
Emergency Response Plan for Wastewater Sector	• Develop an emergency response plan that outlines activities and procedures for CUC Wastewater Sector to follow in case of incident, from disaster preparation to post-disaster recovery.
Wastewater Sector - Operational	
Enhanced wastewater system management	• Actively monitor added wastewater loads for impacts on remaining systems capacity. • Conduct stress testing on wastewater treatment biological systems to assess tolerance to increased temperatures. • Improve pumps for backflow prevention. Sea-level rise and coastal storm surges can cause wastewater outlets to backflow. Stronger pumps may be necessary to prevent the backflow. • Incorporate climate change water table projections when siting septic systems. Areas with septic tanks face serious challenges with sea-level rise. Higher groundwater and sea level will impact septic systems leading to wastewater contamination. • Create a risk-based tiered approach, where areas susceptible to groundwater rise or other contact with surface waters are more protected from septic system wastewater contamination. • Require advanced/innovative septic treatment in high-risk areas. • Create incentive programs to encourage addressing failing septic systems, and/or switch over to advanced/innovative septic treatment systems.
Wastewater - Capital / Infrastructure	
Enhanced wastewater system resiliency	• Construct treatment plants on low-risk areas and armor those in floodplains. • Provide and maintain backup generators for pump stations to enable continued service. Strengthen installation with hardened (concrete) utility poles, generator houses, and underground conductors and switch gears.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Wastewater - Capital / Infrastructure	
Enhanced wastewater system resiliency	• Model and reduce inflow/infiltration in the sewer system. More extreme storm events will increase the amount of wet weather infiltration and inflow into sewers. Sewer models can estimate the impacts of increased flows on wastewater collection system and treatment plant capacity and operation. Potential system modifications to reduce those impacts include infiltration reduction measures, additional collection system capacity, offline storage or additional peak wet weather treatment capacity.
Transportation Sector - Planning	
Emergency Response Plan for Transportation Sector	• Develop an emergency response plan that outlines activities and procedures for Transportation Sector to follow in case of incident, from disaster preparation to post-disaster recovery.
Transportation Plan	• Limit access to hazard areas, guide growth to safe locations, design to function under disaster conditions (e.g., evacuation). • Improve planning and design for roads (new routes, designs, materials) to reduce damage from increased heat. • Plan schools and public facilities to be accessible by multiple modes (walking, biking, driving, or transit) to reduce automobile reliance during times of emergency.
Transportation Sector - Operational	
Enhanced transportation system management	• Improve drainage by regular monitoring to make sure drainage systems remain free of obstructions. • Design road networks with multiple levels of stormwater drainage to remove water from roadways and prevent treatment systems from becoming overwhelmed. • Select urban trees that are less prone to fall during high winds to minimize obstructions to roadways and conduct regular tree trimming. • Acquire and maintain road clearing equipment to enhance preparedness.
Transportation Sector - Capital / Infrastructure	
Enhanced transportation system resiliency	• Raise roadways on piers or fill or, significantly improve drainage systems. Utilization of piers is the preferred choice because fill can compound flooding problems by impounding water. • Relocate key arteries to more inland locations.

Table 7.1 Utilities; Design, engineering and construction tools. (*cont'd*)

Tool Name	Tool Summary
Transportation Sector - Capital / Infrastructure	
Enhanced transportation system resiliency	• Raise or harden harbor facilities including docks, access roads, storage areas and tanks. • Build seawalls as required for infrastructure that cannot be relocated. • Provide natural vegetative buffer zones to reduce flooding and erosion along roadways and near harbor facilities.

7.2 Land Use Management Tools

To grow smarter and safer, adjustments to how development is planned, sited, designed, and constructed will need to be made over time. Many SSG measures have significant co-benefits, such as energy security, economic growth and job creation, public safety, that justify infrastructure investment now. Inclusion of SSG Principles in early stages of design can improve a project's attractiveness and allow for multiple uses (e.g., Inos Peace Park) and support other community functions such as economic activity and public health.

Important developments located in high-hazard areas should be relocated if possible. Flood mitigation and other retrofit protective measures to enhance the structural integrity, overall performance, and functionality of developments that cannot be relocated to low-hazard areas should be considered.

The natural world provides many protective functions to the built environment for little or no cost. These ecosystem services can degrade overtime if natural resources are not protected, conserved, and managed. Also, as the climate changes and new weather patterns develop, the level of protection provided by natural features may change. For example, as sea levels rise waves may overtop the barrier reef with more energy and result in more wave-run up and beach erosion. Establishing living shorelines by planting native coastal vegetation (or selected introduced species) is an example of green infrastructure that can slow coastal erosion. Watersheds provide other essential ecosystem services such as increased water infiltration, reduced storm water run-off, increased water recharge potential, and improved near-shore water quality.

Figure 7.4 Limited vegetation types and abundance leads to eroding shoreline with utilities exposed.

The tools in Table 7.2 can help CNMI officials select actions to improve land use functions and to restore, maintain, and enhance natural ecological processes.

Land use management is integral with most SSG Principles, is among the most important factors for all planning initiatives and is the common denominator for all infrastructure and development initiatives. Land use is best determined through use of data and is best managed through regulation. A highly developed and well-maintained GIS database, contemporary vulnerability assessments, and enhanced regulations are key to aligning land use with SSG objectives. Continued development of GIS capabilities in the CNMI, and the application of the regulations review provided in Appendix B, are important first steps for using the tools presented in Table 7.2.

Figure 7.5 The resilient design at Smiling Cove Marina, Saipan helps dissipate wave energy to reduce shoreline erosion and promotes recreation in open space.

Table 7.2 Land use tools.

Tool Name	Tool Summary
Ecosystem-based Tools	
Open space preservation and conservation	• Set aside high-risk areas as open space to prevent development in these areas to limit damage from storm flooding and sea-level rise. Open spaces provide protection from wind and storm-driven wave action and wind damage. These areas can be limited to a particular land use such as agriculture or recreation, which can better sustain occasional flood waters, and cost of any damage that occurs is lower. • Offer incentives to land owners that encourage creation of conservation easements to preserve open space. Easements manage development while allowing land owners to retain title.
Shoreline protection	• Increase shoreline setbacks and establish rate-based setbacks at relevant sites based on erosive history. Establishing geographical setbacks in high-risk areas that account for potential sea-level rise can clearly delimit inappropriate development land issues, alert the public to flood risks, and limit inappropriate development. • Trap or add sand through beach nourishment (addition of sand to a shoreline to enhance or create a beach area). • Incorporate cobble beaches, mudflats, or other natural shoreline features. • Create planted dunes along backshores of beaches; including planting dune grasses and sand fencing to induce settling of wind-blown sands.
Ecosystem creation, restoration, and enhancement	• Create living shorelines and wetland restoration to offer ecosystem-based protection. These active ecological strategies can help maintain and potentially expand the existing coastal area, thus delaying impacts of sea level rise and coastal inundation. ○ Living shorelines are a type of soft protection structure that may restore, protect, and enhance the natural shoreline. ○ Living shorelines utilize vegetation and fill that is sometimes combined with additional shoreline protection elements to contain sediment, build additional coast, and reduce wave energy. ○ Incorporate native low- and high-marsh vegetation augmented by regionally specific coastal plants. ○ Re-establish coral, seagrass, and mangroves at some aquatic sites. ○ Consider installing marine-safe concrete for coral establishment. ○ Create, restore, and enhance wetlands to minimize disruptions caused by storms. This process is accomplished by planting and seeding, water flow modification, sediment diversion, dredging, removing impediments to natural processes, and invasive species control. • Create, restore, and enhance upland riparian buffers for flood control.

Table 7.2 Land use tools. (*cont'd*)

Tool Name	Tool Summary
Ecosystem-based Tools	
Ecosystem creation, restoration, and enhancement	• Exchange private property in the floodplain for government owned land outside the floodplain (utilize CNMI land transfer regulations DPL 145-40, 145-50, 145-60). • Purchase coastal land that is damaged or prone to damage and use it for conservation ecosystems (utilize CNMI land transfer regulations DPL 145-40, 145-50, 145-60).
Ecosystem protection and maintenance	• Reduce non-climate anthropogenic stressors (e.g., excess nutrient inputs, introduction of invasive species, overfishing) to make ecosystems more resilient to stressful climatic events.
Green infrastructure	• Utilize green infrastructure to help reduce runoff and stormwater flows. Examples of green infrastructure include: ○ Bio retention areas (rain gardens), ○ Low impact development methods, green roofs, ○ Swales (depressions to capture water), and ○ The use of vegetation or pervious materials instead of impervious materials. • Remove shoreline hardening structures such as bulkheads, dikes, and other engineered structures to allow for shoreline migration. • Replace shoreline armoring with living shorelines – through beach nourishment, planting vegetation, etc. • Create new flood storage capacity within redevelopment in vulnerable areas by promoting parks and other open spaces in vulnerable area and creating shallow depressions in properties that can accommodate isolated inundation events.
Permitting Tools	
Scenarios	• Consider relative hazard vulnerability levels in future DCRM permitting decisions and coastal development or re-development conditions. Follow the proposed coastal flooding scenario for 50 years of SLR with seasonal extremes and storms (SLR50_ONDTY). This scenario projects that by the year 2067 (50 years) cumulative sea level change will be 3.16 meters higher.
Retreat / Relocate	• Incentivize relocation out of high-hazard areas and reduce or prohibit rebuilding after a disaster. This strategy can preserve open space to use as flood mitigation and recreation on non-developable, high-hazard lands. • Utilize CNMI land transfer regulations (DPL 145-40, 145-50, 145-60) to redirect development from high-hazard areas to preferred low-hazard areas.

Table 7.2 Land use tools. (*cont'd*)

Tool Name	Tool Summary
Permitting Tools	
Retreat / Relocate	• Implement rolling development restrictions that "move landward" or "roll" as the tide line moves landward – allows property owners to use their land under the regular applicable land use laws until the sea level rises to the point that it affects the safety of land use in that area. • Adjust setback requirements to reflect varying degrees of vulnerability along the shoreline, instead of static, broad application of a single setback measure. • Place permanent conservation or hazard mitigation easements for high-hazard area properties. • Require building-level design for disassembly/adaptability planning (known as design for de-construction) to reduce the environmental impacts of buildings that must be moved or disassembled due to sea level rise.
Retrofit	• Undertake flood mitigation and other protective measures to enhance the structural integrity, overall performance, and functionality of facilities such as tourist developments that are located in high-hazard areas. • Retrofit existing structures with resilient or flood and wind-proof modifications such as elevating structures, reinforcing roofs and doors, anchoring buildings to foundations, installing shutters on windows, replacing exterior building components with hazard-resistant alternatives, modifying structures to allow flood waters to enter and escape, and sealing structures to prevent water from entering. • Replace vertical walls along drainage banks with more gradual slopes to create increased channel area.
Build Better	• Continue to identify "better building" principles and practices and incorporate them into regulatory updates, incentives, and policies. • Consider cooperative agreements or memorandums of understanding with DCRM, DPW, CUC, and Zoning to support the joint publication of guidance or adoption of "climate smart" development BMPs in high hazard areas.
Zoning Tools	
Flood Hazard Zoning	• Adopt revised flood hazard zoning that increases specificity of vulnerable areas and provides more detailed guidance on development within these areas. DPW regulations currently require this practice, and consistent application of regulations should be monitored and enforced.

Table 7.2 Land use tools. (*cont'd*)

Tool Name	Tool Summary
Zoning Tools	
Overlay Zoning	• Establish overlay zoning districts to direct new development. Overlay zones allow the government to superimpose additional regulatory requirements on an existing zone to add supplemental regulation in areas with special characteristics such as areas most vulnerable to sea-level rise impacts. Overlay zones can include: ○ Protection zones – areas with critical infrastructure where coastal armoring is permitted and soft-armoring employed where feasible. ○ Accommodation zones – areas where new development is allowed but intensity and density are limited, hard shoreline armoring is limited, and structures are required to be designed or retrofitted to be more resilient to flood impacts. ○ Retreat zones – areas where hard-armoring and rebuilding of damaged structures is prohibited, and removal and relocation of inundated structures is required. ○ Preservation zones – areas where important natural resources, ecosystems, habitats, or flood buffers are preserved.
Other Land Use Tools	
Community / Village / Watershed Plans	• Ensure all future community plans and studies consult existing hazard mitigation and disaster risk reduction plans or studies, including climate change vulnerability assessments. Follow the proposed coastal flooding scenario recommended for 50 years of SLR with seasonal extremes and storms (SLR50_ONDTY). This scenario projects that by the year 2067 (50 years) cumulative sea level change will be 3.16 meters higher.
Natural Hazard Disclosures	• Require natural hazard disclosure for property purchases, leases, and renters.
Social Justice	• Ensure that retrofit and relocation decisions are appropriate for the people most at risk, which often includes disadvantaged low income, elderly, or minority populations, and that everyone's interests and needs are considered equitably.
Insurance	• Promote the use of insurance mechanisms and other financial instruments. Adequate insurance can insulate property owners from financial losses due to extreme weather events.
Dual use of facilities	• Encourage dual use of facilities (e.g., high rise hotels that serve as vertical evacuation areas for schools in shoreline hazard zones, and commercial buildings used for community shelters).

7.3 Post-Disaster Recovery Tools

The post-disaster period provides a significant influx of funding sources that can be used for hazard mitigation purposes. Including hazard mitigation in recovery is fundamental to achieving a disaster-resilient community and is key to disrupting the cycle of rebuilding in areas vulnerable to future hazards. Understandably, the recovery process focuses strongly on the immediate needs, but the recovery process should also improve a community's ability to recover from future disasters.

Post-disaster recovery is best achieved through pre-disaster planning. Pre-disaster planning for recovery is critical to efficiently direct efforts following a natural disaster and to prepare for long-term recovery. Without a plan, recovery efforts are *ad hoc* and slow the return of community stability. Using a collaborative approach to develop a pre-disaster plan establishes resilience through government leadership and structure, forms communication channels, and builds whole-community partnerships to support recovery efforts. The US Department of Homeland Security and FEMA provide many tools under the National Disaster Recovery Framework to assist local governments and communities to identify critical components to include in pre- and post-disaster recovery plans, such as sector-specific plans for the recovery of essential services and for localized community plans (i.e., Village plans). The underlying idea of developing pre-and post-disaster plans before an event is to provide planners the opportunity to better understand how short- and long-term decisions made after a disaster will affect ongoing development priorities. Specific components of pre-disaster plans for CNMI need to be determined by government officials and agency staff. The tools below can guide pre- and post-disaster plan development in a manner that is consistent with SSG Principles and continue to reduce vulnerabilities over time. Selected tools to aid in pre- and post-disaster planning and post-disaster recovery are provided in Table 7.3. Additional resources and tools available under the National Disaster Recovery Framework are provided in Appendix C.

Figure 7.6 Wreckage from *Super Typhoon Soudelor* (August 2015). On the left are damaged utility poles and on the right is damage to the port.

Table 7.3 Post-disaster recovery tools.

Tool Name	Tool Summary
Post-Disaster Recovery Tools	
Adaptive management	• Use lessons learned during the recovery process to inform mitigation actions and pre-disaster recovery planning. Link recovery and mitigation to break the cycle of damage-repair-damage resulting from rebuilding without mitigation following disaster.
Recovery and rebuilding plans	• Create a pre-disaster rebuild and recovery plan that designates ○ When, where, and how rebuilding will occur after a disaster; ○ Which areas will be rebuilt according to existing plans and codes and which will be re-planned; ○ Whether rebuilt homes will be encouraged or required to be strengthened against future hazard events; and ○ Who will be in charge of coordinating and overseeing the recovery process. Integrate the plan with other major governing documents such as the *CNMI Comprehensive Sustainable Development Plan* and the Hazard Mitigation Plan.[1,2] • Revise local plans and development codes to permit interim or temporary land uses to support critical public facilities to facilitate and expedite recovery after a disaster event.
Voluntary mitigation	• Encourage private or voluntary structural mitigation during repair and recovery. Offer technical assistance for obtaining funding for mitigation upgrades. • Establish continuity plans for critical health care facilities.
Airborne damage assessment	• Conduct post-disaster damage assessments, if possible and when feasible, with unmanned aerial vehicles (UAV) or drones equipped with high-resolution cameras and, global positioning systems to help reduce costs and response time.
Recovery ordinance	• Pass a recovery ordinance, resolution, or administrative memorandum to help ensure that the authorities and processes needed to achieve recovery goals are in place before a disaster strikes. The recovery ordinance can accomplish the following: ○ Create legal authority for post-disaster interventions to modify future development; ○ Authorize recovery management organization; direct preparation of a recovery plan; ○ Establish temporary regulations covering extraordinary actions regarding private property (create a moratorium on development or allow expedited demolition or building permits, fee waivers, and other approaches to accelerate recovery); and

Table 7.3 Post-disaster recovery tools. (*cont'd*)

Tool Name	Tool Summary
Post-Disaster Recovery Tools	
Recovery ordinance	○ Outline the protocols and lines of communication among all stakeholders involved with recovery planning and implementation. • Adopt a post-disaster redevelopment ordinance that establishes a redevelopment task force or advisory board that sets up temporary post-disaster regulations such as building moratoria and permits for repairs, streamline permitting processes, and waive fees. • Prioritize critical community facilities (e.g., emergency response center and potential shelters) for retrofitting and relocation.
Economic redevelopment	• The return of jobs, tourism, and other indicators of economic health are intertwined with housing recovery, infrastructure restoration, and health and social services provisions. ○ Economic recovery requires participation from the private sector. Include the private sector in emergency operations through an emergency support function for businesses and industry. ○ Develop a post-disaster economic redevelopment plan. ○ Goals to build back better can be translated to economic success. • Local government should work with the private sector to assess and track company and job losses, assist displaced workers, and understand the availability of skilled workers to meet employment demands after a disaster. • Develop a marketing and branding strategy for tourism renewal as a key component of economic disaster recovery.
Public health during recovery	• Major disasters result in numerous public health issues, from addressing immediate life and safety concerns to ensuring that long-term reconstruction provides safe and healthy living conditions. ○ Address short-term public health issues by prioritizing infrastructure restoration (water, sewage treatment) and restoration of hospitals and clinics. ○ Address longer-term public health issues by improving housing conditions, environmental justice, and restoration of safety standards (e.g., food service inspections).
Redevelopment restrictions	• Recognize that post-disaster reconstruction is the single greatest opportunity to bring existing vulnerable structures up to current or new safety codes. ○ Include mitigation in infrastructure repairs or relocate destroyed infrastructure.

Table 7.3 Post-disaster recovery tools. (*cont'd*)

Tool Name	Tool Summary
Post-Disaster Recovery Tools	
Redevelopment restrictions	○ Require structures destroyed more than 50% of their replacement cost to be rebuilt in conformance with current regulations and codes. Impose rebuilding restrictions on structures damaged less than 50% of their replacement cost. Apply more stringent rebuilding restrictions to structures that have been rebuilt more than once. Prohibit property owners from rebuilding structures large or further seaward. Allow reconstruction only without hard armoring of the shoreline. ○ Restore natural environmental functions that provide protection from hazards (wetlands, floodways, and beach and dune systems. Pair environmental restoration with projects to relocate substantially damaged structures.
Floodproof	• If buildings cannot be elevated or safeguarded by reliable flood barriers (for structural, financial, or other reasons) during restoration, floodproof buildings by dry or wet methods. ○ Dry floodproofing (preferred) keeps the building interior dry by holding water outside the structure. ○ Wet floodproofing lets water into the building but protects the structure, contents and building systems independently. Wet floodproofing can be a practical way to reduce flooding damage because it is flexible, can be done in stages, and may be the least expensive floodproofing option. Methods include: provide floor drains, use flood-resistant materials, create flushable, drainable walls to prevent wicking, elevate appliances and utilities, install barriers around appliances, and add a storage level above flood levels.[3]
Environmental restoration	• While environmental restoration may not be an immediate priority, degraded ecosystem services can impact the health, economy, quality of life, and hazard protection levels of the recovering community. Include plans to use recovery funds to repair conservation properties and acquire new properties for habitat restoration to strengthen the recovery plan.
Tool Resources	1. Pre-disaster Recovery Planning Guide for State Governments https://www.fema.gov/media-library/assets/documents/128572 2. Pre-disaster Recovery Planning Guide for Local Governments https://www.fema.gov/media-library/assets/documents/129203 3. FEMA Technical Bulletin 2, Flood Damage-resistant Materials https://www.fema.gov/media-library/assets/documents/2655 4. Flood Recovery Guidance http://lfma.org/drt/flood-recovery-guidance/

7.4 Funding Tools

A challenge to implementing SSG is determining how to pay for initiatives such as retrofitting vulnerable infrastructure, buy-out programs for vulnerable development, and land acquisitions. Added to the challenge is that many SSG projects address hazards potentials that are likely over the long-term. In the near-term, it is often difficult to justify the added expense for long-term projects, especially when governments are fiscally constrained and have difficulty funding short-term priorities. However, several tools are available to assist governments and communities to develop multiple approaches to fund SSG projects. The tools presented in Table 7.4 may be adapted to meet the specific needs of CNMI. Also, many Federal agencies provide funding opportunities to help governments fund long-term projects that will foster SSG. Links to websites are provided with each opportunity listed below.

Source: FEMA Hazard Mitigation Grant Program.

Table 7.4 Funding tools.

Tool Name	Tool Summary
Funding Tools	

Multi-pronged financial strategy	• Develop a multi-pronged financing strategy at government, private sector, and philanthropic levels to address costs of adaptation.
	  ○ Bond programs (General Obligation bonds backed by general fund or Revenue Bonds provisions of service, e.g., energy supply or taxes such as sales tax, fuel tax, or hotel occupancy tax).
	  ○ Parcel or Sales Tax (investments made over time).
	  ○ Tax-based and Fee-based Special Districts (geographically limited area).
	  ○ Approach philanthropic interests such as the Rockefeller and MacArthur foundations to gain support for increasing CNMI's resilience.
	  ○ Infrastructure Financing Districts (special district created to finance a project located in a redevelopment area with seed financing from infrastructure bonds that are eventually paid back by increments in property taxes).
	  ○ Development and Construction Loans for non-hazardous areas (funds secured by a mortgage, to finance construction and installation of improvements to convert raw land into construction-ready building sites).
	  ○ Revolving Loan Funds (offers capital for projects that can provide return on investment, e.g., sewage systems, drainage systems, parks) thus creating a self-replenishing pool of capital for similar projects.
	• Consider drought recovery funding sources that include conservation rate structure (tiered rates for greater use), emergency pricing or surcharge, dedicated conservation or drought response fund, dedicated sales tax, CNMI and Federal funding (grant or loan).
	• Create sustainable funding for stormwater infrastructure – assess a stormwater fee based on the management of a property's impervious ground coverage and stormwater runoff contribution. Compactly developed lots incur smaller fees as do parcels that use green infrastructure techniques such as permeable paving and rain gardens to reduce runoff and impervious coverage. To gain public acceptance of the fee, clearly link the fee to preventing or paying for impacts to water quality and flooding, and encourage green infrastructure by reducing fees if property owners install cisterns, rain gardens, permeable paving, and similar features.
	• Include climate change as a central topic for funding proposals for agricultural development on the islands, especially through Northern Marianas College – Cooperative Research Extension and Education Service (NMC-CREES).

Table 7.4 Funding tools. (*cont'd*)

Tool Name	Tool Summary
Funding Opportunities	
FEMA	• Listing of Disaster Recovery Funding Resources by Agency (FEMA website) https://www.fema.gov/media-library-data/1474548130660-db3c22abcc037416428fe7db69d45926/FundingResources.pdf • Climate Resilient Mitigation Activities eligible for mitigation: aquifer storage and recovery; floodwater diversion storage and recovery; and floodplain and stream restoration. This program encourages using green infrastructure or nature based design to develop and implement mitigation activities and incorporate more nature-based elements that include ecosystem service benefits. https://www.fema.gov/hazard-mitigation-assistance-mitigation-activity-chart
FEMA Hazard Mitigation Framework	• The Pre-Disaster Mitigation Program is a competitive program that annually provides funds to manage risk by implementing hazard mitigation planning and mitigation projects before a disaster. https://www.fema.gov/grants https://www.fema.gov/hazard-mitigation-assistance • The Hazard Mitigation Grant Program provides funds after a Presidential disaster declaration to protect public or private property through various mitigation measures based on local priorities. https://www.fema.gov/grants https://www.fema.gov/hazard-mitigation-assistance • The Flood Mitigation Assistance program is a competitive program that annually provides funds for projects that reduce or eliminate the long-term risk of flood damage to buildings, homes, and other structures that are insured under the FEMA's National Flood Insurance Program. https://www.fema.gov/grants https://www.fema.gov/hazard-mitigation-assistance • FEMA Property Acquisition program funds governments to purchase destroyed or severely damaged properties, remove the buildings, and maintain the land as open space. FEMA will pay 75% of the fair market value of the property before the disaster struck, while communities are responsible for administering funds and paying costs usually associated with real estate costs. Property owner participation is voluntary. https://www.fema.gov/media-library-data/1487973067729-d34bd451527229a45bad0ef5ac6ddf93/508_FIMA_Acq_FAQs_2_24_17_Final.pdf
Other FEMA Programs	• FEMA Public Assistance Program funding for improved or alternate project options when restoration of the damaged facility is not in the best interest of the public https://www.fema.gov/9500-series-policy-publications/952513-alternate-projects

Table 7.4 Funding tools. (*cont'd*)

Tool Name	Tool Summary
Funding Opportunities	
Other FEMA Programs	• The Community Rating System (CRS) is a voluntary incentives program that recognizes and encourages community floodplain management activities that exceed the minimum National Flood Insurance Program (NFIP) standards. Depending on the level of participation, flood insurance premium rates for policyholders can be reduced by 45%. https://www.fema.gov/community-rating-system
Department of Interior	• "Energizing Insular Communities Program" with the key goal of lowering energy costs to consumers. http://www.federalgrants.com/Energizing-Insular-Communities-69993.html
National Oceanic and Atmospheric Administration	• NOAA's Coastal and Estuarine Land Conservation Program (CELCP) provides support for state and local governments to purchase coastal and estuarine lands that are important for ecological, historical, recreational, or aesthetic values https://coast.noaa.gov/czm/landconservation/
Housing and Urban Development	• US Department of Housing and Urban Development (HUD) Block Grant program: Provides resources to address a wide range of community development needs. https://www.hud.gov/program_offices/comm_planning/communitydevelopment/programs
Economic Development Administration	• US Economic Development Administration (EDA) Economic Development Assistance Program: Supports construction, technical assistance, and revolving loan fund projects to implement economic development strategies in distressed communities. https://www.eda.gov/grants/
Environmental Protection Agency	• List of Smart Growth National Funding Opportunities (EPA website) https://www.epa.gov/smartgrowth/smart-growth-national-funding-opportunities • EPA State Revolving Fund https://www.epa.gov/cwsrf https://www.epa.gov/drinkingwatersrf
US Department of Agriculture	• US Department of Agriculture Rural Development Loan and Grant Program https://www.rd.usda.gov/programs-services/rural-economic-development-loan-grant-program
Small Business Administration	• The Small Business Administration Disaster Loan Program provides low interest disaster loans to help businesses and homeowners recover from declared disasters and can also can lend up to 20 percent over the amount of a repair loan for mitigation activities. https://www.sba.gov/funding-programs/disaster-assistance

7.5 Market-Based Tools

One of the most effective and popular strategies to encourage green infrastructure and green building is to incentivize the market by providing advantages for selection of SSG principles in proposed development. "Green infrastructure" is a cost effective, resilient approach to managing wet weather impacts. "Green Building" can be defined as the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials, and reducing the potential negative impacts buildings have on human health and the environment through better siting, design, construction, operation, maintenance, and removal. Sustainable resilient buildings seek to limit resource consumption and environmental impacts over the life of buildings – from initial resource extraction to waste disposal – while simultaneously providing building occupants an optimized environment.

Types of SSG activities that could be made eligible for incentives include:

- Reduction and mitigation of stormwater runoff and erosion (e.g., downspout disconnection, rainwater harvesting, cisterns, rain gardens, planter boxes, bioswales, permeable pavements, green parking, green roofs, land conservation);
- Wetland protection through mitigation banking, permittee-pay, and in-lieu fee programs;
- Reduced exposure to risk in coastal hazard areas including shoreline setback requirements and buffer enhancement in high-risk areas;
- Standard application of low impact development and "green infrastructure" deployment in highly flood prone areas;
- Protection of natural hazard mitigation features such as strand vegetation, sea grass, and fringing reef structures;
- Additional BMPs for development and resource use activities
- Renewable energy development;
- Investments in energy-efficient buildings or components;
- Investments in systems to capture items from a company's waste stream for recycling or use by others;
- Manufacturing products from recycled materials;
- Undertaking environmental remediation activities;
- Use of alternate energy sources such as solar, wind, and biomass;
- Use of alternative fuels to power a company's fleet;
- Installation of pollution control devices.

Source: EPA 2015.

Source: Green Building Alliance 2013.

Incentives can either be considered on a "first-come, first-serve" basis or be strategically applied to particular watersheds, villages, or land use types that are the highest priority.

The importance of incentives to promote SSG is recognized in DCRM's *2016-2020 Section 309 Assessment and Strategy Report*. The goal of Strategy #1 in this report is to incentivize the use of more environmentally friendly development and building practices in the CNMI. The strategy aims to prioritize building practices to reduce the impacts of stormwater runoff and non-point source pollution on the shorelines and coastal waters and methods to build and enhance the resiliency of the CNMI's environment and communities under conditions of a changing climate.

The goals of Strategy #1 will be accomplished through development of an incentives program built into the DCRM's permitting system, and cooperative efforts with other regulatory and permitting agencies as well as the CNMI legislature, to implement similar incentive practices outside of DCRM. Tools to aid development of the program are provided in Table 7.5.

Table 7.5 Market-based tools (Incentives).

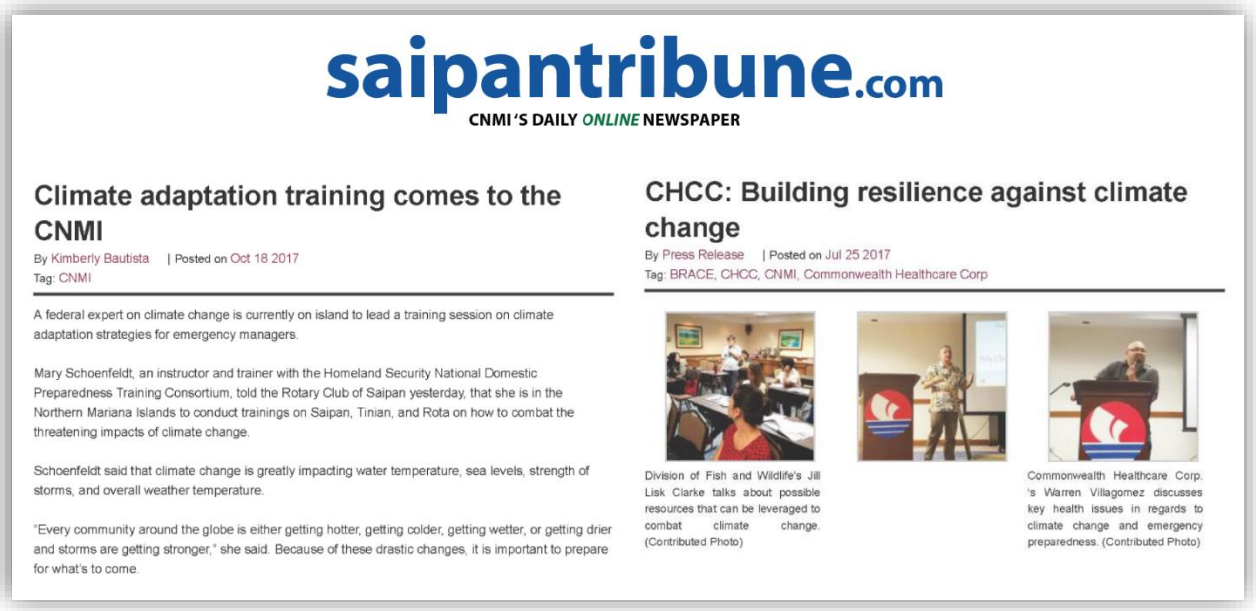
Tool Name	Tool Summary
Market-Based Tools	
Incentives	• Tiered permitting discounts for qualifying "Energy Star" rated or "LEED certifiable" projects (Tier 1 10%, Tier 2 15%, Tier 3 20%, Tier 4 25%). This incentive is currently in use; requirements for discounts are provided in Title 15 subsection (h)(5)(i)(A) and (B). • Tiered permitting discounts for best management practices (BMPs) including on-site recycling and composting, installation and utilization of "Energy Star" rated high efficiency / LED lighting and appliances, and building redevelopment (Tier 1 5%, Tier 2 10%, Tier 3 20%, Tier 4 30%, Tier 5 50 %). This incentive is currently in use; requirements for discounts are provided in Title 15 subsection (h)(5)(i)(A) and (B). • Develop a CNMI Incentives Fact Sheet for SSG Developers. • Conduct a study to determine how to best incentivize SSG practices. The study report should explore the following types of incentives: **Development Incentives** o Expedited permitting and decreased permitting fees o Zoning upgrades o Reduced stormwater requirements o Bonuses for density, height, floor/area ratio, reduction in landscaping requirements, or counting of green roof space as landscaping/open space o Parking requirement relaxation (reduce # of parking stalls required) o Technical assistance with designs and development **Grants / Loans** o Grants for green infrastructure practices (e.g., subsidize costs of green building certification, such as LEED) o Revolving loan funds

Table 7.5 Market-based tools (Incentives). (*cont'd*)

Tool Name	Tool Summary
Market-Based Tools	
Incentives	**Rebates/Installation Financing** ○ Tax credits (transferable or abatement) or tax reimbursements to property owners who develop green buildings or install green infrastructure ○ Incremental tax rebates offered at various levels of development ○ Rebates for energy efficient equipment and appliances ○ Funding cost share where the Government provides a percentage of the cost of installation of the practice (e.g., underground utilities) ○ Funding cost share for improvements to the public right-of-way **Awards/Recognition Programs** ○ Reward innovation and increase awareness of green infrastructure projects by the public and decision makers. Provide "Green-Certified" signs and publicity. **Utility Fee Discounts** ○ Discount stormwater utility fees to property owners who manage stormwater onsite ○ Discount power, water, wastewater and solid waste fees ○ Net metering (ability to sell renewable energy excess back to CUC) • Once the study is completed, develop and implement a program in the DCRM permitting system that will offer developers incentives to incorporate SSG practices into development projects. • Develop a citizen complaint program where citizens can submit a "Citizen Development Complaint" form with attached photographs / videos to BECQ regarding non-compliance with SSG permitting requirements. Citizens will collect a portion of any resultant fines levied on the developer.
FEMA National Flood Insurance Program	• FEMA's National Flood Insurance Program's (NFIP) Community Rating System (CRS). The voluntary incentive program recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. Flood insurance premium rates are discounted to reflect the reduced flood risks. The CRS provides credits for designated open-space corridors, natural shoreline protections and other areas that support native species, maintain natural ecological processes, and sustain air and water resources.
	• The NFIP currently has minimal coverage in the CNMI due mainly to the limited number of mortgages. Expanding the NFIP on a voluntary basis may lead to greater coverage and premium discounts.
Transferable development credits	• Implement Transferable Development Credits. Transferable development credits (TDCs) create market incentives to shift development to preferred areas. Zoning ordinances can (1) restrict development in vulnerable areas (designated as "sending areas"); (2) designate inland "receiving areas" where development is appropriate; and (3) establish and calculate a development credit market that gives affected landowners incentives to transfer development rights rather than build on threatened properties.

7.6 Capacity Building Tools

To effectively plan and move towards SSG development, communities and elected government officials as well as workers and the public at large must be knowledgeable about SSG. The government and community must also be aware of the need and advantages of responding in advance of vulnerabilities from a progressively changing climate. To effectively work toward SSG, the CNMI needs to further build impact assessments, planning, and disaster risk reduction capacities.



saipantribune.com
CNMI'S DAILY ONLINE NEWSPAPER

Climate adaptation training comes to the CNMI

By Kimberly Bautista | Posted on Oct 18 2017
Tag: CNMI

A federal expert on climate change is currently on island to lead a training session on climate adaptation strategies for emergency managers.

Mary Schoenfeldt, an instructor and trainer with the Homeland Security National Domestic Preparedness Training Consortium, told the Rotary Club of Saipan yesterday, that she is in the Northern Mariana Islands to conduct trainings on Saipan, Tinian, and Rota on how to combat the threatening impacts of climate change.

Schoenfeldt said that climate change is greatly impacting water temperature, sea levels, strength of storms, and overall weather temperature.

"Every community around the globe is either getting hotter, getting colder, getting wetter, or getting drier and storms are getting stronger," she said. Because of these drastic changes, it is important to prepare for what's to come.

CHCC: Building resilience against climate change

By Press Release | Posted on Jul 25 2017
Tag: BRACE, CHCC, CNMI, Commonwealth Healthcare Corp

Division of Fish and Wildlife's Jill Lisk Clarke talks about possible resources that can be leveraged to combat climate change. (Contributed Photo)

Commonwealth Healthcare Corp.'s Warren Villagomez discusses key health issues in regards to climate change and emergency preparedness. (Contributed Photo)

Many of the hazard assessments are conducted by external consultants or short-term contract workers, which does not necessarily help to build local capacity to implement actions. With expected risks from climate change, integrating specialized local knowledge in the planning efforts will ensure that it is possible to adapt to climate change. Improving local capacity further ensures that impacted communities and the government have conserved intellectual capital and retained knowledge to recover and be resilient. Tools to aid capacity building are provided in Table 7.6.

Table 7.6 Capacity building tools.

Tool Name	Tool Summary
Capacity Building Tools	
Enhanced capacity building	• Incorporate SSG concepts in high school and college curricula. • Develop continuing education curricula about SSG strategies for professionals, including construction managers, architects, developers, landscape architects, land use and hazard mitigation planners, lawyers, and realtors. Support the development of natural resource management planning and sciences at continuing education providers (NMC, NMTI). • Coordinate local capacity building efforts among agencies, professional organizations, extension groups, and others. • Train outreach specialists such as extension agents in SSG. • Build capacity in all key areas: administrative, technical, legal, regulatory, and fiscal. • Utilize the FEMA Local Capacity Building Support Catalog that contains resources useful to local governments recovering from severe disasters. It is a compilation of time sensitive and ongoing training, toolkits, and technical assistance offered by 40 federal and state departments, professional and trade associations, and national non-profit organizations. The catalog's purpose is to help local governments address knowledge and capacity gaps in disciplines necessary for long-term recovery. Most of the offerings are free or low cost. https://www.fema.gov/media-library/assets/documents/160154 • Utilize tools, such as Vulnerability Assessment and Local Early Action Planning (VA-LEAP), designed for island nations to build community capacity.

7.7 Community Engagement Tools

The successful implementation of SSG projects depends upon the knowledge and actions of all community stakeholders, including nongovernmental institutions and social networks. Governments alone cannot ensure SSG. Community leaders must be prepared to make decisions concerning SSG, before and after disasters.

Underlying effective adaptation is public comprehension of the challenges and the solutions offered by adaptation interventions.

Communication of complex science and engineering concepts and details to the general public is not easy. Regardless, this is essential and requires carefully crafted public programs that utilize formal education programs as well as traditional media such as newspapers and radio along with digital social media.

Figure 7.7 Participants of the 2017 Pacific Islands Environmental Conference, Saipan.

Several challenges to community engagement specific to the CNMI were identified in 2012 and 2014 during preliminary climate change adaptation planning efforts. Additional capacity building among agencies and stakeholders is needed to develop a collaborative process to work toward SSG. Also, the culture of decision-making is strongly influenced in the CNMI by traditional social structure. This may present opportunities to use engagement tools in smaller community village settings. Tools to aid community engagement are provided in Table 7.7.

Table 7.7 Community engagement tools.

Tool Name	Tool Summary
Community Engagement Tools	
Public participatory practices	• Build public support of adaptation solutions. Techniques to ensure public involvement from the initial stages of deliberations and to offer the means to overcome the "democratic deficit" of top-down planning include interactive community forums, public surveys, targeted interviews, community mapping exercises, and scenario building workshops. These processes result in a better informed population that has bought into the plan through their contributions to the decision-making process. • Create a forum for local government to facilitate discussion between planners and elected officials. This could take the form of a quarterly or semi-annual "summit" arranged by OPD or BECQ. • Form interdisciplinary teams to include the traditional marketing and social marketing expertise to support outreach and education efforts. • Disseminate best available hazard and climate risk information through community-based organizations and non-traditional partners. Seek opportunities to expand existing, successful community based programs (e.g., programs on crime, education or other important community issues) to better communicate hazard and climate risks and potential solutions to community members. • Include adaptive management planning considerations and dedicated funding to ensure that programs that support implementation are sustained long-term to overcome the tendency for communities to "lose the sense of urgency" after adaptations are completed. • Facilitate the permanent movement of people and communities from high-risk areas. Evacuation before storms is a long-standing adaptation and enables the reduction of risk. Transplanting families, neighborhoods, or entire communities to a different area permanently may occur depending on the severity of the risk (if we don't do it for ourselves, Nature may do it for us, e.g., recent Kilauea eruption). Residents will be extremely sensitive to any discussion of resettlement. In order for community members to make a decision about an adaptive move, they must receive information and support from local, territorial, and federal authorities. Equal attention must be directed to preparations at the departure and destination locations. This process can be financially burdensome. Provisions need to be made to compensate landowners who might decide to relocate, and sometimes, monetary incentives can facilitate the process. Funding resources (Section 7.4) may have programs to provide start-up funding for revolving loan programs from which low-interest, no-costs loans would be available to landowners.

Table 7.7 Community engagement tools. (*cont'd*)

Tool Name	Tool Summary
Community Engagement Tools	
Public outreach and education	• Develop consistent messages, sound bites, and locally relevant, short success stories about the benefits of SSG, emphasizing economic and health benefits, and share these messages with different stakeholders (e.g., developers, land use planners, and local decision makers). • Use a market-based approach to discourage investment in high-hazard area by communicating the potential costs and cost savings of different development approaches. • Build outreach initiatives on existing communication and education programs to improve dissemination of information regarding risks, vulnerabilities, and opportunities to build climate resistant systems. • Develop public understanding of post-disaster code compliance, build-back requirements, insurance coverage, and disaster assistance programs and options. • Prepare outreach and educational materials in languages other than English, to reach important target audiences: Chamorro, Carolinian, Filipino, Korean and Chinese are particularly important.

8.0 CONCLUSION

Smart, Safe Growth is achievable for the CNMI over the long-term. Persistent application of SSG Principles for planning documents and development projects, whether these be for government, utility, or private-sector, will create momentum towards Smart, Safe Growth. The shift from the present-day disaster-recovery cycle to a cycle of planning and building for resiliency will be incremental. It is not unreasonable to expect that several decades will pass before this shift is substantial. Daunting as the prospect of broad-scope change may seem, it is important to begin the groundwork. Government has the most important role. Leadership support, legislative action, regulatory consistency, and cohesion are key. Leadership from the Office of Planning and Development is vital to create and maintain cohesion among government elements and stakeholder groups for the persistent and coordinated application of SSG Principles in order to culture resiliency into growth. Support from the community at large and CNMI leadership in ongoing planning and implementation efforts is critical. The benefits realized tomorrow are the results of actions taken today. Implementation of the strategies presented in this *Guidance Manual*, and the use of the various tools, to the extent practicable within budgets and staffing, will place the CNMI on a course towards Smart, Safe Growth.

Next steps are left largely to the intuition and creativity of the many dedicated and committed staff of the CNMI resource, regulatory, and planning agencies. Suggestions from the authors to help propel local government SSG momentum are:

- Identify key personnel to be introduced to SSG and its importance in government and private-sector work cultures;
- Disseminate this *Guidance Manual* to a progressively widening audience;
- Convene a series of SSG workshops, beginning with identified key personnel, then progressively adding new members as SSG gains visibility and favor;
- Begin revisions and promulgation to enhance regulations;
- Provide within-agency SSG trainings to key personnel;
- Incorporate SSG Principles and Climate Adaptation Strategies as foundational concepts in the *CNMI Comprehensive Sustainable Development Plan*;
- Develop cross-walk between immediate critical infrastructure needs, federal programs and required plans, and federal funding opportunities to maximize the potential to secure federal funds to implement SSG for short-term critical infrastructure needs;
- Celebrate successful SSG projects with stakeholders and in the media to sustain public support and momentum for SSG implementation over the long-term.

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APPENDIX A – REVIEW CHECKLISTS FOR PLANNING DOCUMENTS AND PROPOSED PROJECT TECHNICAL SUBMITTALS

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

Project Name: _____ Proponent: _____

Location: _____ Value: _____

Development Category: _____ Description: _____

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Climate Adaptation (SSG P1)							
1. Does project consider long-term climate change impacts in the following areas:							
a. Sea-level rise	☐ Yes	☐ No	☐ N/A				
b. Coastal inundation/erosion	☐ Yes	☐ No	☐ N/A				
c. Increased tropical cyclone intensity	☐ Yes	☐ No	☐ N/A				
d. Change in precipitation patterns (drought/flood potential)	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Hazard Mitigation (SSG P2, P3, P4, P5)							
2. **Tropical cyclone and tropical storm** - Does the project include SSG to reduce risks from storms?	☐ Yes	☐ No	☐ N/A				
a. *High Wind Speeds* - Does the project include SSG mitigation / adaptation measures such as storm shutters, building alignment, etc.?	☐ Yes	☐ No	☐ N/A				
b. *Coastal Inundation / Wave runup* - Does the project include SSG mitigation / adaptation measures such as living shorelines, elevation, etc.?	☐ Yes	☐ No	☐ N/A				
c. *Heavy Rainfall* - Does the project include SSG mitigation / adaptation measures such as stormwater management, rain gardens, green infrastructure, etc.?	☐ Yes	☐ No	☐ N/A				
d. Does the project comply with DPW Building Safety Code for Typhoon Standards? (CNMI Reg. Title 155-10.1)	☐ Yes	☐ No	☐ N/A				
3. **Flood Hazard** – Is the project located in a CNMI Flood Hazard Zone? Link to DCRM Portal for maps	☐ Yes	☐ No	☐ N/A				
a. Does the project include SSG mitigation / adaptation measures to reduce potential risks / impacts from flooding?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Hazard Mitigation (SSG P2, P3, P4, P5) cont'd							
b. Does the project comply with DPW Flood Damage Prevention Regulations? (CNMI Reg. Title 155-10.2)	☐ Yes	☐ No	☐ N/A				
4. **Sea Level Rise / Change** - Is the project located in a Flood Hazard Zone based on the scenario (SLR50_ONDTY)? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
a. Does the project include SSG mitigation / adaptation measures to reduce potential risks / impacts from flooding	☐ Yes	☐ No	☐ N/A				
5. **Earthquake** - Is the project located near an identified fault line? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
a. Does the project include SSG mitigation / adaptation measures to reduce potential risks / impacts from earthquakes	☐ Yes	☐ No	☐ N/A				
b. Does the project comply with DPW Building Standards for Earthquakes? (CNMI Reg. Title 155-10.1)	☐ Yes	☐ No	☐ N/A				
6. **Drought** – Is the project located in a priority Groundwater Management Zone (GMZ)? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
a. Does the project include SSG mitigation / adaptation measures to reduce risks from drought?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Hazard Mitigation (SSG P2, P3, P4, P5) cont'd							
b. Does the project comply with DEQ regulations / permit requirements for GMZs? (CNMI Reg. Title 65-20)	☐ Yes	☐ No	☐ N/A				
c. Does the project have redundant / backup water systems?	☐ Yes	☐ No	☐ N/A				
7. **Wildfire** – If the project is located near grasslands or an area identified in the CNMI SSMP (2014, Appendix P), are SSG mitigation / adaptation measures to reduce risk from wildfire included?	☐ Yes	☐ No	☐ N/A				
8. **Tsunami** – Is the project located in an area at risk from Tsunami impacts (see SSMP, 2014, Appendix Q)?	☐ Yes	☐ No	☐ N/A				
a. Does the project include SSG mitigation / adaptation measures to reduce risks from tsunamis such as living shorelines, coastal set back, etc?	☐ Yes	☐ No	☐ N/A				
b. Does the project comply with DPW Flood Damage Prevention Regulations? (CNMI Reg. Title 155-10.2)	☐ Yes	☐ No	☐ N/A				
c. Does the project comply with HSEM evacuation plans / requirements?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Hazard Mitigation (SSG P2, P3, P4, P5) cont'd							
9. Is the project located on an Island with an active volcano? If yes, does the project consider SSG mitigation / adaptation measures to reduce risk from volcanic activity?	☐ Yes	☐ No	☐ N/A				
10. Does the project consider retrofitting existing infrastructure in hazard-prone areas?	☐ Yes	☐ No	☐ N/A				
11. Does the project consider implementing green infrastructure / living design elements to further reduce risk of identified hazards?	☐ Yes	☐ No	☐ N/A				
Incentives (SSG P*5*)							
12. Did project proponent apply for available / applicable regulatory / financial incentives?	☐ Yes	☐ No	☐ N/A				
Smart Growth (SSG P*6*, P*7*, P*8*, P*9*, P*10*, P*11*, P*12*)							
13. Does project consider BMPs identified in the CNMI Sustainable Development Manual (HW, 2018)?	☐ Yes	☐ No	☐ N/A				
14. Does project consider BMPs identified in the CNMI Sustainable Development Manual (HW, 2018)?	☐ Yes	☐ No	☐ N/A				
15. Does the project consider open space for recreation and resource protection meets DEQ minimum requirements (30%) for all projects over 1 ac?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Smart Growth (SSG P6, P7, P8, P9, P10, P11, P12) cont'd							
16. Does the project consider green infrastructure, soft stabilization measures, and living shoreline alternatives?	☐ Yes	☐ No	☐ N/A				
17. Does the project consider social vulnerabilities of the community in which the project is located?	☐ Yes	☐ No	☐ N/A				
18. Did the project proponent engage the community to meet minimum requirements?	☐ Yes	☐ No	☐ N/A				
19. Did the project proponent consider early community stakeholder engagement to gather community input?	☐ Yes	☐ No	☐ N/A				
20. Does the project include a review and update processes as part of an Adaptive Management Framework to promote the incorporation of lessons learned in future plans?	☐ Yes	☐ No	☐ N/A				
Environmental Protection and Ecosystem Services (SSG P7, P8, P12)							
21. Is the project located in an Area of Particular Concern (APC) as designated by BECQ-DCRM? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
a. If yes, does the project comply with APC management standards? (CNMI Reg. Title 15-10 Part 300).	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Environmental Protection and Ecosystem Services (SSG P7, P8, P12) cont'd							
22. Does the project consider protection and conservation of important Natural Resources, including, but not limited to:	☐ Yes	☐ No	☐ N/A				
a. Marine protected areas and coral reefs	☐ Yes	☐ No	☐ N/A				
b. Wetlands / Mangroves / Riparian Zones	☐ Yes	☐ No	☐ N/A				
c. Ecological critical habitats and endangered species	☐ Yes	☐ No	☐ N/A				
d. Watersheds (i.e., vegetated slopes)	☐ Yes	☐ No	☐ N/A				
23. Does the project consider green infrastructure, soft stabilization measures, and living shoreline alternatives?	☐ Yes	☐ No	☐ N/A				
Cultural Resources Protection (SSG P*9*, P*10*, P*11*)							
24. Is the project located near a Culturally Important site? www.cnmihop.net Link to Historic Preservation Office	☐ Yes	☐ No	☐ N/A				
25. Will the project potentially impact any cultural sites listed on the National Register of Historic Sites? www.cnmihop.net Link to Historic Preservation Office	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Development Projects – Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Cultural Resources Protection (SSG P6, P9, P10, P11) cont'd							
26. Will the project require a historic preservation review for any of the following:							
a. Does the project require an earth moving permit? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
b. Does the project require a Coastal Resources Management (CRM) major siting permit? If so, has an archeological survey plan or survey report been provided to or approved by the HPO? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
c. Does the project require federal permits or have federal funding?	☐ Yes	☐ No	☐ N/A				
d. Will the project affect historic structures or buildings? Link to Historic Preservation Office	☐ Yes	☐ No	☐ N/A				
27. Does the project plan address potential impacts to churches, cemeteries, and/or traditional burial grounds?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

Plan Name: _____ Preparer: _____

Location: _____ Description: _____

Planning Category: _____ _____

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Climate Adaptation (SSG P*1*)							
1. Does the plan consider long-term climate change impacts to design and cost determination for structures and site infrastructure in the following areas:							
a. Sea-level rise	☐ Yes	☐ No	☐ N/A				
b. Coastal inundation/erosion	☐ Yes	☐ No	☐ N/A				
c. Increased tropical cyclone intensity	☐ Yes	☐ No	☐ N/A				
d. Change in precipitation patterns (drought/flood potential)	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Hazard Mitigation (SSG P2, P3, P4, P5)							
2. Does the plan consider natural hazards and a changing climate and incorporate SSG principles to minimize vulnerability of identified risks?	☐ Yes	☐ No	☐ N/A				
3. Does the plan incorporate or consider the Standard State Mitigation Plan and Climate Vulnerability Assessments and include measures to reduce risks?	☐ Yes	☐ No	☐ N/A				
4. Has the plan been coordinated with the DPW to ensure compliance with Flood Damage Prevention Regulations? (CNMI Reg. Title 155-10.2)	☐ Yes	☐ No	☐ N/A				
5. Does the plan consider the selected SLR/SLC scenario SLR50_ONDTY as the basis for plan elements?	☐ Yes	☐ No	☐ N/A				
6. Has the plan been coordinated with the DPW Building Standards for Earthquakes and Tsunami? (CNMI Reg. Title 155-10.1 and Title 155-10.2)	☐ Yes	☐ No	☐ N/A				
a. Has the plan been coordinated with HSEM evacuation plans / requirements?	☐ Yes	☐ No	☐ N/A				
7. Has the plan been coordinated with DEQ regulations for Groundwater Management Zones? (CNMI Reg. Title 65-20) Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Hazard Mitigation (SSG P2, P3, P4, P5) cont'd							
a. Does the plan consider redundant / backup water systems?	☐ Yes	☐ No	☐ N/A				
8. Does the plan consider increased risk from wildfire and include SSG principles to lower the risk?	☐ Yes	☐ No	☐ N/A				
9. Does the plan consider impacts from volcanic activity and include SSG principles to minimize / mitigation risk?	☐ Yes	☐ No	☐ N/A				
10. Does the plan consider retreating from areas of highest risk as identified in the SSMP or on BECQ's permitting website? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
11. Does the plan consider retrofitting existing infrastructure in hazard-prone areas as identified in the SSMP or on BECQ's permitting website? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
12. Does the plan consider locating new critical facilities outside high-risk zones as identified in the SSMP or on BECQ's permitting website? Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Incentives (SSG P*5*)							
13. Are regulatory / financial incentives available to direct the project toward areas with low hazard risks?	☐ Yes	☐ No	☐ N/A				
14. Does the plan consider incentivization to promote actions that work towards SSG?	☐ Yes	☐ No	☐ N/A				
Smart Growth (SSG P*6*, P*7*, P*8*, P*9*, P*10*, P*11*, P*12*)							
15. Does plan incorporate BMPs identified in the CNMI *Sustainable Development Manual* (HW, 2018) for the identified areas of practice?	☐ Yes	☐ No	☐ N/A				
16. Does the plan provide for open space for recreation and resource protection?	☐ Yes	☐ No	☐ N/A				
a. At a minimum, does the plan meets DEQ minimum requirements (30%) for all projects over 1 ac?	☐ Yes	☐ No	☐ N/A				
17. Does the plan incorporate green infrastructure, soft stabilization measures, and living design elements to further reduce risk of identified hazards?	☐ Yes	☐ No	☐ N/A				
18. Was the plan coordinated with stakeholders per CNMI Regulations to promote fair, transparent decision-making processes?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Smart Growth (SSG P6, P7, P8, P9, P10, P11, P12) cont'd							
19. Were stakeholders (private and public) engaged early in plan development to encourage collaboration in development decisions?	☐ Yes	☐ No	☐ N/A				
20. Does the plan adequately describe proposed SSG principles / actions and their function in risk reduction to build community capacity / knowledge re: SSG principles?	☐ Yes	☐ No	☐ N/A				
21. Does the plan include review and update processes as part of an Adaptive Management Framework to promote the incorporation of lessons learned in future plans?	☐ Yes	☐ No	☐ N/A				
Environmental Protection and Ecosystem Services (SSG P7, P8, P12)							
22. Does the plan apply SSG principles to ensure protection of Areas of Particular Concern (APC) and compliance with standards designated by BECQ-DCRM? (CNMI Reg. Title 15-10 Part 300). Link to BECQ Public Permitting App	☐ Yes	☐ No	☐ N/A				
23. Is the plan adequately coordinated with other CNMI Natural Resources plans to encourage resource protection?	☐ Yes	☐ No	☐ N/A				
24. Does the plan address the use of SSG Principles to protect / promote the protective functions of key natural resource areas to enhance ecosystem services that protect the built environment?	☐ Yes	☐ No	☐ N/A				

CNMI Smart, Safe Growth (SSG) Checklist for Review of Planning Documents– Government Facilities, Commercial, Residential

	SSG Compliant			Noted Deficiency(ies)	Relevant Regulation(s)	Relevant Literature	Recommended Corrective Action(s)
Cultural Resources Protection (SSG P*9*, P*10*, P*11*)							
25. Does the plan consider SSG principles to protect Cultural Sites? Link to Historic Preservation Office	☐ Yes	☐ No	☐ N/A				
26. Does the plan address potential impacts to churches, cemeteries, and/or traditional burial grounds?	☐ Yes	☐ No	☐ N/A				
Planning Process (SSG P*9*, P*10*,)							
27. Was the plan coordinated with other CNMI agencies that may have overlapping jurisdictions / responsibilities / or provide a required service?	☐ Yes	☐ No	☐ N/A				

APPENDIX B – REGULATIONS REVIEW

CNMI Smart, Safe Growth (SSG) Guidance – Relevant Regulations

Table B.1 Review and Summary of CNMI Regulations for Conformance with SSG Principles

Chapter Title	Subchapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Conformance with SSG Principles[1] Strengths	Conformance with SSG Principles[1] Deficiencies
Bureau of Environmental and Coastal Quality – Titles 15 and 65					
Coastal Resources Management Rules and Regulations 15-10	N/A	1 CMC §§ 2081-2082 2 CMC §§1501-1543	Coastal Resources Management Act of 1983 (PL 3-47)	P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*	
Aboveground Storage Tank Regulations 65-5	N/A	1 CMC §§ 2646-2649 2 CMC §§ 3101-3134	Commonwealth Env. Protection Act of 1982 (PL 3-23)	P*4*	P*1*, P*2*, P*3*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Air Pollution Control Regulations 65-10	N/A	"	"	Not Applicable	Not Applicable
Drinking Water Regulations 65-20	N/A	"	"	P*1*, P*2*, P*3*, P*4*, P*6,* P*9*, P*10*, P*11*, P*12*	P*5*, P*7,* P*8*
Earthmoving and Erosion Control Regulations 65-30	N/A	"	"	P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*	
Harmful Substance Clean Up Regulations 65-40	N/A	"	"	Not Applicable	Not Applicable
Hazardous Waste Management Regulations 65-50	N/A	"	"	Not Applicable	Not Applicable
Litter Control Regulations 65-60	N/A	"	"	Not Applicable	Not Applicable
Pesticide Regulations 65-70	N/A	"	"	Not Applicable	Not Applicable

CNMI Smart, Safe Growth (SSG) Guidance – Relevant Regulations

Chapter Title	Subchapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Conformance with SSG Principles[1] Strengths	Conformance with SSG Principles[1] Deficiencies
Bureau of Environmental and Coastal Quality – Titles 15 and 65 cont'd					
Solid Waste Management Regulations 65-80	N/A	"	"	Not Applicable	Not Applicable
Underground Injection Control Regulations 65-90	N/A	1 CMC §§ 2646-2649 2 CMC §§ 3101-3134	Commonwealth Env. Protection Act of 1982 (PL 3-23)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Underground Storage Tank Regulations 65-100	N/A	"	"	P*4*	P*1*, P*2*, P*3*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Used Oil Management Rules and Regulations 65-110	N/A	"	"	Not Applicable	Not Applicable
Voluntary Response Program Regulations 65-115	N/A	"	"	Not Applicable	Not Applicable
Wastewater Treatment and Disposal Rules and Regulations 65-120	N/A	"	"	P*4*, P*5*, P*6,* P*7,* P*8*, P*9*	P*1*, P*2*, P*3*, P*10*, P*11*, P*12*
Water Quality Standards 65-130	N/A	"	"		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Well Drilling and Well Operations Regulations 65-140	N/A	"	"	P*4*, P*5*, P*6,* P*9*	P*1*, P*2*, P*3,* P*7,* P*8*, P*10*, P*11*, P*12*

CNMI Smart, Safe Growth (SSG) Guidance – Relevant Regulations

Chapter Title	Subchapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Conformance with SSG Principles[1] Strengths	Conformance with SSG Principles[1] Deficiencies
Commonwealth Utilities Corporation – Title 50					
Electrical Power Davison; Electrical Service Regulations 50-10	N/A	4 CMC §§ 8111-8158	Commonwealth Utilities Corporation Act of 2008 (PL 4-47)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6*, P*7*, P*8*, P*9*, P*10*, P*11*, P*12*
Sewer Division; Public Sewer Use Regulations 50-20	N/A	"	"		P*1*, P*2*, P*3*, P*4*, P*5*, P*6*, P*7*, P*8*, P*9*, P*10*, P*11*, P*12*
Water Services Division; Water Services Regulations 50-30	N/A	4 CMC §§ 8111-8158	Commonwealth Utilities Corporation Act of 2008 (PL 4-47)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6*, P*7*, P*8*, P*9*, P*10*, P*11*, P*12*
Interconnection and Net Metering 50-60 (Reserved, regulations not adopted)	N/A	"	"		P*1*, P*2*, P*3*, P*4*, P*5*, P*6*, P*7*, P*8*, P*9*, P*10*, P*11*, P*12*
Department of Land and Natural Resources – Title 85					
Division of Parks and Recreational 85-50	Commonwealth Parks, Recreational Facilities, and Tourist Sites 85-50.2	1 CMC §§ 2653, 2654, 2705	Public Lands and Natural Resources Administration Act of 1997 (PL 10-57)	Not Applicable	Not Applicable
Forestry Section; Forest Resources Protection Regulations 85-90	N/A	1 CMC §§ 2654	"	P*7*, P*8*	P*1*, P*2*, P*3*, P*4*, P*5*, P*6*, P*9*, P*10*, P*11*, P*12*

CNMI Smart, Safe Growth (SSG) Guidance – Relevant Regulations

Chapter Title	Subchapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Conformance with SSG Principles[1] Strengths	Conformance with SSG Principles[1] Deficiencies
Department of Public Lands – Title 145					
Administrative Hearing Procedure Rules and Regulations 145-10	N/A	1 CMC §§ 2801-2808	Public Lands Act of 2006 (PL 15-2 and 15-67)	Not Applicable	Not Applicable
Agricultural and Village Homesteads Rules and Regulations 145-20	Agricultural Homesteads Rules and Regulations 145-20.1	2 CMC §§ 4321-4328	Homestead Waiver Act of 1981 (PL 2-13)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
"	Rota Agricultural Homesteads Rules and Regulations 145-20.2	2 CMC §§ 4321-4328	Homestead Waiver Act of 1981 (PL 2-13)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
"	Tinian Agricultural Homesteads Rules and Regulations 145-20.3	"	"		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
"	Village Homesteads Rules and Regulations 145-20.4	"	"		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Commercial Use of Managaha Island Rules and Regulations 145-30	N/A	1 CMC §§ 2801-2808	Public Lands Act of 2006 (PL 15-2 and 15-67)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Land Compensation Claims Rules and Regulations 145-40	N/A	2 CMC §§ 4741-4751	Land Compensation Act of 2002 (PL 13-25, PL 13-39, PL 13-56, PL 14-29, and PL 15-2)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*

CNMI Smart, Safe Growth (SSG) Guidance – Relevant Regulations

Chapter Title	Subchapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Conformance with SSG Principles[1] Strengths	Conformance with SSG Principles[1] Deficiencies
Department of Public Lands – Title 145 cont'd					
Public Purpose Land Exchange Rules and Regulations 145-50	N/A	2 CMC § 4146	Public Purpose Land Exchange Authorization Act of 1987 (PL 5-33, § 1)	P*10*	P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*11*, P*12*
Submerged Land Rules and Regulations 145-60	N/A	2 CMC §§ 1201-1231	Submerged Lands Act of 1979 (PL 1-23)	P*4*, P*7,* P*8*, P*9*, P*10*	P*1*, P*2*, P*3*, P*5*, P*6,* P*11*, P*12*
Temporary Occupancy Rules and Regulations 145-70	N/A	1 CMC §§ 2801-2808	Public Lands Act of 2006 (PL 15-2 and 15-67)		P*1*, P*2*, P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*, P*11*, P*12*
Department of Public Works – Title 155					
Building Safety Division 155-10	Building Safety Code Rules and Regulations 155-10.1	1 CMC § 2404; 2 CMC § 7153	Building Safety Code of 1990 (PL 6-45, as amended)	P*3*, P*10*	P*1*, P*2*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*11*, P*12*
"	Flood Damage Prevention Regulations 155-10.2	1 CMC § 2404; 2 CMC § 7148	"	P*3*, P*4*, P*5*, P*6,* P*7,* P*8*, P*9*, P*10*	P*1*, P*2*, P*11*, P*12*
Roads and Facilities Division 155-20	Public Rights-of-way and Related Facilities Regulations 155-20.1	1 CMC § 2404; 2 CMC § 4134	Executive Branch Organization Act of 1978 (PL 1-8)	P*2*, P*3*, P*4*, P*7,* P*8*, P*9*, P*10*	P*1*, P*5*, P*6,* P*11*, P*12*
Solid Waste Management Division 155-30	Solid Waste collection and Disposal Regulations 155-30.1	2 CMC §§ 3511-3521	Commonwealth Solid Waste Management Act of 1989 (PL 6-30, § 1)	Not Applicable	Not Applicable

CNMI Smart, Safe Growth (SSG) Guidance – Relevant Regulations

Chapter Title	Subchapter Title	CMC Title / Section(s)	Statute Title (Public Law #)	Conformance with SSG Principles[1] Strengths	Conformance with SSG Principles[1] Deficiencies
Office of Homeland Security & Emergency Management					
None?			CNMI Homeland Security & Emergency Management Act 2013 (PL 18-4)		
Office of Planning and Development					
Under Development			CNMI Planning and Development Act 2017 (PL 20-20)		
Saipan Zoning Board – Title 165					
Saipan Zoning Board 165-30	Commonwealth Zoning Board Regulations 165-30.1	2 CMC §§ 7201-7255; 10 CMC §§ 3511-3517	Zoning Code of the CNMI of 1989 (PL 6-32)	P*4*, P*5*, P*6*, P*7*, P*8*, P*9*	P*1*, P*2*, P*3*, P*10*, P*11*, P*12*

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Coastal Resources Management (DCRM)

Regulation: Title 15-10 Coastal Resources Management Rules and Regulations

Description: Enabled by Public Law 3-47, the Coastal Resources Management Act of 1983, DCRM's regulations are intended to balance wise use and conservation within the CNMI. The 1983 legislation articulated twenty-three policy goals for coastal resource management that range from planning, education, and inter-agency coordination to permitting and enforcement. Title 15-10 established the rules and regulations that govern practice and procedure within the federally approved CRM program and establish procedures and set standards for the DCRM in implementing its responsibilities, as approved by the National Oceanic and Atmospheric Administration's office of Coastal Resources Management. Where they may conflict these regulations supersede the zoning requirements for any project or proposed use from the high tide line to 150 feet inland from the line. Nothing in this title prohibits DCRM from imposing an additional buffer zone to protect environmentally sensitive resources as appropriate regardless of any zoning or building regulations pertaining to setbacks and buffer zones. Mandatory vegetative buffers for wetlands are established in 15-10-330, while de facto buffers are established for shorelines under management standards and use priorities in 15-10-335.

Title 15-10 establishes permitting requirements for 3 types of CRM permits: temporary permits for emergency repairs, permits for major sitings, and Areas of Particular Concern (APCs). APCs include Lagoon and Reefs, Managaha and Anjota Islands, Coral Reefs, Wetlands and Mangroves, Shorelines, Ports and Industrial Areas, and Coastal Hazards. Permits are required of a proposed development wholly or partially within an APC which as or is more likely than not to have an adverse impact on an APC unless mitigated, or which constitutes a major siting under Section 15-10-501. Impact Avoidance, Minimization, and Mitigation are required for all developments. Permits are also required as early action for flood zone risk reduction through 3 measures: 1) When a major siting proposal falls within a coastal hazard APC of FEMA designated AE/AO flood zone DCRM is required to coordinate with the Zoning Office and DPW at the earliest possible time to ensure relevant flood hazard reduction standards are met; 2) Soft measures must be considered as alternatives to hard structures to limit coastal erosion; and 3) Implementation of green infrastructure elements and related best management practices must be considered for development projects in listed high priority watersheds with designated conservation management plans including Garapan, Laolao, and Talakaya.

The permitting process is detailed including fees, conditions, and enforcement. There is no fee for government agencies engaging in government projects, and APC application fees may be reduced for beneficial projects or in cases of financial hardship upon request. Fees for Major Siting projects are based upon appraisal of construction costs. Tiered discounted fees are available for qualifying "green" and /or "low impact development" projects based on "LEED Certifiable" building design and construction and, for Best Management Practices (BMP) for redevelopment and rehabilitation of existing buildings. General criteria considered for CRM permit application evaluations includes: 1) the ability to accommodate future climatic change, determination whether a reasonable alternative site exists for the proposed project; 2) effect on existing public services; 3) setbacks from hazardous lands including floodplains, erosion-

prone areas, storm wave inundation areas, and major fault lines; 4) BMPs for control of nonpoint source pollution that are a result of a site's conditions such as soil type, erodibility and permeability, slope, drainage patterns etc.; and 5) adequacy of vegetated buffer zones between the project footprint and environmentally sensitive areas such as high risk flood zones, wetlands, highly erodible slopes, and shorelines, considering current conditions and future projections.
General criteria for CRM permits are listed that include SSG principles such as: the ability to accommodate future climatic change; determination of whether or not a reasonable alternative site exists for the proposed project; effect on existing public services, setbacks from floodplains, erosion-prone area, storm wave inundation areas, air installation crash and sound zones, and major fault lines; management measures as a result of soil type, erodibility, and permeability, slope drainage patterns; and, adequacy of vegetative buffer zones between the project footprint and high risk flood zones, wetlands, highly erodible slopes, and shorelines.

Specific use criteria and management standards are listed for APCs. Avoidance, minimization, and mitigation of impacts are required for all projects likely to have negative impacts to coastal resources. For individual APCs, areas are defined and use priorities (highest, moderate, lowest, and unacceptable) are provided. SSG principles addressed as specific criteria include: unacceptable to dredge and fill activities not associated with permitted construction of piers, launching facilities, infrastructure and boat harbors (P*3,* P*7*); unacceptable to destroy reefs and corals not associated with permitted projects (P*7*); maintaining or increasing public landholding on shorelines and in and adjacent to wetlands and mangroves for hazard mitigation through land trades, purchases, creation of easements, or taking by eminent domain (P*2,* P*5,* P*7*); use of soft shoreline stabilization (re-vegetation, green infrastructure, and other living shoreline alternatives) instead of hard stabilization (P*2,* P*7,* P*8*); unacceptable to place on shorelines new commercial structures, industrial structures, or non-recreational public structures which are not water-dependent, water-orientated or water-related (P*2,* P*4,* P*5*); coastal hazard management standards and review considerations (P*1,* P*2,* P*4,* P*5,* P*6, P9,* P*10,* P*11,* P*12*) and, unacceptable to degrade or modify natural shoreline protective features, hard shoreline protection unless boating or marine based facilities, and projects which interfere or disrupt the natural shoreline processes as littoral transport or coastal dynamics (P*2,* P*4*, P*4,* P*7,* P*8).*

Setback guidelines are provided. No exceptions may be granted for shoreline setbacks.

Procedures and criteria for creation and modification of APCs are provided. Criteria considered include areas subject to significant hazard due to storms, slides, floods, erosion, stormwater, sedimentation, settlement, or salt water intrusion, and , areas needed to protect or replenish coastal lands or resources including coastal flood plains, aquifers and their recharge areas, estuaries, sand dunes, coral and other reefs, beaches, and offshore sand deposits. Any changes in DCRM regulations, including establishment of new APCs must be approved by the CRM Agency Board which is composed for agency heads from the Division of Environmental Quality, Department of Lands and Natural Resources, Department of Public Works, Commonwealth Utilities Corporation, Commerce, and Historical Preservation Office.

The CRM board, chaired by the DCRM Director, also oversees issuance of major siting permits. Standards for determination of a Major Siting are provided. Criteria include mitigation

of adverse impacts (incorporation of management measures to limit risk of loss and damage from sea level rise and coastal flooding, and, where data is available consideration of current and future risks when assessing potential, direct, indirect, and cumulative impacts form coastal hazards. To limit avoidable impacts from coastal hazards, major siting proposals must meet or exceed flood hazard reduction standards as codified in Chapter 155-10.2, Par 200 (DPW).

Establishment and procedures for the CRM Coastal Advisory Council are described.

Federal activities and development projects and standards for determining consistency with Federal enforceable policies are discussed.

Water sport permit procedures are provided in 15-10.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	**Deficiencies**
P*1* - Climate Change	
P*2* - Retreat	
P*3* - Retrofit	
P*4* - Critical Facilities Locations	
P*5* - Development Incentives	
P*6* - Sustainable Development BMPs	
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
P*11* - SSG Knowledgeable Communities	
P*12* - Adaptive Management	

Synthesis: Title 15-10 is comprehensively and adequately developed for management of development in the coastal zone, which encompasses the entirety of the land and territorial waters of the CNMI, and can be interpreted to incorporate Principles P*1* – P*12*. Of particular concern under conditions of a progressively changing climate are changes in flood hazard areas, valued habitat, and the determination of APCs. Title 15-10 was established in the context of present-day coastal conditions. Coastal conditions will change under the 1 meter sea level rise and altered precipitation patterns expected by year 2100. Provisions should be made so that Title 15-10 continues to apply under progressively changing coastal conditions.

Recommended Technical Revisions: At this time recommendations are limited to inclusion of language that makes Title 15-10 applicable to present-day conditions as well as to all future conditions that may occur under the impacts of a progressively changing climate. The most important criteria is an official CNMI sanctioned SLR scenario. This scenario should be incorporated into future APC updates.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-5 Aboveground Storage Tanks (AST)

Description: These regulations are intended to impose AST permitting requirements, location requirements including prohibited locations such as storm water inundation areas, spill containment and leak detection requirements and release responses, and address potential sources of pollution that may result from AST systems.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
P*4* - Critical Facilities Locations	
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: These regulations are well developed and comprehensive for the management of ASTs and stored product. The SSG Principles P*1* – P*3* and P*5* – P*12* are not readily applicable. SSG Principle P*4* is applicable to address changing future climate conditions.

Recommended Technical Revisions: §65-5-210 and §65-5-215. The regulated locations and setback standards and requirements for ASTs will become increasingly critical under conditions of progressively changing climate. Revisions to these sections are recommended to enhance regulatory criteria for ASTs as shorelines change in the future, and loss of land area create increased density of populations and commercial facilities.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-10 Air Pollution Control Regulations

Description: These regulations are intended to establish minimum standards and requirements to insure that air resources are protected against pollution and do not constitute a health hazard, and imposes permitting and operating requirements for air emissions sources. Controls are described for open burning, vehicle emissions, incineration, process industries, and constituent pollutants as specified under the federal Clean Air Act.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are specific to air emissions regulatory controls, applicable to any location. SSG Principles are not applicable to the intent and purpose of these regulations.

Recommended Technical Revisions: None recommended.
Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-20 Drinking Water Regulations

Description: These regulations are intended to establish minimum standards and requirements to insure that public water systems (PWS) are protected from contamination and provide water that is safe for human consumptions. Technical provisions and specifications are described for PWS design, construction, operation, disinfection, monitoring, sanitary surveys, and operator certification. Requirements are also described for bottled water companies and rainwater catchment systems. Procedures for supply of drinking water during emergencies are described.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
P*1* - Climate Change	
P*2* - Retreat	
P*3* - Retrofit	
P*4* - Critical Facilities Locations	
	P*5* - Development Incentives
P*6* - Sustainable Development BMPs	
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
P*11* - SSG Knowledgeable Communities	
P*12* - Adaptive Management	

Synthesis: Title 65-20 is well developed and can be interpreted and applied to adequately accommodate SSG Principles P*1* – P*4,* P*6,* and P*9* – P*12*. Engineering principles and economic factors for the siting and design/construction of new PWS or modifications can

readily be evaluated in the context of these SSG Principles as the decision-making process among planners and designers proceeds. SSG Principles P*5* and P*7* – P*8* are not applicable to Title 65-20 because they are not consistent with the purpose and intent of these regulations.

Recommended Technical Revisions: None recommended. Provisions for siting, design, construction, operation and compliance are adequately developed for application under any scenario of a progressively changing climate.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-20 Drinking Water Regulations

Description: These regulations are intended to establish minimum standards and requirements to insure that public water systems (PWS) are protected from contamination and provide water that is safe for human consumptions. Technical provisions and specifications are described for PWS design, construction, operation, disinfection, monitoring, sanitary surveys, and operator certification. Requirements are also described for bottled water companies and rainwater catchment systems. Procedures for supply of drinking water during emergencies are described.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
P*1* - Climate Change	
P*2* - Retreat	
P*3* - Retrofit	
P*4* - Critical Facilities Locations	
	P*5* - Development Incentives
P*6* - Sustainable Development BMPs	
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
P*11* - SSG Knowledgeable Communities	
P*12* - Adaptive Management	

Synthesis: Title 65-20 is well developed and can be interpreted and applied to adequately accommodate SSG Principles P*1* – P*4,* P*6,* and P*9* – P*12*. Engineering principles and economic factors for the siting and design/construction of new PWS or modifications can readily be evaluated in the context of these SSG Principles as the decision-making process among planners and designers proceeds. SSG Principles P*5* and P*7* – P*8* are not applicable to Title 65-20 because they are not consistent with the purpose and intent of these regulations.

Recommended Technical Revisions: None recommended. Provisions for siting, design, construction, operation and compliance are adequately developed for application under any scenario of a progressively changing climate.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-30 Earthmoving and Erosion Control Regulations

Description: These regulations are intended to establish minimum standards and requirements necessary for control of non-point source runoff from human-related activities. The regulations are intended to: protect marine and fresh water quality; maintain and enhance beneficial uses of marine and fresh waters; promote public awareness of the importance to protect the CNMI's marine and fresh water resources from siltation and bacterial and chemical contamination; conserve upland soils; and protect public health by protecting and enhancing the quality of marine and fresh water recreational and traditional fishing sites. These regulations impose requirements and procedures for permitting, subsurface investigations, grading, filling and clearing operations, discharge prohibitions, dust control, and certification of erosion control specialists.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	**Deficiencies**
P*1* - Climate Change	
P*2* - Retreat	
P*3* - Retrofit	
P*4* - Critical Facilities Locations	
P*5* - Development Incentives	
P*6* - Sustainable Development BMPs	
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
P*11* - SSG Knowledgeable Communities	
P*12* - Adaptive Management	

Synthesis: Title 65-30 provides a well developed framework for the regulation of land disturbance activities. The potential to apply all SSG Principles exists within the regulations as written. Strong permitting, enforcement, and follow-up inspection actions on the part of the regulatory authority will allow Title 65-30 to play a major beneficial role in economic development and SSG under conditions of a progressively changing climate. Of particular importance to erosion potential are sea level rise (~1 meter by year 2100), increased tropical cyclone force, and altered precipitation patterns.

Recommended Technical Revisions: §65-30-005. A summary paragraph on the importance of these regulation in the context of SSG Principles will be beneficial to draw attention to regulation applicability under conditions of a progressively changing climate.
Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-40 Harmful Substance Clean Up Regulations

Description: These regulations are intended to establish administrative procedures and standards to identify, investigate, and clean up facilities where harmful substances are discovered and identified. They define the role of DEQ and encourage public involvement in decision-making at these facilities. The title is primarily intended to address releases of harmful substances caused by past activities, but provisions may be applied to potential and

ongoing releases of harmful substances from current activities. Technical provisions and specifications are described for site discovery and reporting, initial investigations, site hazard assessments, remedial investigations and feasibility studies, clean up actions, clean up standards, and evacuation if necessary. Administrative procedures for remedial actions, public notice and participation, and human health risk criteria are defined.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are specific to the cleanup of hazardous substances once discovered and identified. SSG Principles are not applicable to the intent and purpose of these regulations.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-40 Harmful Substance Clean Up Regulations

Description: These regulations are intended to establish administrative procedures and standards to identify, investigate, and clean up facilities where harmful substances are discovered and identified. They define the role of DEQ and encourage public involvement in decision-making at these facilities. The title is primarily intended to address releases of harmful substances caused by past activities, but provisions may be applied to potential and ongoing releases of harmful substances from current activities. Technical provisions and specifications are described for site discovery and reporting, initial investigations, site hazard assessments, remedial investigations and feasibility studies, clean up actions, clean up standards, and evacuation if necessary. Administrative procedures for remedial actions, public notice and participation, and human health risk criteria are defined.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are specific to the cleanup of hazardous substances once discovered and identified. SSG Principles are not applicable to the intent and purpose of these regulations.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-50 Hazardous Waste Management Regulations

Description: These regulations address potential sources of pollution that may result from hazardous waste. Handlers of hazardous waste are required to meet acceptable standards and practices applicable to their specific waste type and quantity to ensure the proper management of hazardous waste from cradle to grave. Solid waste and hazardous waste are defined, hazardous wastes are listed and characteristics provided. Standards are described for generators transporters and importers of hazardous waste, universal waste management, and military munitions.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are well developed and comprehensive, and provide for the location-specific and activity-specific management of hazardous wastes. Title 65-50 will therefore provide adequate regulatory framework for the management of hazardous wastes under conditions of progressively changing climate.

Recommended Technical Revisions: None recommended.

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-60 Litter Control Regulations

Description: These regulations are intended to govern specific governmental agencies' duties, responsibilities, and authority to implement the Litter Control Act of 1989. The regulations define prohibited acts, enforcement procedures, and jurisdictions. DEQ is responsible for coordination and implementation of anti-litter educational programs, posting anti-litter signs, and to make litter containers available for parks, beaches, public lands and highways in coordination with DPW. DPW is responsible for weekly collection of garbage and disposal at a designated public landfill site. DPS is responsible for disposal of dead animals and enforcement training for all apprehending officers.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: Principles of SSG are not applicable to the intent and purpose of the litter control regulations.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-60 Litter Control Regulations

Description: These regulations are intended to govern specific governmental agencies' duties, responsibilities, and authority to implement the Litter Control Act of 1989. The regulations define prohibited acts, enforcement procedures, and jurisdictions. DEQ is responsible for coordination and implementation of anti-litter educational programs, posting anti-litter signs, and to make litter containers available for parks, beaches, public lands and highways in coordination with DPW. DPW is responsible for weekly collection of garbage and disposal at a designated public landfill site. DPS is responsible for disposal of dead animals and enforcement training for all apprehending officers.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: Principles of SSG are not applicable to the intent and purpose of the litter control regulations.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-70 Pesticide Regulations

Description: These regulations are intended to establish a system of control over the importation, distribution, sale, storage, and disposal of pesticides by persons within the CNMI for the protection of public health and the prevention of environmental contamination. Unlawful acts are described along with requirements for pesticide importation, use, permits, storage, transportation, disposal, record-keeping, worker protection standards, and applicator training and certification. A list of banned and restricted pesticides is provided.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: Principles of SSG are not applicable to the intent and purpose of the pesticide regulations.

Recommended Technical Revisions: None recommended.
Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-80 Solid Waste Management Regulations

Description: These regulations are intended to establish the requirements and criteria for new and existing solid waste management activities and solid waste management facilities (SWMFs) including but not limited to, municipal solid waste landfills and other landfilling operations, incineration, solid waste collection and transfer, materials processing, recycling, composting, and salvage. The requirements and criteria are for the protection of human health and the environment.

All new and existing solid waste management activities and facilities failing to comply with the regulations and criteria in this title are prohibited. Facilities for the disposal of solid waste that fail to satisfy the requirements of this title are considered open dumps, and the use of open dumps is prohibited.

Solid waste management and SWMF permit requirements are described along with registration requirements for commercial waste haulers. RCRA criteria for municipal solid waste landfill units (40 CFR 258 [1999]) and RCRA criteria to ensure that non-municipal non-hazardous waste disposal units that receive conditionally exempt small quantity generator waste do not present risks to human health and the environment, taking into account the practicable capability of such units (40 CFR 257 [1999]) are adopted by reference.

REGULATION EVALUATION for CNMI SSG

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are well developed and comprehensive, and provide for the location-specific and activity-specific management of solid waste. Title 65-80 will therefore provide adequate regulatory framework for the management of solid waste under conditions of progressively changing climate.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-80 Solid Waste Management Regulations

Description: These regulations are intended to establish the requirements and criteria for new and existing solid waste management activities and solid waste management facilities (SWMFs) including but not limited to, municipal solid waste landfills and other landfilling operations, incineration, solid waste collection and transfer, materials processing, recycling, composting, and salvage. The requirements and criteria are for the protection of human health and the environment.

All new and existing solid waste management activities and facilities failing to comply with the regulations and criteria in this title are prohibited. Facilities for the disposal of solid waste that fail to satisfy the requirements of this title are considered open dumps, and the use of open dumps is prohibited.

Solid waste management and SWMF permit requirements are described along with registration requirements for commercial waste haulers. RCRA criteria for municipal solid waste landfill units (40 CFR 258 [1999]) and RCRA criteria to ensure that non-municipal non-hazardous waste disposal units that receive conditionally exempt small quantity generator waste do not present risks to human health and the environment, taking into account the practicable capability of such units (40 CFR 257 [1999]) are adopted by reference.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are well developed and comprehensive, and provide for the location-specific and activity-specific management of solid waste. Title 65-80 will therefore provide adequate regulatory framework for the management of solid waste under conditions of progressively changing climate.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-90 Underground Injection Control Regulations

Description: These regulations are intended to establish requirements for any underground injection of hazardous waste, of fluids used for extraction of minerals, oil, and energy, and of certain other fluids with potential to contaminate ground water in order to protect underground sources of drinking water. The regulation prohibit deep injection of wastes, injection of fluids with gas and oil mining, solution mining, injection of hazardous wastes and other categories identified in this title. Regulations allow all other types of injection to exist, subject to applicable regulations. The regulations do not apply to drinking water supply wells and water production wells or monitoring well drilling, well development, and rehabilitation processes.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: Regulation of underground injection control (UIC) is mainly concerned with the protection of groundwater resources that are used as drinking water sources or have potential as a drinking water source. Title 65-90 does not provide for potentially changing conditions of ground water under climate change impacts of rising sea level and altered precipitation patterns. It is likely that sub-surface hydrologic conditions will change progressively over the near-term (year 2100) and it is necessary that UIC activities should take changing conditions into account. Title 65-90 does not provide for application of SSG principles P*1* P*12* to the UIC evaluation and permitting process.

Recommended Technical Revisions: Part 001 (§ 65-90-005) and Part 300 are recommended for revision to include a statement on the requirement to consider climate change when proposing a UIC activity. Part 300 revisions are also recommended to specifically address the potential for changes in groundwater conditions (aquifer extent and properties) under conditions of rising sea level (1 meter by year 2100) and altered precipitation patterns, as a result of progressively changing climate.

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-100 Underground Storage Tank Regulations

Description: These regulations are intended to establish a system of control and enforcement over the permitting, installation, compliance, use and monitoring of all underground storage tanks (USTs) containing regulated substances, and prohibit the storage of hazardous

substances or wastes in UST systems by persons within the CNMI as necessary to conserve the land and water resources of the CNMI, protect public health, and prevent environmental pollution, resource degradation, and public nuisances. 40 CFR Part 280 (2015) are adopted by reference. Permitting and acceptable locations requirements are provided. No tanks are allowed within tidal or storm water inundation areas.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
P*4* - Critical Facilities Locations	
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: These regulations are well developed and comprehensive for the management of USTs and stored product. The SSG Principles P*1* – P*3* and P*5* – P*12* are not readily applicable. SSG Principle P*4* is applicable to address changing future climate conditions.

Recommended Technical Revisions: §65-100-310 and §65-100-315. The regulated locations and setback standards and requirements for USTs will become increasingly critical under conditions of progressively changing climate. Revisions to these sections are recommended to enhance regulatory criteria for USTs as shorelines change in the future, and loss of land area create increased density of populations and commercial facilities.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-110 Used Oil Management Regulations

Description: These regulations are intended to establish and ensure safe and proper management practices for the handling of used oil from the initial point of generation to the final disposal action and to ensure the protection of public health and welfare and the prevention of environmental contamination in the CNMI. 40 CFR part 279, subparts B, C, D, F and H, and 279.12 are adopted by reference. Requirements are detailed for used oil permits, storage, transportation, notifications, burning, and spill prevention and remediation.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: The management of used oil, from point of generation to point of disposal, is a location specific activity. As such, management of this activity can be regulated based on location conditions. As land availability and use changes under conditions of a progressively changing climate, these regulations will continue to apply and will be sufficiently effective for the management of used oil. The regulatory agency must remain diligent to ensure specific locations are not in potential hazard zones.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-110 Used Oil Management Regulations

Description: These regulations are intended to establish and ensure safe and proper management practices for the handling of used oil from the initial point of generation to the final disposal action and to ensure the protection of public health and welfare and the prevention of environmental contamination in the CNMI. 40 CFR part 279, subparts B, C, D, F and H, and 279.12 are adopted by reference. Requirements are detailed for used oil permits, storage, transportation, notifications, burning, and spill prevention and remediation.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: The management of used oil, from point of generation to point of disposal, is a location specific activity. As such, management of this activity can be regulated based on location conditions. As land availability and use changes under conditions of a progressively changing climate, these regulations will continue to apply and will be sufficiently effective for the management of used oil. The regulatory agency must remain diligent to ensure specific locations are not in potential hazard zones.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-115 Voluntary Response Program Regulations

Description: These regulations are intended to specify the criteria a person or ownership entity must meet in order to qualify for liability protection from action by the DEQ for the release or threatened release of a harmful substance as defined under the DEQ Harmful Substances Cleanup Regulations (65-40). Facilities not eligible to participate in the program are listed. Requirements for applications for remediation are described and the process is detailed: approved applicants complete a Phase II ESA; DEQ determines if remedial action is necessary and if so, applicants enroll in Stage 2 of Voluntary Response Program; applicants complete and implement a Remedial Action Plan.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: The cleanup of harmful substances is a location specific activity. As such, management of this activity can be regulated based on location conditions. As land availability and use changes under conditions of a progressively changing climate, these regulations will continue to apply and will be sufficiently effective for the management of the Voluntary Response Program. The regulatory agency must remain diligent to ensure specific locations in potential hazard zones are prioritized for cleanup.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-120 Wastewater Treatment and Disposal Rules and Regulations

Description: These regulations are intended to protect the health of the wastewater disposal system user and neighbors, and to establish minimum standards that will ensure that the discharge of wastewater will not contaminate or degrade CNMI waters, be accessible to insects, rodents or other carriers of disease, pose a health hazard by being accessible to children, create a public nuisance due to odor or unsightly appearance and will not violate any local or federal laws or regulations governing water pollution or sewage disposal. The regulations also provide for a reasonable service life for wastewater systems (conditions for construction and operation), provides registration and requirements for sanitary waste hauling and disposal, and establishes minimum standards for treatment of animal wastes. Permiting processes are described.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
P*4* - Critical Facilities Locations	
P*5* - Development Incentives	
P*6* - Sustainable Development BMPs	
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: Title 65-120 is comprehensively and adequately developed to provide for regulation of wastewater to protect human health and the environment under present-day conditions. These regulations can be interpreted and applied to incorporate SSG principles P*4* – P*9*. Title 65-120 does not provide for the anticipated impacts of changing climate. Sea level rise will have a significant impact on wastewater infrastructure of coastal areas. Seal level rise of 1 meter will greatly alter the hydraulic profile of the CUC wastewater treatment facilities and gravity collection system, and will reduce the vertical separation of on-site leaching systems to the ground water table. Coastal inundation from a 1 meter sea level rise (by year 2100) will require a planned retreat and retrofit of wastewater infrastructure if the protection of human health and the environment are to be maintained under conditions of a progressively changing climate.

Recommended Technical Revisions: Part 001 is recommended for revision to provide for incorporation of SSG Principles P*1* – P*3* and P*10* – P*12* for application of these regulations under conditions of a progressively changing climate. Sea level rise is the principle climate change of concern for wastewater infrastructure. Provisions in the regulations are recommended to account for re-assessment of wastewater infrastructure planning and retreat/retrofit, based on the expected sea level rise of 1 meter by year 2100.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-130 Water Quality Standards

Description: These regulations are intended to establish standards for water quality of all CNMI surface waters and ground water to protect their use and value for propagation of fish and wildlife, recreation, and public water supplies, and take into consideration their use and value for commerce. An Anti-degradation Policy is provided. Classifications of waters, and protected uses, prohibited uses, and water quality criteria for each class are described. Requirements for mixing zones, dredging, Water Quality Certifications and land disposal of wastewater are provided.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: The water quality standards are based on historical data and identified trends, and regulatory policy for protection and continued improvement of CNMI water quality. New scenarios for near-shore water quality may develop under conditions of a progressively changing climate. Presently, there is no provision in the standards to address climate change. Similarly, the present-day regulatory framework may not sufficiently regulate economic activities under conditions of sea level rise and coastal inundation. The Water Quality Standards are overall deficient in accommodating all SSG principles (P*1* – P*12*). Revisions for all sections should be considered. Revisions to specific sections are discussed below.

Recommended Technical Revisions: § 65-130-010 (Anti Degradation Policy) is recommended for revision to include a statement describing protections from effects of climate change.

Part 100 (all sections) are recommended for revisions to increase setback requirements for sources of human and animal waste due to seal level rise, coastal inundation, and increased potential for flooding.

Part 200 (§65-130-201, 205, 210, 215) are recommended for revision to provide for regular review and updates (as necessary at a suitable frequency until year 2100) on waterbody classifications and water use areas. Rising sea level and inundation will create expansion or other changes in boundaries of present waterbodies. Changes in shorelines may require revisions to established water use areas.

REGULATION EVALUATION for CNMI SSG

Part 400 (all sections) are recommended for revision to address the potential for release of contaminant from known and unknown sources, as shorelines recede (landward) as sea level rise progresses. Present-day disposal sites and infrastructure that are located in uplands may be inundated in the future. Submergence of these sites will likely result in release of contaminants to the water column, and distribution via currents and storm surge in near-shore waters. Changing base-line conditions and "hot-spots" may occur, with no identifiable responsible party. Statements should be included for each criteria as to the potential for need of revised standards under conditions that result from a progressively changing climate.

Part 600 (all sections) are recommended for revision to include consideration of the effects of climate change (including retreat) during Water Quality Certification determinations.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: BECQ, Division of Environmental Quality (DEQ)

Regulation: Title 65-140 Well Drilling and Well Operations Regulations

Description: These regulations are intended to promote the long-term capability for the CNMI to provide reliable potable water to the public. The regulations establish a water well permitting system to monitor and regulate the use of groundwater resources, promote the non-degradation and rational utilization of groundwater resources and public awareness of the critical importance of protecting the resources from contamination and degradation, provide that groundwater resources be put to the highest beneficial uses possible, designate groundwater management zones, and protect public health by protecting and enhancing the quality of existing and potential groundwater resources used for human consumption. Requirements are described for well driller licensing, well drilling permits, siting criteria, construction criteria, development and disinfection, pump testing, reporting of activities, water supply capacity guidelines, and well operation permits.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
P*4* - Critical Facilities Locations	
P*5* - Development Incentives	
P*6* - Sustainable Development BMPs	
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
P*9* - Development Decision Processes	
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: Title 65-140 is comprehensively developed for regulation of water well development and operation based on accumulated hydrologic data and appropriate level of government oversight to provide safe drinking water. These regulations can be interpreted and applied to provide adequate framework to meet SSG Principles P*4* – P*6* and P*9*. Title 65-140 does not provide for the incorporation of SSG Principles P*1* – P*3*, P7 – P*8,* or P*10* – P*12*. The advance of sea level rise (1 meter by year 2100) will change sub-surface hydrologic conditions on small Pacific islands. Changes will occur most rapidly and will be most pronounces on atoll islands. Pacific high islands such as those of the CNMI will experience changes more slowly than atolls due to differences in the geologic base and influence of topography on precipitation patterns. Under conditions of a progressively changing climate over the relative near-term, it will be increasingly important to site new sources of drinking water and to abandon/close wells with saltwater intrusions, in a manner that accounts for the steadily changing hydrologic conditions in the sub-surface and precipitations.

Recommended Technical Revisions: Part 200 is recommended for revision to include the consideration of climate change impacts on siting of new water wells. Sea level rise and coastal inundation are the principal impacts of concern. Parts 1800 and 1900 are recommended for revisions to provide for the timely and orderly decommission of wells that are abandoned due to salt water intrusion or surface flooding due to coastal inundation.

REGULATION EVALUATION for CNMI SSG

Regulation of groundwater management zones (Part 2000) are recommended for revision to include re-assessment of specified zones on a regular frequency. Steadily changing hydrologic conditions of the sub-surface and precipitation will likely require revised zone designations as sea level rises and precipitation patterns change.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Commonwealth Utilities Corporation (CUC)

Regulation: Title 50-10 Electrical Power Division; Electrical Service Regulations

Description: These regulations establish requirements for connection of electrical services where and when electrical services are available, establish fees for the use of and connection to electrical services, and establish acceptable standards for construction and operation of electrical services, to residential, commercial, government, and non-conforming customers.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths

Deficiencies

P*1* - Climate Change
P*2* - Retreat
P*3* - Retrofit
P*4* - Critical Facilities Locations
P*5* - Development Incentives
P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services
P*8* - Green Infrastructure
P*9* - Development Decision Processes
P*10* - Early Collaboration
P*11* - SSG Knowledgeable Communities
P*12* - Adaptive Management

Synthesis: These electrical service regulations govern the distribution and management of electrical power in the conventional context of provider-customer. No provision is made for application of SSG Principles for adaptation to circumstances under a progressively changing climate. Sea level rise, increased tropical cyclone force, and increased coastal inundation will impact the distribution and management of electrical service to customers in the CNMI. Revisions to include SSG Principles P*1* - P4, P*6*, and P*10* – *12* will improve the sustainability of electrical infrastructure and help to maintain economic viability of the utility provider. In addition, CUC should implement the CUC 2015 Integrated Resource Plan to provide resiliency.

Recommended Technical Revisions: Part 100. Relevant sections for public lands and utility corridors and established rights of way are recommended for revision to include adaptive measures to changing conditions of climate. Access to public and private lands may require new regulatory mechanisms as coastal lands are lost to inundation.

Parts 200, 500, 600 and 700. Enhanced resistance to tropical cyclone force and salt water induced corrosion will be necessary to protect infrastructure investments under conditions of progressively changing climate. Requirements for underground distribution, concrete/steel utility poles, water-tight seals, and site selection should be under the regulatory jurisdiction of the utility provider.

Part 2100. Conservation of electrical power (i.e., reduced consumption) is a significant resource. Less demand equates directly to lower economic impact of construction and operation. Electrical rate structure can have a major positive impact to reduce electrical power consumption. Inclining block rates provide a rate structure that imposes proportionately higher kW-hr rates for successive tiers (blocks) of consumption.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Commonwealth Utilities Corporation (CUC)

Regulation: Title 50-20 Sewer Division; Public Sewer Use Regulations

Description: These regulations establish requirements for connection of public sewers where and when public sewers are available, establish fees for the use of and connection to public sewers, and establish acceptable standards for construction and operation of public sewers, to residential, commercial, government, and non-conforming customers.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths

Deficiencies

P*1* - Climate Change
P*2* - Retreat
P*3* - Retrofit
P*4* - Critical Facilities Locations
P*5* - Development Incentives
P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services
P*8* - Green Infrastructure
P*9* - Development Decision Processes
P*10* - Early Collaboration
P*11* - SSG Knowledgeable Communities
P*12* - Adaptive Management

Synthesis: These wastewater service regulations govern the distribution and management of wastewater services in the conventional context of provider-customer. No provision is made for application of SSG Principles for adaptation to circumstances under a progressively changing climate. Sea level rise, increased tropical cyclone force, and increased coastal inundation will impact the distribution and management of wastewater service to customers. Revisions to include SSG Principles P*1* - P4, P*6*, and P*10 – 12* will improve the sustainability of wastewater infrastructure and help to maintain economic viability of the utility provider.

Recommended Technical Revisions: Part 001. Adaptive planning for sewer laterals, mains, trunk lines, and pumping stations will become increasingly important under conditions of progressively changing climate. Provisions for retreat, retrofit, and re-location will be critical planning criteria to ensure wastewater service is maintained. A section following § 50-20-005 to incorporate planning and adherence to SSG principles is recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Commonwealth Utilities Corporation (CUC)

Regulation: Title 50-30 Water Services Division; Water Services Regulations

Description: These regulations establish requirements for connection to the CUC water system where and when the CUC water system is available, establish fees for the use of and connection to the CUC water system and establish acceptable standards for construction and operation of the water system to residential, commercial, government, and non-conforming customers.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	**Deficiencies**
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: These water service regulations govern the distribution and management of water services in the conventional context of provider-customer. No provision is made for application of SSG Principles for adaptation to circumstances under a progressively changing climate. Droughts, sea level rise, increased tropical cyclone force, and increased coastal inundation will impact the distribution and management of water service to customers. Revisions to include SSG Principles P*1* - P4, P*6*, and P*10* – *12* will improve the sustainability of water infrastructure and help to maintain economic viability of the utility provider.

Recommended Technical Revisions: Part 001. Adaptive planning for storage facilities, distribution mains, and booster pump facilities will become increasingly important under conditions of progressively changing climate. Provisions for retreat, retrofit, and re-location will be critical planning criteria to ensure water service is maintained. A section following § 50-30-005 to incorporate planning and adherence to SSG principles is recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Commonwealth Utilities Corporation (CUC)

Regulation: Title 50-60 Interconnection and Net Metering

Description: These regulations intend to establish requirements and procedures for connection of discrete renewable energy sources (e.g., solar or wind) associated with individual residences or businesses to the CUC electrical power system to reduce power generation demand and allow customers to receive monetary credit for excess electricity generated by the renewable source.

CUC proposed these regulations in January 2011 and again in February 2012. To date, an adoption notice has not been published. This chapter is reserved for future interconnection and net metering regulations should they be adopted.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: No synthesis can be developed at this time

Recommended Technical Revisions: Not applicable at this time.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Lands and Natural Resources (DLNR)

Regulation: Title 85-50.2 Commonwealth Parks, Recreational Facilities and Tourist Sites

Description: These regulations provide for access to and to establish standards for use and behavior for the Commonwealth Parks, recreational facilities, and tourist sites. The regulations establish a permit system, set fee and security deposit rates, identify allowable and prohibited activities, and establish enforcement procedures. Rules for erection of structures, use of motorized vehicles, protection of natural resources, fires, and sanitation are described.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are essentially limited to governing the use of established parks, recreational facilities, and tourist sites, and are not relevant to the selection and leasing of public lands for such use. Therefore, these regulations are not relevant for the application of SSG principles.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Lands and Natural Resources (DLNR)

Regulation: Title 85-90 Forestry Section: Forest Resources Protection Regulations

Description: These regulations establish minimum standards for the protection and use of CNMI public forest land for the long-term maintenance of forest values and ecosystem services including but not limited to: watershed protection; soil and water conservation; maintenance of wildlife habitat; and recreation. The regulations only apply to Saipan, Tinian. Aguiguan, and Rota. Permit processes for clearing or burning of vegetation, removal or destruction of plant products, are described.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: These regulations pertain to the protection of public land forests and the value forests provide to biota and human populations. Presently these regulations are limited in application to the four southernmost islands of the CNMI, which leaves the eleven northern islands (Farallon de Mendinilla and northward) unprotected by regulation. All forest resources of the CNMI will have increased value and increased importance for SSG under conditions of progressively changing climate. Inclusion of all islands under these regulations appears warranted. Management of all public land forests on all islands in accordance with relevant SSG principles is also warranted.

Recommended Technical Revisions: §85-90-005 is recommended for revision to include Managaha, the islands north of Saipan, and to include all islets or rocky outcrops associated with all of the islands in the CNMI.

§85-90-401 is recommended for revision to include standards that proposed activities must demonstrate conformance with SSG Principles P*1* - P*2*, P*4*, P*7* - *10*, and P*12.*

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-10 Administrative Hearing Rules and Regulations

Description: The Department of Public Lands is responsible for the administration, use, leasing, development and disposition of all those lands defined as public lands by the NMI Constitution except as limited by transfers of freehold interests to individuals, entities, or other government agencies. The Department's authority does not extend to the issuance of land use permits and licenses except as specifically provided for in PL 15.2, and does not limit in any respect the authority of other Commonwealth agencies to issue permits and licenses pursuant to their respective enabling legislation. These rules and regulations are intended to provide a comprehensive and efficient administration hearing process for the Office of Public Lands.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are entirely procedural. As such, there is no applicability to decision-making for proposed land use. Therefore, there is no applicability of SSG principles.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-20 (20.1, 20.2, 20.3, 20.4) Agricultural and Village Homestead Rules and Regulations

Description: The Department of Public Lands is empowered to promulgate rules and regulations to carry out the purposes of the Homestead Waiver Act of 1980 (PL 2-13 as amended). The Homestead Waiver Act requires the Department to assess the demand for homesteads and develop a program for meeting the need, to the extent practicable within the available land base.

145-20.1 provides procedures for agricultural homestead waivers (standards for eligibility, requirements necessary to meet the goals and objectives of the waiver program, and procedures required to administer and implement the waiver program).

145-20.2 provides Rota Agricultural Homestead Program Rules and Regulations. A notice of adoption was never published and this subchapter is reserved for future rules and regulations governing the Rota Agricultural Homestead Program.

145-20.3 provides Tinian Agricultural Homestead Program Rules and Regulations including procedures necessary to administer and implement the agricultural homestead program for Tinian.

145-20.4 provides Village Homestead Rules and Regulations including procedures necessary to administer and implement the village homestead program.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	**Deficiencies**
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: The "waivers' of agricultural homestead requirements (20.1) provides a mechanism to deed land to individuals who occupied a portion of public land for the purposes of agriculture, prior to the effective date of the NMI Constitution. Once a deed is issued the land no longer is managed under the laws and regulations applicable to public lands. Under private ownership an agricultural homestead is subject to government regulatory controls. The incorporation of SSG principles into various regulations that apply to private lands will have a direct positive impact on lands transferred from public to private ownership via the agricultural waiver program.

REGULATION EVALUATION for CNMI SSG

The Rota and Tinian homestead rules and regulations (20.2 and 20.3, respectively) provide for the distribution of agricultural lots based on the identification of agricultural tracts on public land.

Village Homestead lots (20.4) are treated similarly to the waiver and transfer requirements for agricultural lots. An individual may receive a waiver if a village dwelling was occupied prior to the date of the NMI constitution, or the government may occasionally make public lands available for housing. If an applicant is deemed eligible for a village homestead lot, the granting of lots is determined by lottery.

The granting of public lands for agricultural and residential purposes under 145-20 does not take SSG Principles into account. The regulation is deficient in provisions to incorporate and apply SSG Principles P*1* – P*12*.

Recommended Technical Revisions: Chapter 145-20 should include a general section on the evaluation of public land tracts in the context of SSG principles P*1* – P*12* to guide and influence the decision-making process before public lands are transferred to private ownership and hence beyond government control. Present-day lands may especially be determined of value in the future with regard to SSG principles P*1* – P*4*, P*7* – P*8* and P*12*.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-30 Commercial Use of Managaha Island Rules and Regulations

Description: These rules and regulations set forth restrictions on commercial activities on Managaha Island: regulations for use of the pier; establish a landing and user fee for the commercial use of the pier; recreational use of the island including activities on the land, beaches, and in the water; concessionaire and sub-concessionaire activities approved for commercial operations; rules governing commercial photography on the island; and, for other miscellaneous purposes related to these activities.

In consultation with the DPL, the DLNR is empowered to manage the preservation, protection, and maintenance of Managaha Island.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths

Deficiencies

P*1* - Climate Change
P*2* - Retreat
P*3* - Retrofit
P*4* - Critical Facilities Locations
P*5* - Development Incentives
P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services
P*8* - Green Infrastructure
P*9* - Development Decision Processes
P*10* - Early Collaboration
P*11* - SSG Knowledgeable Communities
P*12* - Adaptive Management

Synthesis: The rules and regulations under 145-30 largely pertain to the use of Managaha for tourism purposes and recreational activities for local residents. Commercial operations without free-market competition are approved for a sole concessionaire (and up to 3 sub-concessionaires) as selected by DPL. These rules impose responsibility on the concessionaire for the majority of operations and maintenance requirements for infrastructure and facilities.

As a low-lying lagoon island composed of coralline sands and extremely small surface area, Managaha Island very likely has limited advantage to the CNMI for the application of SSG Principles. The widely accepted estimate of 1 meter sea level rise by year 2100 will result in extreme salt water inundation of the island. This will result in greatly reduced land area and irrevocable impacts on groundwater resources and terrestrial habitat. Submergence of the protective barrier reef to the west due to sea level rise will leave Managaha increasingly susceptible to storm surge from tropical cyclones. Increased cyclone force due to the climate change impact of increasing sea surface temperatures will exacerbate the effects of rising seas.

Managaha Island's distance from shore and its decreased economic viability under conditions of a progressively changing climate will limit its attraction for commercial investment and will likely lower its priority status for government expenditures to support maintenance and upkeep.

For the short term, requirements to establish and protect of vegetation on the accreting sides of the island may facilitate temporary formation of “new land”. Sand replacement and installation of shoreline structures to alter coastal process are possible but would be expensive and likely only provide short term adaptation.

Recommended Technical Revisions: For the long term, Title 145-30 should incorporate revisions under Parts 001, 100, 200, 300, and 400 that provide for an orderly and systematic retreat from the use of Managaha Island under conditions of progressively changing climate.

Provisions should specifically address the de-commissioning of wastewater and water infrastructure in a manner to ensure protection of public health and maintenance of marine water quality. Salvage of above-ground infrastructure for re-purposing on the Saipan mainland should also be provided for. This will help reduce the amount of abandoned-in-place infrastructure, which could be washed into nearshore waters and result in loss of protective ecosystem services provided by coral reefs and seagrass beds. Infrastructure adrift could also damage shoreline facilities.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-40 Land Compensation Claims Rules and Regulations

Description: These rules and regulations intend to provide for a comprehensive method of processing claims and disbursing monetary compensation to landowners whose lands are taken by the Commonwealth for a beneficial public purpose, and for the efficient administrative hearing process pursuant to PL 13-17, as amended by PL 13-25 and PL 13-39.

For the purpose of these regulations "Public Purpose" is defined as: any public use or purpose declared or determined by the legislature by law or by joint resolution; any public use or purpose determined by the Governor pursuant to CMC § 9213(b); the acquisition of privately owned beach, shoreline and historic property or access to such properties; and, the acquisition of privately owned wetlands and sensitive ecological and environmental lands. "Wetlands" are as defined in the CRM Act of 1983 (2 CMC § 1501 et seq.) and regulations promulgated thereunder.

Priority for compensation based on the time of taking and compliance with the regulations in this chapter are: First, rights-of-way; Second, ponding basins; and Third, wetlands and other claims.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: As written, Title 145-40 priorities do not accommodate any of the SSG principles. The priorities of right-of-way, ponding basins and wetlands (and other ecologically sensitive areas) are likely to become irrelevant in present-day geographical locations, under conditions of progressively changing climate.

Public lands presently along shorelines are especially vulnerable to loss of public benefit under conditions of progressively changing climate. Replacement of these lands through a mechanism of condemnation and compensation will empower government to retreat and retrofit and site critical facilities and maintain to the extent possible ecosystem services and green infrastructure. To achieve an orderly retreat from the shoreline and to maintain services for the public benefit, adaptive and collaborative approaches must be fostered between government and the community.

REGULATION EVALUATION for CNMI SSG

The priorities for taking public lands require re-analysis, and the mechanisms must be strengthened.

Recommended Technical Revisions: Revisions to §145-40-105 with regard to SSG principles P*1*-P*4*, P*7*-P*8* and P*10*-P*12* to provide for a systematic and prioritized approach for the beneficial acquisition of public lands from private ownership, is recommended to help ensure that adaptation to conditions of progressively changing climate can be controlled by government action if deemed necessary for the overall public benefit.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-50 Public Purpose Land Exchange Rules and Regulations

Description: These rules and regulations are intended to provide for a comprehensive method for land exchanges for public uses or purposes between the government and a land owner based on a "fair market value" ratio as determined and established by an independent appraisal study. If the owner does not want a land exchange, the government shall negotiate for monetary compensation, subject to the Governor's approval, or recommend condemnation proceedings if needed.

Note that DPL published these proposed Land Exchange Rules and Regulations pursuant to the authority of PL 15-2 on 29 Feb 2012 but a notice of adoption has never been published to date.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
P*10* - Early Collaboration	
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: These regulations pertain exclusively to the mechanism for the exchange of land from private ownership to government ownership, through compensation. Compensation may be monetary or public land of equivalent value. Provision is made for publication of a proposed land exchange to allow review and comment by the general public. The opportunity for early collaboration (P*10*) among Government agencies and the public is implied.

Because these rules and regulations are strictly procedural, they do not directly provide for any consideration of SSG principles P*1*-P*9* and P*11*-P*12* to influence or guide the identification or selection of a parcel to be used for exchange. With appropriate revision, this regulation has significant potential to incorporate SSG principles of retreat (P*2*) and critical facilities locations (P*4*) as priority uses of public lands, for adaptation to climate change impacts and long-range smart, safe, growth in the CNMI.

These regulations identify and acknowledge that the availability of public lands for purposes of exchange is dwindling in the CNMI. It should therefore be inferred that public lands available for exchange are of steadily increasing value (intrinsic and extrinsic) with regard to public benefits.

REGULATION EVALUATION for CNMI SSG

Recommended Technical Revisions:

Part 100: add § 145-100 preceding all other basic acquisition policies, to require an assessment of any proposed exchange parcel in terms of SSG principles and the potential preferential or priority use of the land for public benefits that are of greater importance than conversion to private ownership.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-60 Submerged Lands Rules and Regulations

Description: These rules and regulations are intended to establish procedures and guidelines for leasing, licensing, or permitting use of CNMI submerged lands. Submerged lands are generally defined and inferred to be lands below the ordinary high water mark. The Commonwealth holds in trust these resources for the benefit of the public, and public uses thereof generally include recreation, fishing, shoreline access and navigation. The department is authorized to grant leases or licenses for dredging, filling, erection of permanent structures and installation of fixtures (i.e., cables and pipelines) on the submerged lands. Guidelines are provided for the regulation of use activities proposed for submerged lands including aquaculture, archeological areas and historic sites, breakwaters, bulkheads, commercial development, dredging, jetties and groins, marinas, mining, permanent moorage anchors, outdoor advertising, signs and billboards, piers, port and water related industries, recreation, residential development, shoreline protection, and utilities

It is noted that coordinated management is necessary to resolve conflicts that may arise between development and preservation of environmental quality, resource conservation, and public rights to use these resources and that activities on submerged lands must conform to various resource planning and protection laws administered by CRM (BECQ), DEQ (BECQ), HPO, and Division of Fish and Wildlife. Management of submerged lands is subject to other Commonwealth and federal laws.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
P*4* - Critical Facilities Locations	
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: Rules and regulations for submerged lands generally provide for support and the protection of ocean bottom for right(s)-of-way for public utilities (P*4*) and the maintenance of aesthetics, open space, and compatibility of development with natural shoreline conditions (P*7*-P*10*).

These regulations do not address the potential for a significant change in near-shore and shore-line dynamics due to progressive changes in climate, nor the probable changes in land-use priorities as coastal lands are inundated and lost (P*1*-P*3,* P*5*-P*6*, P*11*-P*12*).

REGULATION EVALUATION for CNMI SSG

The interpretation of beneficial use and regulatory requirements for submerged lands will likely undergo a change in understanding as the character of the near-shore and shore-line environments changes with the progressive change in climate.

Recommended Technical Revisions:

Part 300 – This section should be revised to impose more restrictive considerations on dredging and filling, due to the recognized potential impacts on shore-side and upland facilities from a change in bathymetry (submerged topography) due to coastal inundation. Consideration of sea level rise and coastal inundation are especially important to dredging and filling regulations, as these may lead to changes in near-shore oceanographic dynamics, and present day understanding may not be applicable in the future.

Part 500 – Not all specific use activities may have practical or beneficial uses under conditions of progressive changes in climate. This section should be reviewed and revised in accordance with expected changes in shore-line conditions under the most broadly accepted climate change scenario (i.e.,1 m sea level rise by 2100).

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Lands (DPL)

Regulation: Title 145-70 Temporary Occupancy Rules and Regulations

Description: These regulations are intended to govern new leases, lease renewals, new temporary occupancy agreements, and temporary occupancy agreement renewals of public lands whether by permit, lease, or temporary authorization as in conformity with the obligation to objectively manage the use and disposition of public lands set forth at 1 CMC § 2801 *et. seq*. No commercial use of public lands is authorized or permitted without a valid lease, temporary occupancy agreement, permit, or concession agreement authorized by these regulations.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths

Deficiencies

P*1* - Climate Change
P*2* - Retreat
P*3* - Retrofit
P*4* - Critical Facilities Locations
P*5* - Development Incentives
P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services
P*8* - Green Infrastructure
P*9* - Development Decision Processes
P*10* - Early Collaboration
P*11* - SSG Knowledgeable Communities
P*12* - Adaptive Management

Synthesis: These DPL regulations provide for the use of public land for commercial purposes, under permits and leases. Private enterprise has an opportunity to request use of public lands, and the government has an opportunity to issue Requests for Proposals (RFPs) to support government economic development goals.

These regulations do not provide for prioritization of use of public lands for SSG in the era of a progressively changing climate. Without significant revision, the access to public lands for private enterprise special interests may have a detrimental impact on government ability to use public lands for adaptation to sea level rise and coastal inundation under conditions of a progressively changing climate.

Recommended Technical Revisions: §145-7-220 is recommended for revisions that include the use of public lands for adaptation to conditions of a progressively changing climate. As discussed for other DPL regulations, public lands will evolve increasingly greater value and importance for incorporation of SSG principles as sea level rises and increased cyclone force and storm surge make use of coastal lands less desirable or impossilbe. Provisions via regulation should be made to prioritize adaptation to climate change in favor of commercial development on public lands.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Works (DPW)

Regulation: Title 155-10.1 Building Safety Code Rules and Regulations

Description: These regulations are intended to impose building safety standards for protection of public health, safety, and welfare. Provisions are defined for existing buildings and structures. Cooperation and assistance in enforcement of the provisions is required from all CNMI government departments, agencies, or branches. The regulations promote energy conservation and efficiency and renewable energy programs as policy. The building permit application and review process as well as inspection, fees, and Certificate of Occupancy requirements are defined. Procedures for demolition of unsafe or damaged buildings and structures and emergency orders to vacate are defined. International Building Code (IBC) of 2009 is adopted and amended with the 2014 revised CNMI Tropical Energy Code (TEC). Structures are required to be in compliance with earthquake and typhoon standards (Seismic Zone 4, and able to withstand the minimum horizontal and uplift pressure of wind velocity of at least 175 mph).

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
P*3* - Retrofit	
	P*4* - Critical Facilities Locations
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
	P*7* - Ecosystem Services
	P*8* - Green Infrastructure
	P*9* - Development Decision Processes
P*10* - Early Collaboration	
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: Regulation 155-10.1 provides extensively and adequately for required compliance with the 2009 IBC, TEC, Seismic Zone 4, and Typhoon standards, with regard to human life-health-safety for conventional construction materials and methods, and for the policy of improved energy efficiency. The regulation provides extensively for procedures for permitting and enforcement.

Retrofit is addressed in the context of the IBC, TEC, and Earthquake and Typhoon standards, and is essentially limited to conventional construction materials and methodology (P*3*).

Inter-agency collaboration for project(s) is clearly indicated (P*10*).

The regulation fundamentally addresses human life-health-safety for projects that receive sanction under various economic and planning authorities (development authorities). The regulation is largely limited to human life-health-safety concerns for proposed new construction or modifications/alterations to existing structures, and does not address any other aspect of the economic or infrastructure development decision-making processes.

REGULATION EVALUATION for CNMI SSG

SSG Principles P*1*-P*2*, P*4*-P*9*, P*11*-P*12* are not applicable to 155-10.1 because large-view economic planning and development-decision making are not consistent with the intent and purpose of the regulation.

Recommended Technical Revisions: Any revisions to this regulation would follow the advent of an altered economic development trajectory for the CNMI that incorporates in whole or in part the SSG principles.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Works

Regulation: Title 155-10.2 Flood Damage Prevention Regulations

Description: These regulations are intended to protect human life and health, minimize expenditure of public money for costly flood projects, minimize damage to public facilities and utilities, ensure that potential buyers are notified that property is in an area of special flood hazard, and ensure that those who occupy areas of special flood hazard assume responsibility for their actions. The basis for establishing the Areas of Special Flood Hazard is provided (FEMA Flood Insurance Study for the CNMI, 30 April 1990 and any amendments). DPW is required to create a flood hazard mitigations plan. A Building Safety Official is designated to administer and implement the regulations. Alteration or relocation of a watercourse within a special hazard area will not be permitted without written permission of the building safety officer and the flood carrying capacity of the altered or relocated portion of the watercourse must be maintained and not lessened. Provisions for flood hazard reductions in areas of special flood hazards include standards for: construction, storage of materials and equipment, utilities, coastal high hazard areas, subdivisions, manufactured homes, and recreational vehicles. Variance and appeal procedures are provided.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
P*3* - Retrofit	
P*4* - Critical Facilities Locations	
P*5* - Development Incentives	
P*6* - Sustainable Development BMPs	
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: These regulations provide extensively for the regulatory control of land use and construction in areas established with potential hazards of flooding. Hazard determination is based on the extensive long-term databases of US Federal agencies such as FEMA and NOAA and accumulated empirical data throughout the latter half of the 20th century. Under the relatively rapidly changing coastal conditions due to a progressively changing climate, especially with regard to sea level and precipitation patterns, scientific databases will become increasingly less usable as a statistical basis to establish boundaries of flood zones. SSG principles P*1* - P*2* and P*11* - P*12* are lacking for accommodation of changing conditions. SSG principles P*3* - P*10* are relative to any conditions for flood protection and therefore are valid for present and future scenarios.

Recommended Technical Revisions: 1) §155-10.2-005 (qq). Reference to Northern Marianas Vertical Datum of 2003 (22 Jan. 2009) is recommended to have a qualifying statement that acknowledges the likely rapid rise of “Sea Level” referenced to the datum.

2) §155-10.2-015. The basis for Areas of Special Flood hazards (present-day) will become increasingly less valid as sea level continues a rapid rise of ~1 m by year 2100 as widely accepted among the climate change community of practice.

3) §155-10.2-020. It is recommended that the Flood Hazard Mitigation Plan undergo 20 year interval updates until year 2100 (or later).

4) §155-10.2-110(b). The use of “other flood data” by government for regulatory purposes of flood damage prevention will become increasingly important as the rates of sea level rise and changes in precipitation patterns advance under conditions of a progressively changing climate. Federal agencies such as FEMA, NOAA, and USGS may find it difficult to update and revise databases in a timely manner.

5) Part 200. Each section of this Part (standards for construction, storage of materials and equipment, utilities, coastal high areas, subdivisions, manufactured homes, and recreational vehicles) is recommended for review and potential revision because standards applicable to present-day conditions of sea level and precipitation patterns are likely to become increasingly less applicable under conditions of a progressively changing climate.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Works (DPW)

Regulation: 155-20.1 Public Right-of-Way and Related Facilities

Description: These regulations are intended to ensure uninterrupted, unimpeded, and unobstructed use and quiet enjoyment of every portion and part of public rights-of-way. Exceptions are provided for publically beneficial use by the CNMI Government, public utilities and private telecommunication entities for pipelines (water, sewers, drains, etc.) and communications infrastructure as long as the use does not interfere with public use of the property except during permitted construction or maintenance. Closure, encroachments, impairments, or obstruction of rights-of–way are prohibited unless duly permitted. The permitting process is defined. Procedures for removal of encroachments, impairments, or obstruction are defined.

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
P*2* - Retreat	
P*3* - Retrofit	
P*4* - Critical Facilities Locations	
	P*5* - Development Incentives
	P*6* - Sustainable Development BMPs
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
P*10* - Early Collaboration	
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: Regulation 155-20.1 provides adequate regulatory framework to protect public rights-of-way, and to allow for government review of any proposed improvement or obstruction. Due process is provided for, to include enforcement authority by government for violations, and inclusion of public engagement for proposed improvements or obstructions. This regulation can be interpreted and implemented to support SSG Principles P*2*, P*3*, P*4*, P*7*, P*8*, P*9*, and P*10*.

No specific provision is available for the modification or alteration of a public right-of-way that may be required due to changing natural conditions that result from the progressive change in climate (P*1*, and P*12*).

SSG Principles P*5*, P*6*, P*11* are not applicable to 155-20.1, because development within public rights-of-way is not consistent with the intent and purpose of the regulation.

Recommended Technical Revisions:

1) Part 300 – include provisions for beneficial alterations or modifications to rights-of-way.

2) Part 300 – include specific reference to the potential for climate change to impact existing rights-of way, and procedures for adaptive management. An example is permanent loss of a right-of-way along a shoreline due to sea level rise, and provisions to compensate for the loss, such as re-establishing right(s)-of-way at a new non-vulnerable location.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Department of Public Works (DPW)

Regulation: Title 155-30.1 Solid Waste Collection and Disposal

Description: These regulations describe tipping fees, require pre-sorting of garment material for recycling, and allocate funds for sub-accounts within the Solid Waste Revolving Fund (Saipan, Tinian, Rota, and financial assurance).

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
Not Applicable	Not Applicable

Synthesis: These regulations are essentially limited to governing solid waste collection and disposal. Therefore, these regulations are not relevant for the application of SSG principles.

Recommended Technical Revisions: None recommended.

REGULATION EVALUATION for CNMI SSG

Administrative Agency: Saipan Zoning Board

Regulation: Title 165-30.1 Commonwealth Zoning Board Regulations

Description: Authority for the regulations lies in PL 6-32 and the *Saipan Zoning La*w of 2013 (SLL 18-04). These regulations are intended to describe the organization, powers, duties, operations, and rules of procedure of the Commonwealth Zoning Board. Requirements for disqualification for conflict of interest are detailed. Fees, charges, and assessments are described. Part 400 Wind Energy Systems was removed because its sections were incorporated into the *Saipan Zoning Law* of 2013 (reserved for future regulations concerning wind energy systems).

Strengths and Deficiencies with Regard to SSG Principles (P*1* – P*12*):

Strengths	Deficiencies
	P*1* - Climate Change
	P*2* - Retreat
	P*3* - Retrofit
P*4* - Critical Facilities Locations	
P*5* - Development Incentives	
P*6* - Sustainable Development BMPs	
P*7* - Ecosystem Services	
P*8* - Green Infrastructure	
P*9* - Development Decision Processes	
	P*10* - Early Collaboration
	P*11* - SSG Knowledgeable Communities
	P*12* - Adaptive Management

Synthesis: The Zoning Board Regulations (165-30.1) specify Board governance, activities, and procedures to implement the *Saipan Zoning Law*. The *Saipan Zoning Law* is the jurisdictional document of interest with regard to SSG Principles. The *Zoning Law* has adequate framework to allow beneficial application of SSG Principles P*4* – P*9* to guide economic development and community quality of life. The *Zoning Law* does not provide for the application of SSG Principles P*1* – P*3* and P*10* – P*12*. Under conditions of a progressively changing climate over the near term (year 2100), sea level rise, coastal inundation, altered precipitation patterns, and the likely need for government land acquisitions, zoning will become an increasingly important regulatory tool.

Recommended Technical Revisions: Articles 4,5,6, and 7 of the *Saipan Zoning Law* (18-04) are recommended for revisions to provide for enhanced board authority to address near-term future conditions (year 2100) and the effects of progressively changing climate on land use. The *Saipan Zoning Law* will likely require regular review and revision as sea level rise and changes in precipitation patterns advance over the next several decades. Requirements for a mandatory 10-year review are recommended.

APPENDIX C – MASTER BIBLIOGRAPHY OF RELEVANT LITERATURE

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APPENDIX D – ANNOTATED BIBLIOGRAPHY OF SELECTED RELEVANT LITERATURE

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

Table D.1 CNMI Smart, Safe Growth (SSG) Guidance – Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Climate Change Adaptation			
01	Preparing for climate change. A guidebook for Local, Regional, and State Governments (Snover et al., 2007)	Within decades, climate in many parts of the US is expected to be significantly warmer, increasing the risk of drought, flooding, forest fires, disease, and other impacts. Preparing for climate is not a "one size fits all" process. Local, regional, and state government decision-makers must take an active role in preparing for climate change, because climate change impacts are felt and understood most clearly in their jurisdictions. This guidebook assists decision-makers to prepare for climate change by recommending a detailed, easy-to-understand process for climate change preparedness based on familiar resources and tools.	Land-use Planning Resiliency Planning Infrastructure Development	Recovery Planning Economic Development
02	Analysis of integrating disaster risk reduction and climate change adaptation in the US Pacific Islands and Freely Associated States (Anderson, 2012)	This project recommends ways for the US Pacific Islands and Freely Associated States to integrate essential information on climate-related hazard risks into risk and vulnerability assessments to ultimately support climate adaptation planning.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development
03	Sea level extremes in the US-Affiliated Pacific Islands — a coastal hazard scenario to aid in decision analyses (Chowdhury, Chu, Zhao, Schroeder, & Marra, 2010)	The study provides perspective on the extremes of sea-level variability and predictability for the US-Affiliated Pacific Islands (USAPI) on seasonal time-scales. Models were used to estimate the varying likelihood of extreme events. Findings reveal that there is seasonal climatology of extreme events in the vicinity of USAPI that are variable on temporal and spatial scales. Some islands (Yap and Saipan) display considerably higher seasonal extremes because of typhoon-related storm surges. These surges are likely to cause large tidal sea-level inundations and increased erosion to low-lying atolls/islands and result in considerable damage. Extreme events and associated typhoons need to be evaluated from a regional perspective for coastal hazard management decision analyses in the USAPI.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
04	Climate change in the Federated States of Micronesia: Food and water security, climate risk management, and adaptive strategies, Report of findings 2010 (Fletcher & Richmond, 2010)	A report of findings following research and a three-week field assessment (April 2009) of the Federated States of Micronesia in response to nation-wide marine inundation by extreme tides (2007-2008).	Land-use Planning Resiliency Planning Infrastructure Development	Recovery Planning Economic Development

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Climate Change Adaptation cont'd			
05	A framework to diagnose barriers to climate change adaptation (Moser & Ekstrom, 2010)	Presented is a framework to identify barriers that may impede the process of adaptation to climate change. The framework targets the process of planned adaptation and focuses on potentially challenging but malleable barriers. Three key sets of components create the architecture for the framework. First, a staged depiction of an idealized, rational approach to adaptation decision-making makes up the process component. Second, a set of interconnected structural elements includes the actors, the larger context in which they function, and the object on which they act. To facilitate the identification of barriers, a series of diagnostic questions are provided. Third, a simple matrix helps locate points of intervention to overcome a given barrier. The framework provides a systematic starting point for answering critical questions about how to support climate change adaptation at all levels of decision-making.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development
06	Adapting to climate change: A planning guide for state coastal managers (National Oceanic and Atmospheric Administration, 2010)	The guide is specifically for coastal managers to develop and implement adaptation plans to reduce the impacts and consequences of climate change and climate variability. The guide is an aid and is a flexible process to address specific regional and local conditions and needs. The intent of the document is to help guide coastal managers at the state level in their initial and ongoing climate change adaptation planning efforts.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
07	Climate change and Pacific Islands: Indicators and impacts. Report for the 2012 Pacific Islands regional climate assessment (PIRCA) (Keener, Marra, Finucane, Spooner, & smith, 2012)	Adaptive capacity of Pacific Island communities is examined regarding climate change effects on: 1) freshwater availability and quality; regional and community economies; 2) urbanization, transportation, and infrastructure vulnerabilities; 3) ecosystem services; ocean resource sustainability and coastal zone management; and 4) cultural resources. Key findings suggest multiple concerns for human and natural communities in the Pacific Islands region. Climate change confronts Pacific Islands and their communities with enormous challenges. An informed and timely response is necessary to enhance resilience to the myriad changes.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Climate Change Adaptation cont'd			
08	Coral reef resilience to climate change in Saipan, CNMI; Field-based assessments, and implications for vulnerability and future management (Maynard, McKagan, et al., 2012)	Presented are the results of field-based implementation of the McClanahan et al. (2010) framework to evaluate resilience potential of coral reefs. Resiliency results are based on 35 sites and scores are the average of 9 framework variables. Twenty-three sites had high resilience, nine had medium, and three had low. Sites with the highest resilience, relative to other sites surveyed, had high coral diversity, high bleaching resistance and low macroalgae cover.	Resiliency Planning	Land-use Planning Recovery Planning Economic Development Infrastructure Development
09	Integrating reef resilience and climate change vulnerability into protected area design and management in the Commonwealth of the Northern Mariana Islands (CNMI) and greater Micronesia (Maynard, Mcleod, et al., 2012)	Climate models identified thermal variability and the average frequency of thermal stress events likely to induce coral bleaching over a 20-year period across Micronesia, including CNMI. Based on model outputs, thermal stress events are expected to increase across Micronesia. Reef resilience rankings were coupled with model outputs to recommend management actions to support coral reefs and coastal managers working in Saipan. The report provides a "how-to-guide" to help build the capacity of local resource managers and to address the threat of climate change.	Resiliency Planning	Land-use Planning Recovery Planning Economic Development Infrastructure Development
10	Climate change adaptation toolkit for coastal communities in the coral triangle: Tool 4 - guide to vulnerability assessment and local early action planning (VA-LEAP) - Version I. (Micronesia Conservation Trust and US Coral Triangle Initiative Support Program, 2012)	A step-by-step guide for the development of a Vulnerability Assessment (VA) and a Local Early Action Plan (LEAP) for climate change adaptation. The VA-LEAP guides planning for needed actions to improve management while considering climate change impacts. This guide focuses local knowledge and information to understand the target natural and social resources, and the vulnerability to climate change.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
11	Climate change vulnerability assessment for the Island of Saipan (Greene & Skeele, 2014)	Summarized are the process, results, and recommendations from a community-based climate change vulnerability assessment. Assessment foci are projected sea level rise and rainfall patterns, the exposure and sensitivity of Saipan to these changes, and the Island's capacity to respond. Saipan's western coastal plain is likely the most vulnerable. Low lying areas, critical infrastructure, residential and commercial districts, and habitats located within Garapan and Lower Base should be prioritized for planning efforts. Climate adaptation planning for Saipan should integrate sea level rise into current and future flood control studies, public works projects, and assessments of proposed development impacts.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Climate Change Adaptation cont'd			
12	Public knowledge and perceptions of climate change in the Commonwealth of the Northern Mariana Islands (Skeele & Okano, 2014)	This study examines the public's knowledge and perceptions of climate change and its impacts in the CNMI. A total of 419 surveys were conducted on the islands of Saipan, Tinian, and Rota. Respondents were asked a selection of questions designed to assess their basic knowledge of climate change, its causes and potential impacts, and their perception of vulnerability to climate change. The survey results suggest an overall lack of understanding of the causes and impacts of climate change among the general public, although respondents did display a moderate understanding of some specific topics.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development
13	Climate vulnerability for the Islands of Rota and Tinian, Commonwealth of the Northern Mariana Islands (Bureau of Environmental and Coastal Quality, 2015a)	The Vulnerability Assessment (VA) for Rota and Tinian summarizes current climate trends for the CNMI as well as projection of future climate conditions and associated impacts. Historical impacts and potential vulnerabilities are discussed separately for each island followed by suggestions to address vulnerabilities and opportunities for Rota, Tinian, and CNMI. This VA has identified levels of potential impact, investigates susceptibilities of human and natural systems, and explores any capacities for responding to identified impacts.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
14	Northern Mariana Islands - Typhoon Soudelor (Federal Emergency Management Agency, 2015)	On 05 August 2015 President Obama declared that a major disaster existed in the CNMI due to damage caused by Typhoon Soudelor, which made Individual Assistance available to affected individuals and households on the island of Saipan. This declaration also made debris removal and emergency protective measures available on the islands of Rota, Tinian, and Saipan. Direct Federal assistance was also authorized. Finally, this declaration made Hazard Mitigation Grant Program assistance requested by the Lieutenant Governor available for hazard mitigation measures for the entire Commonwealth of the Northern Mariana Islands.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Energy			
15	Commonwealth of the Northern Mariana Islands strategic energy plan (Conrad & Ness, 2012)	This document is a starting point for energy planning in CNMI and builds upon prior resource assessments. Addressed are a range of energy options focusing on energy efficiency and renewable energy technologies, policies, and programs. This plan can be the foundation for formulating actions and implementation strategies. Three future scenarios are presented regarding the energy efficiency and renewable energy technical potential in the CNMI: 1) a base case; 2) a low-impact scenario (20% reduction in fossil fuel consumption); and 3) a high-impact scenario (53% reduction in fossil fuel consumption). The purpose of this scenario exercise is to show what CNMI's energy portfolio could look like by the year 2026.	Resiliency Planning Recovery Planning Economic Development Infrastructure Development	Land-use Planning
16	Commonwealth of the Northern Mariana Islands energy action plan (Conrad & Ness, 2013)	The CNMI Energy Task Force selects three near-term energy strategies and outlines steps implementation steps. Three energy strategies selected by the task force are: 1) designing a demand-side management program focusing on utility, residential, and commercial sectors; 2) developing an outreach and education plan focused on energy conservation in government agencies and businesses, including workplace rules; and 3) exploring waste-to-energy options.	Economic Development Infrastructure Development	Land-use Planning Resiliency Planning Recovery Planning
17	Commonwealth Utilities Corporation 2015 Integrated Resource Plan, draft final report (Leidos Engineering, LLC., 2015)	The Integrated Resource Plan (IRP) and Energy Supply Analysis was designed to seek firm bids for future resource options for the CNMI and model the CUC's generation system throughout the 25-year planning horizon, given various scenarios and a range of assumptions regarding future loads and fuel price projections, while meeting the energy demands of CUC's customers. The results of the IRP provide planning options for building an optimized resource mix while working toward reducing electric rate impacts for CUC customers.	Economic Development Infrastructure Development	Land-use Planning Resiliency Planning Recovery Planning

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No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Transportation			
18	Overview of the US Department of Transportation programs in the territories (US Office of Intergovernmental Affairs, 2013)	Territorial Highway Program aims to construct and improve a system of arterial and collector highways and necessary inter-island connectors in the CNMI. The Moving Ahead for Progress in the 21st Century Act (MAP-21) funds are directly authorized out of the Highway Trust Fund. Under MAP-21, funding was available for project types, consistent with applicable provisions of 23 U.S.C. and MAP-21 and public transportation.	Economic Development Infrastructure Development	Land-use Planning Resiliency Planning Recovery Planning
19	The Mariana Islands maritime transportation system recovery plan (Guam/CNMI Maritime Transportation System Advisory Group, 2014)	The maritime transportation system (MTS) recovery plan provides an all-hazard operational framework for coordinating system stabilization and recovery of basic functionality of the MTS for CNMI.	Recovery Planning Economic Development Infrastructure Development	Land-use Planning Resiliency Planning
	Water Management			
	Water Management – Drinking Water			
20	Drinking water and wastewater Master Plan- Rota, Commonwealth of the Northern Mariana Islands (Duenas, Camacho & Associates, Inc. & CH2MHill, 2015a)	The Master Plan for Rota works toward compliance with Stipulated Order Number One for Preliminary Injunctive Relief to determine current and future infrastructure needs for Commonwealth Utility Corporation (CUC) drinking water and wastewater systems. The goal of the Master Plan is to meet Stipulated Order requirements through an implementation plan that addresses needs and promotes operational improvements. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency personnel to track compliance.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
21	Drinking water and wastewater Master Plan - Tinian, commonwealth of the Northern Mariana Islands (Duenas, Camacho & Associates, Inc. & CH2MHill, 2015b)	The Master Plan for Tinian works toward compliance with Stipulated Order Number One for Preliminary Injunctive Relief to determine current and future infrastructure needs for Commonwealth Utility Corporation (CUC) drinking water and wastewater systems. The goal of the Master Plan is to meet Stipulated Order requirements through an implementation plan that addresses needs and promotes operational improvements. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency personnel to track compliance.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

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No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Water Management – Drinking Water cont'd			
22	Drinking Water Master Plan - Saipan, Commonwealth of the Northern Mariana Islands (Duenas, Camacho & Associates, Inc. & CH2MHill, 2015c)	The draft Drinking Water Master Plan for Saipan works toward compliance with Stipulated Order Number One for Preliminary Injunctive Relief to determine current and future infrastructure needs for Commonwealth Utility Corporation (CUC) drinking water systems. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency (EPA) personnel to track compliance.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
23	2016 Commonwealth of the Northern Mariana Islands 303 (d), 305 (b) and 314 water quality assessment integrated report (Arriola et al., 2016)	This report satisfies requirements of Sections 303(d), 305(b), and 314 of the Clean Water Act. The CNMI prepares a Water Quality Assessment Integrated Report every two years and the report is the principle means to evaluate whether CNMI is meeting Water Quality Standards (WQS) to ensure that all designated uses, as established by regulations, are attained. The most common sources of water quality degradation are from: 1) point sources such as failing sewer lines; 2) illicit wastewater discharges; and 3) non-point sources such as stormwater pollutants.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development
24	Sustainable aquifer production on the Island of Saipan (Spaeth, 2017)	This paper evaluated Saipan's water infrastructure, aquifers, needs, and long-term goals to sustain the aquifer. The amount of water collected in aquifers on small islands can vary through the seasons and without proper planning and maintenance, pumping wells can greatly affect the aquifer. This paper details a list of problems, goals, and alternatives to sustainably manage groundwater resources to maintain the quality of the water in the aquifer.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
	Water Management - Wastewater			
25	Wastewater Master Plan - Saipan, Commonwealth of the Northern Mariana Islands (Duenas, Camacho & Associates, Inc. & CH2MHill, 2015)	The draft Saipan Wastewater Master Plan works toward compliance with Stipulated Order Number One for Preliminary Injunctive Relief to develop new capital projects, replacement and repair of existing facilities, modification of operational procedures, and assessing current staffing levels and related policies. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency (EPA) personnel to track compliance.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

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No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Water Management - Stormwater			
26	CNMI and Guam stormwater management manual, Final - October 2006, Volume I (Horsley Witten Group, Inc., 2006a)	The CNMI and Guam Stormwater Management Manual compiles industry knowledge and experience into a single design handbook useful to engineers, plan reviewers and the regulated community. The Manual provides a framework for effective implementation of stormwater management practices to protect the vital water resources of the CNMI and Guam. Volume I of the manual provides designers a general overview on local stormwater issues and how to size and design BMPs to comply with stormwater performance standards.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
27	CNMI and Guam stormwater management manual, Final - October 2006, Volume II (Horsley Witten Group, Inc., 2006b)	The CNMI and Guam Stormwater Management Manual compiles industry knowledge and experience into a single design handbook useful to engineers, plan reviewers and the regulated community. The Manual provides a framework for effective implementation of stormwater management practices to protect the vital water resources of the CNMI and Guam. Volume II of the manual provides information on how to select and locate BMPs at a development site and prepare effective landscaping plans, BMP construction specifications with step-by-step BMP design examples and other assorted design tools.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
28	Soil erosion and stormwater sedimentation: A guide for landowners and developers in the CNMI (BECQ, n.d.-b)	This poster provides background and information about stormwater management and erosion. The poster depicts several erosion control Best Management Practices.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning

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No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Solid Waste			
29	Final Environmental Assessment for the siting of a solid waste transfer station on Tinian, CNMI (Duenas, Camacho & Associates, 2012)	EA examines potential impacts of the proposed action to construct a solid waste transfer station with supporting infrastructure on Tinian. The transfer station would accommodate waste separation and recycling. Non-recyclable and certain other waste will be hauled from the transfer station to the proposed new sanitary landfill at Atgidon. The proposed action is consistent with the CRM Program and no federally-listed T&E species or critical habitat occur in or near proposed sites. A "No Historic Properties Affected" determination was made. A FONSI was signed and issued by the US Department of the Interior, Office of Insular Affairs in 2013 (Pula, 2013).	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
30	Commonwealth of the Northern Mariana Islands joint military training solid waste study (Naval Facilities Engineering Command, Pacific, 2014)	Report provides solid waste management information as associated with the proposed military training actions and support facilities on Tinian and Pagan, CNMI. Solid waste on Tinian is currently transported to the Tinian Municipal Dump, which is non-compliant RCRA Subtitle D regulations. It operates under a notice of violation issued by the CNMI Division of Environmental Quality. The current Tinian Municipal Dump is not an option for the US military to dispose of CJMT-generated municipal solid waste (MSW).	Land-use Planning Infrastructure Development	Resiliency Planning Recovery Planning Economic Development
31	Sustainable approaches for materials management in remote, economically challenged areas of the Pacific (Townsend, Carson, & Scott, 2016)	Materials management in remote areas of the Pacific, such as in CNMI, is challenging. Report outlines the current state of solid waste management in the US Pacific island territories and includes information from site visits to Guam, Saipan, Tinian, Rota, Tutuila, and Apia and assessments of the technical and economic feasibility of solid waste management technologies. The report also provides guidance on management practices that promote sustainable materials management and minimize risk to human health and the environment.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
32	Case Study: Success of Saipan's solid waste management system serving as an example to other South Pacific Islands (Hiney & Hawley, n.d.)	The US EPA issued the CNMI a compliance order to close the Puerto Rico Dump and a new landfill was needed. To implement new solid waste diversion, recycling, and disposal systems, the Lower Base Refuse Transfer Station and the Marpi Soild Waste Facility were constructed. Environmental safeguards at the facilities include: 1) daily six-inch soil cover; 2) landfill liner systems; and 3) a leachate collection system. The landfill design has been successful.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Natural Resources			
	Natural Resources - Marine Resources			
33	Typhoon water source analysis for west coast of Saipan Mariana Islands (Chou, 1989)	Reported is a typhoon water surface analysis for the west coast of Saipan. The synthetic typhoon ensemble used for Agana Bay, Guam was utilized. The surge time-histories of the storms were computed. Deepwater wave conditions associated with each storm were calculated. Predicted still water levels (swl) were calculated by combining surge and astronomical tide time-histories, and the ponding water levels caused by deep water wave breaking on and over the reef. Wave setup for each storm was estimated. Stage-frequency relationships were established using the probability of occurrence of each storm event in the ensemble and the maximum swl generated by the storm.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
34	Saipan Lagoon erosion study, Saipan Island, Commonwealth of the Northern Mariana Islands (US Army Corps of Engineers, 2004)	The specific objectives of the Saipan Lagoon Shoreline Erosion Study are: 1) review and analysis of existing beach profiles with emphasis on identifying beach erosion and accretion trends; 2) a field investigation of shoreline conditions consisting of photographically documenting and accurately locating shoreline features conditions and problems; and 3) preparation of report atlas describing shoreline conditions and presenting the shoreline profile analysis. This atlas consists of text describing the shoreline, photographs illustrating shoreline features, shoreline profile analyses, and topographic maps and vertical aerial photographs at a scale of 1:200.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning
35	The economic value of the coral reefs of Saipan, Commonwealth of the Northern Mariana Islands (van Beukering, Haider, et al., 2006)	The study determines an economic valuation of the coral reefs and associated resources on Saipan. The Total Economic Value, representing the entire economic importance of Saipan's marine environment, was estimated at $61.16 million per year with the tourism industry being the greatest beneficiary of the coral reef ecosystem services. Additionally, spatial analysis showed that, in general, the more valuable the reef, the poorer the condition and the greater the threats. Combining research areas, the report makes three policy recommendations: 1) tackle the problems of non-point and point source pollution; 2) make use of the cultural importance residents place on marine ecosystems to improve coral reef management; and 3) develop a comprehensive system of user fees for visitors of the Marine Protected Areas on Saipan.	Land-use Planning Resiliency Planning Economic Development	Recovery Planning Infrastructure Development

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Natural Resources – Marine Resources cont'd			
36	Impact of a coastal dump in a tropical lagoon on trace metal concentrations in surrounding marine biota: A case study from Saipan, Commonwealth of the Northern Mariana Islands (CNMI) (Denton et al., 2009)	Trace metal enrichment of subtidal sediments around the base of the Puerto Rico dump on Saipan had previously been identified. This study examines the metal status of dominant ecological representatives collected close to the dump and other known or suspected sources of trace element contamination in the lagoon including two marinas, a sea port (Port of Saipan) and dry dock area, and a power plant. Surface sediments and biota were collected from 12 sites over a two week period in June 2003 and tested for metals concentrations. Concentrations were high near the dump and sediment concentrations of most metals were significantly corelated to each other except for arsenic. The data for metal concentrations in the biota tested did not raise any significant public health concerns when evaluated against the risk-based consumption limit health advisories for methylmercury recommended by the US EPA.	Land-use Planning Recovery Planning	Resiliency Planning Economic Development Infrastructure Development
37	Three dimensional wave-current hydrodynamic model for the management of Saipan Lagoon, Saipan, Commonwealth of the Northern Mariana Islands (Damlamian & Kruger, 2010)	The project established a numerical model describing the water flow in Saipan lagoon and assessed coastal erosion. Data collection was from April to June 2010. Field data was used to calibrate the model to reproduce observed coupling effects between offshore waves and lagoon currents. The model was run for two seasons April to September (calm) and October -March (energetic). Dispersion of pollutants discharging for the Sadog Tasi outfall was modeled. Overall, Saipan lagoon is flushed relatively well from October - March compared to the April - September when the pollutant plume may reside in the Managaha marine conservation area.	Land-use Planning Infrastructure Development	Resiliency Planning Recovery Planning Economic Development
38	An analysis of issues affecting the management of coral reefs and the associated capacity building needs in the Commonwealth of the Northern Mariana Islands (Page, Swanenberg, Maddalene, & King, 2014)	The assessment examines issues that affect capacity to implement the management priorities and presents near-term recommendations to address persistent capacity gaps and barriers. Coral reef management in the CNMI will require a long-term strategy to build adaptive capacity within the current governance system as well as an appreciation for changes that may be needed in the existing system. Coral reefs are valuable to the economy, culture and future of the CNMI. The report recommends a "road map" to continue the development of adaptive capacity and a strategy for the development of a long-term capacity building action plan.	Land-use Planning Resiliency Planning Economic Development	Recovery Planning Infrastructure Development

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Natural Resources – Marine Resources cont'd			
39	Coastal Ecosystems: A Critical element of Risk Reduction: Coastal ecosystems and risk reduction (Spalding et al., 2013)	Coastal ecosystem conservation can provide coastal protection benefits. This role has not been sufficiently accounted for in coastal planning and engineering. Substantial evidence now exists showing how, and under what conditions, ecosystems can play a valuable function in wave and storm surge attenuation, erosion reduction, and in the longer term maintenance of the coastal profile. Through their capacity for self repair and recovery, and through co-benefits they provide, ecosystems can offer notable advantages over traditional engineering approaches in some settings. They can also be combined in "hybrid" engineering designs. Ten recommendations are made to encourage the utilization of existing knowledge and to improve the incorporation of ecosystems into policy, planning and funding for coastal hazard risk reduction.	Land-use Planning Resiliency Planning Infrastructure Development	Recovery Planning Economic Development
40	Saipan lagoon use management plan user survey and mapping report (Allied Pacific Environmental Consulting, 2016)	Assessment of recreational and commercial uses of Saipan Lagoon to provide guidance for management. Provides information for the Saipan Lagoon Use Management Plan (SLUMP) and identifies priority issues and management projects to balance habitat conservation with economic activity. Information was derived from participatory mapping technique and maps were produced for recreational activities, commercial activities, and extractive uses. The authors recommend: 1) Implement management to avoid overcrowding and user conflicts; 2) Protect priority locations and resources; 3) Prioritize water quality and erosion control; and 4) Continue frequent stakeholder engagement.	Land-use Planning	Resiliency Planning Recovery Planning Economic Development Infrastructure Development
41	Saipan Lagoon use management plan update - 2017 final (Horsley Witten Group, Inc. & Hofschneider Engineering Corporation, 2017b)	The SLUMP outlines a strategy for the next decade to ensure sustainable use and quality of the Lagoon. The SLUMP has been previously updated to adapt to declining ecosystem health, eroding beaches, water quality challenges, and an expanding number of users. This 2017 update focuses on recommendations and associated actions identified by a wide range of agencies, legislative leaders, and others with a stake in Lagoon use management, such as the Saipan Chamber of Commerce, marine sports operators, fishermen, hospitality groups, and the community.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Natural Resources - Terrestrial Resources			
42	Managaha Island shoreline stability assessment (Fletcher, Barbee, Dyer, Genz & Vitousek, 2007)	The Managaha Island Shoreline Stability Assessment evaluates coastal erosion hazards and potential management responses. Managaha Island is a registered National Historic site, a Marine Conservation Area managed by the Department of Lands and Natural Resources Division of Fish and Wildlife, and an important tourist destination. Recent studies have documented shoreline erosion along the southeast, east, and northeast side of the island. The report documents patterns of shoreline change and offers various mitigation methods available to manage erosion.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
43	Reconnaissance study of the hydrology of American Memorial Park, Island of Saipan, Commonwealth of the Northern Mariana Islands (Perreault, 2007)	American Memorial Park's estuarine system provides critical habitat for various migratory and resident waterfowl, including two Federally-listed endangered species: the Marianas gallinule and the nightingale reed warbler. A reconnaissance study was undertaken to better understand the hydrology of American Memorial Park. The goals of the study were: 1) to describe the occurrence and salinity of surface and ground water within the park; 2) to develop a hydrologic model of the park area of the island, with emphasis on the 27-acre estuarine system; and 3) to identify additional data needed to further develop this model.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development
44	CNMI erosion and sediment control field guide, version 1.0 for contractors and site inspectors (Horsley Witten Group, Inc., 2009)	A field guide for contractors in the CNMI involved in clearing, grading, stockpiling, and other earth moving activities at all construction sites, to help contractors implement 11 erosion and sediment control (ESC) standards of the 2006 CNMI/Guam stromwater manual. The guide explains the importance of ESC as part of the construction process, summarizes ESC practice design, installation, and maintenance tips, outlines inspection and project closeout considerations, and is a reference for field-use.	Land-use Planning Resiliency Planning Infrastructure Development	Recovery Planning Economic Development
45	2016-2020 Section 309 assessment and strategy report: Commonwealth of the Northern Mariana Islands (BECQ-Division of Coastal Resources Management, 2016)	This report satisfies regulatory requirements to develop and submit under the Coastal Zone Management Act (CZMA) § 309. Assessments and strategies for 2016–2020 were developed. The report provides a basis for CNMI coastal management program priorities and a strategy framework to ensure program progress.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Natural Resources – Terrestrial Resources cont'd			
46	Garapan area shoreline assessment study, final (US Army Corps of Engineers, 2017)	This report documents shoreline changes for Saipan Lagoon Shoreline (SLS) due to concerns about erosion and the need to protect coastal ecosystems, upland development, and infrastructure. Planning and conceptual design guidance is provided for the development of Living Shore Line (LSL) projects for Saipan Lagoon. Some reaches are accreting and others are eroding. By 2070, sea level rise may be 1.1 ft to 7.2 ft higher than today in the study area. LSL projects for the SLS should be designed with adaptive management strategies from green or soft solutions, to gray or hard solutions. Conceptual plans for 5 reaches of SLS are described.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
47	Erosion control best management practices: A guide for landowners and developers in the CNMI (Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management, n.d.-a)	This brochure provides background and information about erosion, sediment control, and stormwater management for landowners and developers. The brochure provides general information about erosion management and includes links to additional on-line resources and to Division of Coastal Resource Management and Division of Environmental Quality permit applications.	Land-use Planning Resiliency Planning	Recovery Planning Economic Development Infrastructure Development
	Natural Resources - Watershed			
48	Laolao Bay Conservation Action Plan, Draft (Herrmann & Gombos, 2009)	This report describes a three-year Local Action Strategy for Laolao Bay Watershed is a roadmap for collaborative and cooperative action to identify and implement priority actions to reduce threats to valuable coral reef resources. A Conservation Action Planning (CAP) team used the CAP tool to undergo a comprehensive and strategic process for site-specific threat identification and action planning. The report also contains the 2012 CAP addendum and workplan.	Land-use Planning Economic Development Infrastructure Development	Recovery Planning Resiliency Planning
49	Talakhaya/Sabana Conservation Action Plan (Bickel, 2012)	The CAP identifies critical watershed assets, threats to the assets, prioritized conservation goals, and strategies to achieve goals. Eight resource targets were selected, and three high-priority threats were identified. The five strategies to manage the threats are: 1) revegetate critically eroded areas; 2) implement engineering actions to decrease erosion; 3) raise awareness and education about the negative effects to the watershed from fire and poaching; 4) create effective law enforcement measures; and 5) collect species population information for more informed policy decisions.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Natural Resources – Watershed cont'd			
50	Garapan Conservation Action Plan (CNMI Division of Environmental Quality, 2013)	This Conservation Action Plan CAP identifies critical watershed assets, threats to the assets, and strategies to reduce impacts of the threats. The goal is to maintain and improve watershed natural resources in West Takpochao Central subwatershed and to coordinate efforts between stakeholders. CAP actions can be grouped into six categories: 1) implementing best management practices; 2) improving engineering and infrastructure; 3) improving regulations and enforcement; 4) conducting education and awareness programs; 5) continuing research and monitoring; and 6) improving community stewardship and incentive programs.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning
	Cultural Resources			
51	Integrating historic property and cultural resource considerations into hazard mitigation planning: State and local mitigation planning how-to-guide (Federal Emergency Management Agency, 2005)	Guide offers steps to integrate historic properties and cultural resources into hazard mitigation planning, which is often overlooked in mitigation planning. Historic properties and cultural resources are valuable economic assets. Integrating historic preservation planning and hazard mitigation planning helps to ensure the future growth of safe and sustainable historic communities.		Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development
52	Public shoreline access guide for Saipan, Tinian, and Rota (Skeele, 2015)	This guide helps the public locate shoreline access points on the islands of Saipan, Tinian, and Rota. The islands of CNMI contain incredibly diverse and beautiful shorelines. This guide aims to provide the public with information regarding the recreational opportunities available at the various shoreline access points on Saipan, Tinian, and Rota. These sites include locally or nationally managed beach parks, scenic cliffs, boat ramps and marinas, and even small earthen paths leading to secluded pocket beaches.	Land-use Planning Infrastructure Development	Resiliency Planning Recovery Planning Economic Development

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Planning Resources			
53	Public land use Master Plan update - Phase 1 (Duenas, Bordallo & Associates, Inc., 2007)	Phase 1 of the Public Land Use Master Plan Update for the CNMI Department of Public Lands (DPL). Phase 1 includes: 1) updates the Geographic Information System (GIS) for public lands; 2) review of the CNMI economy and public lands projections of homestead applicants; 3) alternative goals and selects goal for the homestead program; and 4) public land use planning criteria (partial).	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
54	Garapan and Beach Road Revitalization Plan (MAKERS, 2007)	Garapan and Beach Road are critical to the future of Saipan's tourism economy but need urgent attention. Infrastructure is in poor condition, businesses in some areas are not family friendly, and the general appearance is run down. The plan is intended as a guide for CNMI agencies, landowners and developers to revitalize Garapan and Beach Road to be more attractive for visitors and residents. The plan provides a 10-year vision and calls for public and private actions to achieve short, medium and long-term actions related to regulations, circulation and capital improvements, property development, and management oversight. Portions of this plan recommend zoning actions for incorporation into the Saipan Zoning Law.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning
55	Standard State Mitigation Plan, Commonwealth of the Northern Mariana Islands, pre-final May 2010 (CNMI Emergency Management Office, 2010)	The plan addresses the risks associated with hazards in the CNMI, discusses hazard mitigation implementation for the CNMI, satisfies the Federal requirements for hazard mitigation planning funds, and identifies and prioritizes state-level and local mitigation activities. The base plan describes the hazards in the CNMI, governmental coordination, and general mitigation measures. Subsequent chapters contain more detailed information about each hazard and existing mitigation programs, successful mitigation projects and activities, and short- and long-term mitigation goals and objectives.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Planning Resources cont'd			
56	Rural Business Enterprise Grant economic restoration project & report (Island Training Solutions, 2011)	Report discusses the change in CNMI economic and business climate conditions between the 2009 and 2011. In 2009, Agriculture, Aquaculture, Education/Educational Tourism, and Call/Data Centers were targeted as industries for development. The 2009 Economic Restoration Summit (ERS) report provided few implementation examples in similar economic conditions. Many recommendations failed to recognize fiscal and policy constraints that hampered development of thes industries and failed to yield positive economic impact to the islands. This 2011 ERS report includes a background of each targeted industry, discussion on reports presented during the 2011 ERS, and findings and recommendations for each industry.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
57	Standard State Mitigation Plan, Commonwealth of the Northern Mariana Islands, October 2014 (CNMI Homeland Security and Emergency Management, 2014)	For the 2014 CNMI SSMP update, information and report sections remains largely unchanged from the 2010 SSMP, reflecting little change in the CNMI's key identified threats and hazards but also highlighting planning deficiencies experienced throughout the update, including limited time and resources common among small government agencies. Key updates to the 2014 SSMP include: 1) addition of climate change as a new hazard; 2) described new planning bodies involved in the 2014 SSMP update; 3) inclusion of new Mitigation Actions; 4) revision/update of Facilities Assessment Matrix; and 5) inclusion of recent CNMI demographics and statistical data.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	
58	DCRM Permitting in the CNMI (Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management, 2015b)	Permits are required for development activities within Areas of Particular Concern (APC) designated DCRM. Three permit types are: 1) temporary for emergency repairs; 2) APC for all non-major developments within or that may adversely impact an APC; and 3) major siting for all major developments, uses, or activities that may cause significant adverse impacts to coastal resources.	Land-use Planning Resiliency Planning Recovery Planning Economic Development Infrastructure Development	

CNMI Smart, Safe Growth (SSG) Guidance - Annotated Bibliography

No.	Document Title	Abstract	Applicable/Relevant to CNMI SSG Planning and Development [1] Supports	Deficient
	Planning Resources cont'd			
59	5 Year Consolidated Plan (2015 -2019) for the CNMI community planning development programs (Northern Marianas Housing Corporation, 2015)	This plan complies with statutory planning requirements for programs funded through the US Department of HUD. In CNMI, the Housing Corporation administers all HUD-funded programs including programs to address priority needs and goals for housing, services, and public facilities that serve low- and moderate-income populations. Plan goals aim to improve the quality of life through economic development projects, public facilities, energy efficient projects, and recreational facilities.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
60	Annual Report 2017 (CNMI Department of Public Lands, n.d.)	This annual report documents activities by Department of Public Lands (DPL) including the Homestead Division, Land Claims Division, Planning Division, Real Estate Division, Compliance Division, Accounting Division, and Administrative Division.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
61	Tourism Development in the US commonwealth of the Northern Mariana Islands (Horwath HTL, 2017)	This study reviews tourism development in the CNMI, identifies and analyzes key issues, examines best management practices used in other resort destinations, and offers recommendations. Recommendations are categorized into short-term urgent actions and long-term actions to promote sustainable tourism development.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning
62	2016-2021 Comprehensive economic development strategy (Commonwealth Economic Development Strategic Planning Commission, n.d.)	CEDS is a comprehensive economic planning document which considers the jurisdictions of human, physical and natural assets towards an integrated economic plan for a five (5) year period. The CEDS is a collaborative effort between the public and private sectors, governed through a CEDS Commission which is intended to consider all aspects of the CNMI's economic planning.	Land-use Planning Resiliency Planning Economic Development Infrastructure Development	Recovery Planning
63	The Commonwealth Zoning Board FY 2014 annual report (Commonwealth Zoning Board, n.d.).	This annual report highlights the operations and achievements of the Saipan Zoning Office, its permitting and enforcement activities, its challenges, as well as future goals to assist Saipan's economy through improved and organized developments.	Land-use Planning Economic Development Infrastructure Development	Resiliency Planning Recovery Planning

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 01

Citation: Snover, A. K., Binder, W., Lopez, J., Willmott, E., Kay, J., Howell, D., & Simmonds, J. (2007). *Preparing for climate change. A guidebook for Local, Regional, and State Governments* (pp. 186). Oakland, CA: ICLEI - Local Governments for Sustainability.

Abstract: Within a handful of decades, climate in many parts of the US is expected to be significantly warmer than even the warmest years of the 20th century, increasing the risk of drought, flooding, forest fires, disease, and other impacts across many regions. Preparing for climate is not a "one size fits all" process. Local, regional, and state government decision-makers must take an active role in preparing for climate change, because climate change impacts are felt and understood most clearly in their jurisdictions. This guidebook assists decision-makers to prepare for climate change by recommending a detailed, easy-to-understand process for climate change preparedness based on familiar resources and tools.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	Economic Development
Infrastructure Development	

Synthesis: This guide book does not directly address SSG in CNMI but is an excellent source for practical processes to plan and prepare for climate change.

The guidebook provides steps to identify areas of interest that may be affected by climate change (termed "sectors") and to identify and prioritize planning areas in which a government of community manages, plans, or makes policy affecting the services and activities associated with the built, natural, and human systems. Specifically, the guidebook addresses ways to analyze climate change impacts for land-use and resiliency planning including considerations for infrastructure development. The strength of this document is in ensuring climate change planners consider a wide range of information and sets standards for plan elements including preparedness goals and an implementation plan. Although this document does not address CNMI issues directly, it will be helpful to evaluate and guide current climate change planning initiatives.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 02

Citation: Anderson, C. L. (2012). *Analysis of integrating disaster risk reduction and climate change adaptation in the US Pacific Islands and Freely Associated States* (No. 201105) (pp. 38). Honolulu, HI: National Oceanic and Atmospheric Administration Climate Program Office, Pacific Regional Integrated Science and Assessment.

Abstract: This project recommends ways for the US Pacific Islands and Freely Associated States to integrate essential information on climate-related hazard risks into risk and vulnerability assessments to ultimately support climate adaptation planning.

CNMI SSG Planning and Development:

Supports	Deficient
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This report does not directly support SSG planning and development areas for CNMI. However, the review highlights several areas where risk reduction and climate change adaptation planning can be integrated to improve identifying focal areas for risk reduction actions. The report highlights the importance of integrating community-based knowledge and vulnerabilities to identify capacity to ensure sustainable communities and livelihoods. Lessons learned from considering the disaster risk reduction and climate adaptation efforts in the Pacific Islands to date reveal areas of missing information and knowledge gaps that can be targeted in updated planning, and in the development of proposals and implementation of risk reduction actions. The authors provide several recommendations to improve integrated planning efforts.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 03

Citation: Chowdhury, M. R., Chu, PP.-S., Zhao, X., Schroeder, T. A., & Marra, J. J. (2010). Sea level extremes in the US-Affiliated Pacific Islands — a coastal hazard scenario to aid in decision analyses. *Journal of Coastal Conservation*, *14*(1), 53–62.

Abstract: The objective of this study is to provide a perspective on the extremes of sea-level variability and predictability for the US-Affiliated Pacific Islands (USAPI) on seasonal time-scales. Based on the Generalized Extreme Value (GEV) model, the L-moments method has been used to estimate the model parameters. The bootstrap method has been used to define the exceedance probability level of upper and lower bounds of the return periods at the 90% confidence interval. On the basis of these return calculations and expected extremes of high sea level, the seasonal maxima of sea level and the varying likelihood of extreme events have been estimated. For analyzing the predictability of the extremes of sea-level, a canonical correlation analysis (CCA) statistical model has been developed. Findings reveal that there is seasonal climatology of extreme events in the vicinity of USAPI that are variable on temporal and spatial scales. Some of the islands (Yap and Saipan) display considerably higher seasonal extremes than the others for 20-100 year return periods because of typhoon-related storm surges. These surges are likely to cause large tidal sea-level inundations and increased erosion to low-lying atolls/islands and result in considerable damage to roads, harbors, unstable sandy beaches, and other major infrastructure. Finally, the need to evaluate the extreme events and associated typhoons from a regional perspective has been stressed for coastal hazard management decision analyses in the USAPI.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This article does not directly discuss the SSG planning and development areas for CNMI; however, the data analysis directly supports all the relevant planning and development areas.

For example, sea level rise combined with extreme storm events is expected to cause increased beach erosion, higher and more frequent storm surge with more extensive coastal inundation, changes in surface water quality and groundwater availability, increased loss of coastal property and habitats, increased flood risk and potential loss of life, loss of cultural resources and values, impacts on agriculture and aquaculture through declines in soil and water quality, and loss of tourism, recreation, and transportation functions. Moreover, critical infrastructure tends to be located in or near coastal areas and will be increasingly threatened by inundation, storm surge, erosion, and other coastal hazards. This information is critical for land-use, resiliency, and recovery planning to reduce potential coastal hazards to infrastructure and economic development.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

The authors conclude that the rate of observed sea-level rise increased from the 19th to the 20th century. Also, the levels of positive deviation from normal sea levels due to extreme events is expected to be between 0.1 m ~0.3 m for a 20-year return period (RP) and 0.3 m for a 100-year RP. The authors conclude that these elevated sea levels due to extreme events will likely have many negative direct and indirect impacts to natural and built environments on islands. For Saipan, observations have revealed extremely high positive deviations from mean sea level (~0.4 m for 20 RP and ~1.2 m for 100 RP) due to two typhoons. Therefore, accounting for the changes in the frequency and severity of storms with sea-level rise will be important for future SSG planning and development.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 04

Citation: Fletcher, C. H., & Richmond, B. M. (2010). *Climate change in the Federated States of Micronesia: Food and water security, climate risk management, and adaptive strategies, report of findings 2010* (pp. 32). Honolulu, HI: Center of Island Climate Adaptation and Policy, University of Hawaii Sea Grant College Program.

Abstract: A report of findings following research and a three-week field assessment (April 2009) of the Federated States of Micronesia in response to nation-wide marine inundation by extreme tides (2007-2008).

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	Economic Development
Infrastructure Development	

Synthesis: This report is focused on the Federated State of Micronesia (FSM), but the findings and suggested solutions are applicable to CNMI. Continued rise in global mean sea level and changes to the water cycle will threaten FSM food and drinking water resources. Most of the FSM population lives near the cost and the economy is tied to costal resources and infrastructure. The lack of specific costal management policy increases the difficulty of managing climate associated risks. Implementing climate adaptation efforts in FSM may be hampered by traditional and restrictive land-use patterns, decision-making and land tenure, lack of funding and planning, the remote nature of the population and geography, and lack of abundant resources.

The report provides a planning framework to assist coastal communities to plan for sea-level rise and increased marine inundation. The planning framework aims to reduce costal vulnerability and to increase coastal resilience at local and regional levels. Climate risk management strategies for FSM identified via the planning framework include land-use, resiliency, and infrastructure development planning. Although the management strategies are developed for FSM and are general in nature, the planning framework may be applied to similar issues in the CNMI and strategies identified for the FSM may be applicable to the CNMI. Specifically, several adaptations to cope with sea level rise are likely applicable to CNMI such as: 1) for areas of critical infrastructure where protection or retrofit is appropriate, describe effective approaches to protect or rebuild infrastructure and development so that climate risk is reduced; 2) for areas where alternative strategies can be used, describe innovative approaches to shift infrastructure and development away from vulnerable areas; and 3) build long-term coastal retreat and redevelopment planning into land use policies that emphasize climate risk management. Retreat would combine both vertical (in place) and horizontal (relocation) components, to ensure new development is appropriately sited and designed.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 05

Citation: Moser, S. C., & Ekstrom, J. A. (2010). A framework to diagnose barriers to climate change adaptation. *Proceedings of the National Academy of Sciences*, *107*(51), 22026–22031.

Abstract: This article presents a systematic framework to identify barriers that may impede the process of adaptation to climate change. The framework targets the process of planned adaptation and focuses on potentially challenging but malleable barriers. Three key sets of components create the architecture for the framework. First, a staged depiction of an idealized, rational approach to adaptation decision-making makes up the process component. Second, a set of interconnected structural elements includes the actors, the larger context in which they function (e.g., governance), and the object on which they act (the system of concern that is exposed to climate change). To facilitate the identification of barriers, a series of diagnostic questions are provided. Third, a simple matrix helps locate points of intervention to overcome a given barrier. The framework provides a systematic starting point for answering critical questions about how to support climate change adaptation at all levels of decision-making.

CNMI SSG Planning and Development:

Supports	**Deficient**
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This article identifies some of the barriers that sometimes arise during climate change adaptation planning processes. The article does not directly support SSG planning and development in the CNMI but does provide a useful framework to identify and overcome barriers. The authors conclude that no single approach satisfies the complexity of adaptation planning and its associated barriers. Instead, the authors suggest that a systematic diagnostic framework is needed to design strategies to circumvent, remove, or lower the barriers.

The authors provide a framework for an adaptive planning process with three phases – understanding, planning, and managing. Barriers to successful adaptation planning and implementation exist at all stages of the planning framework. To understand why barriers arise, the authors look at three interconnected aspects; the actors, the link between the actors and the systems they manage, and the larger connext in which both the actor and the system of interest are embedded. The authors found that some barriers repeat and can affect multiple planning stages including leadership, resources, communication and information, and values and beliefs. The comprehensive, systematic approach to detecting barriers in each stage of adaptation process, may assist CNMI planners to understand how the actors, the context, and the system of concern contribute to the existence of the barriers. At the least, the article raises awareness that barriers to adaptation planning exist and identifies common barriers for each stage of the planning process.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 06

Citation: National Oceanic and Atmosphere Administration. (2010). *Adapting to climate change: A planning guide for state coastal managers*. (pp.138). Silver Spring, MD: National Oceanic and Atmospheric Administration, Office of Ocean and Coastal Resource Management.

Abstract: The guide was specifically developed for coastal managers to develop and implement adaptation plans to reduce the impacts and consequences of climate change and climate variability. The guide is an aid not a prescriptive directive. Instead it is a flexible process to address specific regional and local conditions and needs. The intent of the document is to help guide coastal managers at the state level in their initial and ongoing climate change adaptation planning efforts.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This planning guide addresses climate change regionally for the Pacific and does not directly address CNMI. However, this guide provides a well-developed process for climate change adaptation planning. Specifically, Chapter 5, supports land-use and resiliency planning and infrastructure development. Recovery planning is treated in Chapter 6 as an element of the implementation and maintenance plan. The report identifies many negative economic impacts climate change might have on natural and built coastal resources and includes socio-economic considerations in the planning processes.

The guide is based on needs assessments and a wide variety of resources specific to climate change. Chapter 2 provides context for adaptive planning by providing an overview of the value of coastal resources and how climate change may affect them. Chapters 3 to 6 describe the planning process and the development of vulnerability assessments, adaptation strategies, and implementation and maintenance plans. The planning process in this guide is similar to the planning process provided in *Preparing for Climate Change: A Guidebook for Local, Regional, and State Governments* (Snover et al, 2007).

This guide also provides many useful checklists for planning considerations as well as key resources at the end of each chapter that support specific areas of plan development.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 07

Citation: Keener, V. W., Marra, J. J., Finucane, M. L., Spooner, D., & Smith, M. H. (Eds.). (2012). *Climate change and Pacific Islands: Indicators and impacts. Report for the 2012 Pacific Islands regional climate assessment (PIRCA)*. Washington, DC: Island Press.

Abstract: Keener et al. (2012) examine the adaptive capacity of Pacific Island communities regarding climate change effects on: 1) freshwater availability and quality; 2) regional and community economies; 3) urbanization, transportation, and infrastructure vulnerabilities; 4) ecosystem services; ocean resource sustainability and coastal zone management; and 5) cultural resources. The material presented in this report is based largely on published research. Key findings suggest multiple concerns for human and natural communities in the Pacific Islands region. This report concludes that climate change confronts Pacific Islands and their communities with enormous challenges. An informed and timely response is necessary to enhance resilience to the myriad changes already occurring and those yet to come.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This report provides well-supported information on current climate change trends but does not specifically or directly address any of the planning and development areas for the CNMI. However, the climate change indicators and associated impacts discussed in this report are essential information for hazard mitigation and adaptation planning.

This report provides general overview of the Pacific Island Regions, including the North Western Pacific where CNMI is located, and includes climate variability and climate change indicators, projections and impacts by region. The report provides historical trends, projections, and impacts related to freshwater and drought (Chapter 2), sea-level rise and coastal inundation (Chapter 3), and marine, freshwater, and terrestrial ecosystems (Chapter 4).

Key findings relevant to CNMI include: 1) low islands, coral reefs, and nearshore and coastal areas are most vulnerable; 2) the quantity and quality of freshwater supplies will be more limited due to warmer, drier conditions coupled with increased marine inundation; 3) rising sea-level will increase coastal flooding and erosion; 4) increases in extreme water levels will occur; 5) higher sea-surface temperatures will increase coral bleaching; 6) changes in ocean chemistry will negatively impact marine ecosystems; 7) distribution patterns of coastal and ocean fisheries will change; 8) changes in rainfall patterns and increases in temperature will stress terrestrial ecosystems; and 9) rising sea-level will lead increasingly to human migration from low islands to high islands and continental sites.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 08

Citation: Maynard, J., McKagan, S., Johnson, S., Houk, P., Ahmadia, G., van Hooidonk, R., … Mcleod, E. (2012). *Coral reef resilience to climate change in Saipan, CNMI; Field-based assessments, and implications for vulnerability and future management* (pp. 56). Saipan, MP: CNMI Division of Environmental Quality and National Oceanic and Atmosphere Administration.

Abstract: This report presents the results of the first field-based implementation of the McClanahan et al. (2010) framework to evaluate and compare the resilience potential of coral reef sites. The results of the resilience analysis are based on 35 sites around Saipan. Resilience scores calculated are the average of the scores for 9 of 11 variables in the framework (two variables were not observed). Twenty-three sites had high resilience, nine had medium, and three had low. Without exception, sites with the highest resilience, relative to other sites surveyed, had high coral diversity, high bleaching resistance and low macroalgae cover.

CNMI SSG Planning and Development:

Supports	Deficient
Resiliency Planning	Land-use Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This report addresses resilience of corals reefs and touches on resiliency planning for this important natural resource. The report does not address other planning and development areas. Information in the report can potentially support land-use planning and economic development.

Coral reefs are important natural systems that provide numerous ecosystem services and economic benefits to CNMI communities. Climate change and human-caused stressors pose serious threats to the health and function of CNMI reefs. This report assessed the resilience of Saipan's reefs to recover from disturbances and to maintain or return to a state that provides similar ecosystem services prior to the disturbance event.

The authors conclude that many human-caused stressors affect reef resilience, especially fishing access, nutrient input, and sedimentation. The authors provide several suggestions to reduce or remove human-caused stressors by implementing various management actions.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 09

Citation: Maynard, J., Mcleod, E., Houk, P., van Hooidonk, R., Johnson, S., Harriman, L., & Ahmadia, G. (2012). *Integrating reef resilience and climate change vulnerability into protected area design and management in the Commonwealth of the Northern Mariana Islands (CNMI) and greater Micronesia* (pp. 69). Mangilao, Guam: Western Pacific Coral Reef Institute, University of Guam.

Abstract: Climate models were used to identify thermal variability and the average frequency of thermal stress events likely to induce coral bleaching over a 20-year period across Micronesia, including CNMI. Based on model outputs, thermal stress events are expected to increase across Micronesia. Reef resilience rankings were coupled with model outputs to recommend management actions to support coral reefs and coastal managers working in Saipan. The report provides a "how-to-guide" to help build the capacity of local resources managers and to address the threat of climate change.

CNMI SSG Planning and Development:

Supports	Deficient
Resiliency Planning	Land-use Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This report addresses resilience of corals reefs and touches on resiliency planning for this important natural resource. The report does not address other SSG planning and development areas.

The project produced tools (vulnerability maps, GIS data layers, and "how-to-guide") to help managers assess climate impacts to and resilience of local reefs. These tools are critical for adaptive planning efforts and can contribute to land-use planning and economic development.

Coral reefs are among the most vulnerable ecosystems to climate change and severe bleaching events have caused coral mortality in CNMI. Healthy reefs that provide essential ecosystem services are critical for the preservation of sustainable livelihoods, natural heritage, customs, and traditions throughout Micronesia. The vulnerability of reefs to thermal stress was modeled for Micronesia and an interactive mapping tool was developed for managers. Additionally, reef resilience was determined using a suite of biological and ecological indicators, historical sea surface temperature and bleaching records. Managers in CNMI can integrate, via the mapping tools, the vulnerability to climate change and resilience of specific reefs to design/designate protected areas and to implement management efforts.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 10

Citation: Micronesia Conservation Trust, & US Coral Triangle Initiative Support Program. (2012). *Climate change adaptation toolkit for coastal communities in the coral triangle: Tool 4 - guide to vulnerability assessment and local early action planning (VA-LEAP) - Version I:2012* (pp. 137). Bangkok, Thailand: US Agency for International Development.

Abstract: This document is a step-by-step guide for the development of a Vulnerability Assessment (VA) and a Local Early Action Plan (LEAP) for climate change adaptation. The VA-LEAP is a simple planning document that practitioners can use to guide needed actions to improve management of important resources while considering climate change impacts. This guide is focused on collecting local knowledge and information to understand the perceived status of target natural and social resources, and the vulnerability of these resources to climate changes based on existing non-climate threats, past and current experience, and future predictions.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This tool was specifically developed for communities in the coral triangle to identify important natural resource and cultural targets that may be impacted by climate change. The tool directly supports land-use planning and economic and infrastructure development by guiding plan developers to consider these important resources during the adaptation planning process. The strength of this document is community engagement with climate change and adaptation planning.

The tool provides a detailed process for developing a Vulnerability Assessment and Local Early Action Plan (LEAP) within Pacific Island coastal communities. The planning process is divided into stages including: getting organized, raising community awareness, assessing non-climate threats, developing a local climate story, assessing vulnerability of target resources, identifying early actions to address vulnerability, and finalizing the LEAP.

The tool provides many processes and worksheets to guide the vulnerability assessment and adaptation planning processes with sample questions and prompts from an island context.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 11

Citation: Greene, R., & Skeele, R. (2014). *Climate change vulnerability assessment for the Island of Saipan* (pp. 102). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: This document summarizes the process, results, and recommendations from a community-based climate change Vulnerability Assessment (VA) conducted in 2012. The assessment focused on projected changes to sea level and rainfall patterns, the exposure and sensitivity of Saipan to these changes, and the Island's capacity to respond to possible impacts. Findings suggest that the villages and infrastructure on Saipan's western coastal plain are the most vulnerable to the effects of sea level rise and possible shifts in rainfall, and that low lying areas, critical infrastructure, residential and commercial districts, and habitats that are located within Garapan and Lower Base should be prioritized as climate change adaptation planning moves forward. The immediate advancement of climate adaptation on Saipan should include the integration of sea level rise considerations into current and future flood control studies, public works projects, and assessments of proposed development impacts.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	
Economic Development	
Infrastructure Development	

Synthesis: The climate change VA supports SSG planning and development areas for Saipan as they relate to exposure and sensitivity to future sea levels and changing rainfall patterns. The VA addresses Saipan's adaptive capacities in natural and built environments and elements of land-use and resiliency planning and infrastructure development are incorporated in the discussions. The VA touches on economic development by discussing exposure of industry and businesses to coastal flooding as well as the potential disproportionate impacts to sensitive population segments across the island. The VA does not touch on recovery planning other than to mention it is more efficient and inexpensive to explore mutually beneficial opportunities for adaptations now than it is to pay for possible damages and extreme system modifications later.

The VA briefly addresses the potential for increases in extreme precipitation events, projected increases in sea surface temperatures and consequent coral bleaching and changing ocean wave conditions. Although not thoroughly analyzed in the VA, additional assessment of these variables is warranted, particularly with respect to marine resources and impacts of changing ocean chemistry. The VA does not address other important aspects of climate changes

Overall, the VA identifies resources of concern in the natural and built environment. A community stakeholder-based qualitative assessment was completed and the results helped

to broadly group resources and served as input for a more technical GIS-based assessment. The VA provides a detailed look at exposure to coastal flooding and inundation to distill vulnerabilities and further delineate focus areas for adaptation planning. Understanding how critical natural systems and infrastructure may be affected under various coastal flooding scenarios is a significant component to assess Saipan's vulnerability to climate change. The VA also assesses sensitive population segments to examine the factors that enable individuals, households, and entire communities to respond and adapt to climate change.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 12

Citation: Skeele, R., & Okano, D. (2014). *Public knowledge and perceptions of climate change in the Commonwealth of the Northern Mariana Islands* (pp. 28). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: This study examines the public's knowledge and perceptions of climate change and its impacts in the CNMI. A total of 419 surveys were conducted on the islands of Saipan, Tinian, and Rota. Respondents were asked a selection of questions designed to assess their basic knowledge of climate change, its causes and potential impacts, and their perception of vulnerability to climate change. The survey results suggest an overall lack of understanding of the causes and impacts of climate change among the general public, although respondents did display a moderate understanding of some specific topics.

CNMI SSG Planning and Development:

Supports	Deficient
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This study does not directly support SSG planning and development, but highlights public awareness and education are lacking and that these are essential for public support and compliance with climate change adaptation initiatives. In particular, public support and buy-in are essential for successful implementation of land-use and resiliency planning. This study highlights the need for extensive public outreach and education regarding climate change and the need to explicitly incorporate SSG and climate change language into planning and development documents.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 13

Citation: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management. (2015a). *Climate vulnerability for the Islands of Rota and Tinian, Commonwealth of the Northern Mariana Islands* (pp. 106). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: The Vulnerability Assessment (VA) for Rota and Tinian summarizes current climate trends in the CNMI as well as projection of future climate conditions and associated impacts. Historical impacts and potential vulnerabilities are discussed separately for each island followed by suggestions to address vulnerabilities and opportunities for Rota, Tinian, and CNMI. This VA has identified levels of potential impact, investigates susceptibilities of human and natural systems, and explores any capacities for responding to identified impacts.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: The climate change VA for Rota and Tinian supports SSG planning and development areas as they relate to changes in precipitation patterns, sea-level, including coastal flooding and erosion, storm patterns, and ocean chemistry. The VA addressees several adaptive capacities for Rota, Tinian, and the CNMI. Elements of land-use and resiliency planning and infrastructure development are incorporated into the discussion. The report identifies many climate change adaptation projects that support recovery planning and incorporate SSG principles to improve infrastructure design during recovery efforts. Potential funding sources are identified for these projects. The VA supports economic development indirectly via discussions of reef resilience, partnerships and funding opportunities to implement adaptation measures.

In short, the VA identifies resources of concern in the natural and built environment. Due to the absence of consistent, accessible climate data, local knowledge and narratives about past climate events and their impacts was compared with projections for future climate scenarios to estimate likely changes under future climate conditions. The VA explores possible climate scenarios for temperature and rainfall, wind and waves, sea level rise and change, and storm genesis, tracking and intensity. Understanding how critical natural systems and infrastructure may be affected under different coastal flooding scenarios is a significant component of assessing Rota's and Tinian's vulnerability to climate change.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 14

Citation: Federal Emergency Management Agency. (2015). *Northern Mariana Islands - Typhoon Soudelor* (No. FEMA 4235-DR) (pp. 2). Washington, DC: Federal Emergency Management Agency.

Abstract: On 05 August 2015 President Obama declared that a major disaster existed in the CNMI due to damage caused by Typhoon Soudelor. This declaration made Individual Assistance available to affected individuals and households on the island of Saipan. This declaration also made debris removal and emergency protective measures (Category A and B), including direct federal assistance under the Public Assistance program, available to Commonwealth and eligible local governments and certain private nonprofit organizations on a cost-sharing basis on the islands of Rota, Tinian, and Saipan. Direct Federal assistance was also authorized. Finally, this declaration made Hazard Mitigation Grant Program assistance requested by the Lieutenant Governor available for hazard mitigation measures for the entire Commonwealth of the Northern Mariana Islands.

CNMI SSG Planning and Development:

Supports	Deficient
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This Preliminary Damage Assessment does not directly support SSG planning or development areas. This document serves as an example of the federal programs available under FEMA if a major disaster is declared by the US President. However, very little information is available in this two-page summary.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 15

Citation: Conrad, M. D., & Ness, J. E. (2012). *Commonwealth of the Northern Mariana Islands strategic energy plan* (pp. 26). Golden, CO: National Renewable Energy Laboratory.

Abstract: This plan is a starting point for energy planning in CNMI and builds upon various prior resource assessments. Addressed are a range of energy options focusing on energy efficiency and renewable energy technologies, policies, and programs. Various steps are presented, including ready-for-action opportunities as well as those that that require further investigation. This plan will serve as the foundation for formulating actions and implementation strategies. Three future scenarios are presented regarding the energy efficiency and renewable energy technical potential in the CNMI: 1) a base case; 2) a low-impact scenario (20% reduction in fossil fuel consumption); and 3) a high-impact scenario (53% reduction in fossil fuel consumption). The purpose of this scenario exercise is to show what CNMI's energy portfolio could look like by the year 2026.

CNMI SSG Planning and Development:

Supports	Deficient
Resiliency Planning	Land-use Planning
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This strategic plan directly supports economic and infrastructure development for energy production and security in the CNMI. The plan develops energy reduction scenarios, which include the development of infrastructure to produce renewable energy, explores methods to reduce the cost of energy, and provides a framework to develop energy policy. The plan highlights energy efficiency strategies that can be applied to resiliency and recovery planning for maintaining and/or replacing buildings. The plan does not support land-use planning.

The CNMI relies almost 100% on fossil fuel imports and is subject to substantial volatility in fuel pricing and availability that impacts security, the environment and economic viability. However, the Commonwealth has diverse sources of alternative energy which can be cost-effective compared to current electricity generation. These resources also provide long-term fuel-price stability and offer other environmental and health benefits resulting in reduced air emissions, waste reduction, and conservation of water resources.

There are a number renewable energy generation options potentially available to the CNMI including solar, wind, biomass, waste-to-energy, and geothermal energy. Each of these technologies has its own operational characteristics, startup initial and operational costs, implementation time horizon, and near- and long-term environmental impacts. Energy efficiency strategies will reduce fossil fuel use, thus saving money and strengthening the economy and power system. The CNMI has already taken the initiative by adopting the International Building Code and a local Tropical Energy Code.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 16

Citation: Conrad, M. D., & Ness, J. E. (2013). *Commonwealth of the Northern Mariana Islands energy action plan* (pp. 26). Golden, CO: National Renewable Energy Laboratory.

Abstract: This document describes the three near-term energy strategies selected by the CNMI Energy Task Force and outlines the steps being taken to implement those strategies. This action plan incorporates several of the areas identified in the CNMI's Strategic Energy Plan as essential components of a comprehensive approach to developing energy security for the Commonwealth. Three energy strategies selected by the task force are: 1) designing a demand-side management program focusing on utility, residential, and commercial sectors; 2) developing an outreach and education plan focused on energy conservation in government agencies and businesses, including workplace rules; and 3) exploring waste-to-energy options.

CNMI SSG Planning and Development:

Supports	Deficient
Economic Development	Land-use Planning
Infrastructure Development	Resiliency Planning
	Recovery Planning

Synthesis: This energy action plan for the CNMI directly supports economic and infrastructure development. The plan outlines several strategies to reduce energy consumption through Demand-Side Management (DSM) measures that are designed to change the level or timing of energy use with the intent to optimize existing and planned generation and transmission assets. The plan offers recommendations to retrofit existing infrastructure to be more energy efficient such as painting roofs white and adding timers to air conditioners. The plan also explores the economics of developing a new waste-to-energy plant.

The plan focuses on short-term actions (1-2 years) to reduce energy consumption and does not directly support land-use, resiliency, or recovery planning. However, several of the short-term strategies are applicable to longer-term planning efforts and can be incorporated in other planning documents.

The energy action plan identifies strategies for implementation over the short-term, breaks them down into feasible incremental steps, identifies the desired outcomes, identifies the organizations and individuals responsible for implementation actions, and sets a timeline for each step. This action plan incorporates several of the areas identified in the CNMI's Strategic Energy Plan as essential components of a comprehensive approach to developing energy security for the Commonwealth: outreach and education on energy issues, implementing energy efficiency technologies, and developing renewable energy generation.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 17

Citation: Leidos Engineering, LLC. (2015). *2015 Integrated Resource Plan, draft final report* (pp. 132). Saipan, MP: Commonwealth Utilities Corporation.

Abstract: The Integrated Resource Plan (IRP) and Energy Supply Analysis was designed to seek firm bids for future resource options for the CNMI and model the CUC's generation system throughout the 25-year planning horizon, given various scenarios and a range of assumptions regarding future loads and fuel price projections, while meeting the energy demands of CUC's customers. The results of the IRP provide planning options for building an optimized resource mix while working toward reducing electric rate impacts for CUC customers.

Applicable/Relevant to CNMI SSG Planning and Development:

Supports	Deficient
Economic Development	Land-use Planning
Infrastructure Development	Resiliency Planning
	Recovery Planning

Synthesis: The final draft IRP does not support resiliency or recovery planning or incorporate the possible future effects of climate change into the selection process for new generating assets. However, the CUC recognizes that sea level rise and increased storm frequency and force threaten CNMI's power systems as a result of high winds and storm surge in low-lying coastal areas. CUC has decided to incorporate storm resiliency into the final selection process. Recovery planning, including energy security, should also be incorporated into the final selection process. This IRP does not evaluate land-use planning for existing infrastructure and briefly explores land-use challenges for procuring land for a photovoltaic facility.

The IRP address many factors of infrastructure and economic development as these topics relate to power generation and distribution. A significant finding was that Demand Side Management (DMS) measures and programs reduced costs to CUC customers in all modeled cases and would ultimately help lower customer bills. Depending on the energy and power generation source selected, new opportunities for improving and upgrading power generation and distribution infrastructure may be present.

This IRP assesses future power generation resource options for CNMI and provides planning options for building an optimized resource mix while working toward reducing electrical rate impacts for CUC's customers. The 25-year planning horizon is full of uncertainty including CUC aging infrastructure, future load growth, renewable energy potential, fuel oil price volatility, and CUC's financial ability to procure new generating assets. Five IPR scenarios were developed, designed to comprehensively evaluate a range of potential resource options available to CUC. The production cost modeling of each scenario incorporated virtually all the assumptions developed for the IRP, projecting the hourly dispatch of each generation resource on a least cost basis as necessary to meet hourly load projections. Scenarios that

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

assume CUC will retire existing power plants and replace them with new reciprocating units that fire liquified natural gas (LNG) resulted in substantially lower costs than fuel oil cases. However, a detailed feasibility study is needed to improve the accuracy of the estimated costs associated with the LNG scenarios. Key finding include: 1) energy efficiency measures are projected to be materially less costly than any type of the supply side options; 2) PV generating facilities are projected to be materially less costly than any of the oil or LNG fueled alternatives, but their relative savings is lower; 3) LNG fueled alternative is projected to be materially less costly than any of the oil fueled generation alternatives; and 4) all of the oil fueled generation alternatives are projected to have similar costs relative to each other.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 18

Citation: US Office of Intergovernmental Affairs. (2013). *Overview of the US Department of Transportation programs in the territories* (pp. 4). US Interagency Group on Insular Affairs.

Abstract: The Territorial Highway Program was created for the purpose of constructing and improving a system of arterial and collector highways and necessary inter-island connectors (including ferry boats, terminal facilities and approaches) in the CNMI. The Moving Ahead for Progress in the 21st Century Act (MAP-21), the Territorial Highway Program, is no longer a set-aside program and federal funding is now directly authorized out of the Highway Trust Fund. Under MAP-21, funding was available for project types, consistent with applicable provisions of 23 U.S.C. and MAP-21 and public transportation.

CNMI SSG Planning and Development:

Supports	Deficient
Economic Development	Land-use Planning
Infrastructure Development	Resiliency Planning
	Recovery Planning

Synthesis: This document directly supports infrastructure and economic development for transportation within CNMI. It summarizes the changes to the Territorial Highway Program. With the enactment of MAP-21, the Territorial Highway Program is no longer a set-aside program. The funding is now directly authorized out of the Highway Trust fund. Territorial Highway Program funds will continue to be allocated to the four territories by administrative formula that has been set at 10 percent for CNMI. Funds may also be transferred to the Federal Transit Administration (FTA) for FTA-eligible uses. However, CNMI will see a decrease in transit formula funds under MAP-21 because Saipan is no longer classified as an urbanized area as of the 2010 census.

The document is deficient in other SSG planning and development areas of land-use, resiliency, and recovery planning.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 19

Citation: Guam/CNMI Maritime Transportation System Advisory Group. (2014). *The Mariana Islands maritime transportation system recovery plan* (pp. 62). Unites States Coast Guard Sector Guam.

Abstract: The maritime transportation system (MTS) recovery plan provides an all-hazard operational framework for coordinating system stabilization and recovery of basic functionality of the MTS for CNMI.

CNMI SSG Planning and Development:

Supports	Deficient
Recovery Planning	Land-use Planning
Economic Development	Resiliency Planning
Infrastructure Development	

Synthesis: This MTS recovery plan directly supports critical recovery planning for CNMI and indirectly support economic and infrastructure development. The plan does not support land-use and resiliency planning.

An effective MTS recovery framework to support restoration of basic functional capability, cargo flow and the international supply chain is vital to CNMI interests. The recovery plan is for use during short-term recovery from an incident (~90-days). This plan is intended to guide preparations and transition to the long-term recovery phase, and associated restoration activities.

Although this plan is very specific to the recovery of maritime trade, this plan can serve as a guide for recovery planning in other essential utility sectors such as power generation and distribution, drinking water supply, and wastewater management.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 20

Citation: Duenas, Camacho & Associates, Inc., & CH2MHill. (2015a). *Drinking water and wastewater Master Plan - Rota, Commonwealth of the Northern Mariana Islands* (pp. 237). Hagatna, Guam: Commonwealth Utilities Corporation.

Abstract: The draft Drinking Water and Wastewater Master Plan for Rota works toward compliance with mandates in Stipulated Order Number One for Preliminary Injunctive Relief to determine current and future infrastructure needs for a 20-year period and to provide a long-term plan for Commonwealth Utility Corporation (CUC) drinking water and wastewater systems. Significant problems with the water system were: 1) lack of flexibility in moving treated water to all parts of the island and difficulty in accessing and maintaining facilities; and 2) failure to comply with Safe Drinking Water Act water quality requirements. The most significant problem with the wastewater system was a lack of central sewer systems in Song Song and Sinapalo. The goal of the Master Plan is to meet Stipulated Order requirements through a realistic implementation plan that also addresses real needs and promotes operational improvements. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency (EPA) personnel to track compliance.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This Plan directly supports infrastructure development of the drinking water and wastewater systems for Rota. The plan addresses land-use planning, but only in the context of existing infrastructure and land-ownership, easements, or rights-of-way. The plan does not discuss land-planning in the context of climate change, resiliency, or recovery planning.

The Plan does not directly support resiliency or recovery planning for the infrastructure of the drinking water system nor fresh water resources in general. Climate change considerations, such as changes in precipitation patterns and sea level rise, are conspicuously missing from this long-term plan. Currently, CUC does not own or operate a wastewater system on Rota. The plan addresses concerns regarding private septic systems and the potential to affect groundwater and coastal areas. However, potential changes in wastewater flows and volumes (i.e., storm water) resulting from a changing climate were not discussed. This Plan is essential for future resiliency and recovery planning because it provides information about the locations and status of critical infrastructure.

The Plan supports economic development through capital improvements to the drinking water system. Also, to forecast future demands on the water system, population growth is project as a function of economic development. Several economic sectors are identified and several factors are used to project future economic and population growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

This Master Plan comprehensively evaluates the condition of existing assets, discusses US EPA regulatory compliance with the Groundwater Under the Direct Influence rule, creates a 20-year capital improvement plan with an implementation schedule, and identifies a number of recommended operational practices for CUC to consider incorporating into its drinking water program. The goal of this Plan is to provide a cost-effective and implementable roadmap to reduce water loss, maintain regulatory compliance, and plan for future growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 21

Citation: Duenas, Camacho & Associates, Inc., & CH2MHill. (2015b). *Drinking water and wastewater Master Plan - Tinian, Commonwealth of the Northern Mariana Islands* (pp. 227). Hagatna, Guam: Commonwealth Utilities Corporation.

Abstract: The draft Drinking Water and Wastewater Master Plan for Tinian works toward compliance with mandates in Stipulated Order Number One for Preliminary Injunctive Relief to determine current and future infrastructure needs for a 20-year period and to provide a long-term plan for Commonwealth Utility Corporation (CUC) drinking water and wastewater systems. The goal of the Master Plan is to meet Stipulated Order requirements through a realistic implementation plan that also addresses real needs and promotes operational improvements. Significant problems with the water system were: 1) large water losses associated with failing infrastructure, theft, and poor meter reading; and 2) failure to comply with Safe Drinking Water Act water quality standards. The most significant problem with the wastewater system was a lack of central sewer systems in major homestead areas. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency (EPA) personnel to track compliance.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This Plan directly supports infrastructure development of the drinking water and wastewater systems for Tinian. The plan addresses land-use planning, but only in the context of existing infrastructure and land-ownership, easements, or rights-of-way. The Plan does not discuss land-planning in the context of climate change, resiliency, or recovery planning.

The Plan does not directly support resiliency or recovery planning for the infrastructure of the drinking water system nor fresh water resources in general. Climate change considerations, such as changes in precipitation patterns and sea level rise, are missing from this long-term plan. Currently, CUC does not own or operate a wastewater system on Tinian and potential changes in wastewater flows and volumes (i.e., storm water) resulting from a changing climate were not discussed in this Plan. However, this Plan is essential for future resiliency and recovery planning because it provides information about the location and status of critical infrastructure.

The Plan supports economic development through capital improvements to the drinking water system. Also, to forecast future demands on the water system, population growth is project as a function of economic development. Several economic sectors are identified and several factors are used to project future economic and population growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

This Master Plan comprehensively evaluates the condition of existing assets, discusses US EPA regulatory compliance with the Groundwater Under the Direct Influence rule, creates a 20-year capital improvement plan with an implementation schedule, and identifies a number of recommended operational practices for CUC to consider incorporating into its drinking water program. The goal of this Plan is to provide a cost-effective and implementable roadmap to reduce water loss, maintain regulatory compliance, and plan for future growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 22

Citation: Duenas, Camacho & Associates, Inc., & CH2MHill. (2015c). *Drinking water Master Plan - Saipan, Commonwealth of the Northern Mariana Islands* (pp. 614). Hagatna, Guam: Commonwealth Utilities Corporation.

Abstract: The draft Drinking Water Master Plan for Saipan works toward compliance with mandates in Stipulated Order Number One for Preliminary Injunctive Relief to determine current and future infrastructure needs for a 20-year period and to provide a long-term plan for Commonwealth Utility Corporation (CUC) drinking water systems. The most significant problems with the water system were: 1) inability to provide a continuous water supply to all customers 24 hours a day; and 2) failure to comply with Safe Drinking Water Act requirements. The goal of the Master Plan is to meet Stipulated Order requirements through a realistic implementation plan that also addresses real needs and promotes operational improvements. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency (EPA) personnel to track compliance.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This Plan directly supports infrastructure development of the drinking water systems for Saipan. The Plan addresses land-use planning, but only in the context of existing infrastructure and land-ownership, easements, or rights-of-way. The Plan does not discuss land-planning in the context of climate change, resiliency, or recovery planning.

The Plan does not directly support resiliency or recovery planning for the infrastructure of the drinking water system nor fresh water resources in general. Climate change considerations, such as changes in precipitation patterns and sea level rise, are missing from this long-term plan. However, this Plan is essential for future resiliency and recovery planning because it provides information about the locations and status of critical infrastructure.

The Plan supports economic development through capital improvements to the drinking water system. Also, to forecast future demands on the water system, population growth is projected as a function of economic development. Several economic sectors are identified and several factors are used to project future economic and population growth.

This Plan evaluates the condition of existing assets, discusses regulatory compliance with the Groundwater Under the Direct Influence Rule, creates a 20-year capital improvement plan and implementation schedule, and identifies several operational practices for CUC to incorporate. The Drinking Water Master Plan provides a cost-effective and implementable roadmap to reduce water loss, eliminate non-24 hour water areas, maintain regulatory compliance, and plan for future growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 23

Citation: Arriola, J., Camacho, R., Chambers, D., Derrington, E., Kaipat, J., Okano, R., & Yuknavage, K. (2016). *2016 Commonwealth of the Northern Mariana Islands 303 (d), 305 (b) and 314 water quality assessment integrated report* (pp. 140). Saipan, MP: Bureau of Environmental and Coastal Quality.

Abstract: This report satisfies requirements of Sections 303(d), 305(b), and 314 of the Clean Water Act. The CNMI prepares a Water Quality Assessment Integrated Report every two years. This report is the principle means to evaluate whether CNMI is meeting Water Quality Standards (WQS) to ensure that all designated uses, as established by regulations, are attained. The most common sources of water quality degradation are from: 1) point sources such as failing sewer lines; 2) illicit wastewater discharges; and 3) non-point sources such as stormwater pollutants.

CNMI SSG Planning and Development:

Supports	Deficient
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This report does not directly address the SSG planning and development areas. However, information in the report indirectly supports all areas.

The report provides a detailed analysis and status of the major surface fresh water resources and marine waters. The information can be used to adjust land-use planning and to guide economic and infrastructure development to reduce impacts to these vital waters. Additionally, the report provides maps and other information on watersheds, rivers, wetlands, ponds and lakes, which is critical information for resiliency and recovery planning. Knowing where these natural assets are located and the current threats or sources of impairment can help guide future planning as well as climate change adaptation planning.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 24

Citation: Spaeth, T. (2017). *Sustainable aquifer production on the Island of Saipan* (pp. 16). Saipan, MP: US Public Health Service for the Commonwealth Utilities Corporation.

Abstract: This paper evaluated Saipan's water infrastructure, aquifers, needs, and long-term goals to sustain the aquifer. The amount of water collected in aquifers on small islands can vary through the seasons and without proper planning and maintenance, pumping wells can greatly affect the aquifer. This paper details a list of problems, goals, and alternatives to sustainably manage groundwater resources to maintain the quality of the water in the aquifer.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This paper does not directly support land-use, resiliency, and recovery planning and economic and infrastructure development. However, the information provided in the report is essential for all SSG planning and development in the CNMI.

The paper discusses the hydrological function of Saipan's aquifer and the perils of mismanagement or over-pumping of the groundwater. Understanding the challenges to effectively manage groundwater resources is essential for all land-use, resiliency, and recovery planning efforts. The paper does not address anticipated impacts to groundwater resources from climate change or from projected population and/or economic growth. Increased water demand, higher sea levels, and altered precipitation patterns may have a profound effect on future aquifer sustainability. Future planning efforts should take into account aquifer hydrology and recharge rates under projected climate change conditions to estimate sustainable groundwater withdrawal rates.

The paper evaluated existing water system infrastructure and identifies several existing problems with effective water-resource management. However, the paper does not discuss existing infrastructure in terms of resiliency or changing risks of exposure to hazards expected from climate change. Spaeth suggests several technological advancements to improve current resource management via monitoring, flow control, in-line metering, water treatment, and sustainable well operation. Reducing the amount of water withdrawn from the aquifer by eliminating leaks and other non-revenue elements is likely the most effective and immediate way to improve sustainability.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 25

Citation: Duenas, Camacho & Associates, Inc., & CH2MHill. (2015d). *Wastewater Master Plan - Saipan, Commonwealth of the Northern Mariana Islands* (pp. 361). Saipan, MP: Commonwealth Utilities Corporation.

Abstract: The draft Saipan Wastewater Master Plan works toward compliance with mandates in Stipulated Order Number One for Preliminary Injunctive Relief to develop a roadmap consisting of new capital projects, replacement and repair of existing facilities, modification of operational procedures, and assessing current staffing levels and related policies. The most significant problems with the wastewater system were: 1) unauthorized wastewater discharges, primarily associated with pipeline breaks and wastewater lift station failures, and 2) failure to comply with National Pollutant Discharge Elimination System (NPDES) effluent discharge limitations at the two wastewater treatment facilities and ocean outfalls. The goal of the Master Plan is to meet Stipulated Order requirements through a realistic implementation plan that also addresses real needs and promotes operational improvements. The Master Plan provides a roadmap for CUC to implement the requirements of the Stipulated Order and sets quantifiable milestones for US Environmental Protection Agency (EPA) personnel to track compliance.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This Plan directly supports infrastructure development of the wastewater system for Saipan. The Plan addresses land-use planning, but only in the context of existing infrastructure and land-ownership, easements, or rights-of-way. The Plan does not discuss land-planning in the context of climate change, resiliency, or recovery planning.

The Plan does not directly support resiliency or recovery planning for the infrastructure of the wastewater system. The Plan lacks an analysis of existing critical assets in areas where they may be exposed to increasing risks due to climate change. Climate change considerations, such as changes in precipitation patterns and sea level rise, are missing from this long-term Plan. Storm water is only briefly mentioned. However, this Plan is essential for future resiliency and recovery planning efforts. It provides valuable information on the hydraulic flow of the wastewater system as well as information about the location and status of critical infrastructure that will be essential for SSG.

The Plan supports economic development through capital improvements to the wastewater system. Also, to forecast future demands on the wastewater system, population growth is project as a function of economic development. Several economic sectors are identified and several factors are used to project future economic and population growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

This Master Plan comprehensively evaluates the condition of existing assets, assesses the hydraulic capacity of the wastewater collection system to reduce dry and wet weather overflows, identifies how NPDES discharge requirements can be met, creates a 20-year capital improvement plan with an implementation schedule, and identifies a number of recommended operational practices for CUC to consider incorporating into its wastewater program. The goal of the Drinking Water Master Plan is to provide a cost-effective and implementable roadmap to upgrade, expand, and maintain the wastewater system; meet permit requirements; and plan for future growth.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 26

Citation: Horsley Witten Group, Inc. (2006a). *CNMI and Guam stormwater management manual, Final - October 2006, Volume I* (pp. 205). Saipan, MP: CNMI and the Territory of Guam.

Abstract: The CNMI and Guam Stormwater Management Manual aims to compile industry knowledge and experience into a single comprehensive design handbook that is useful to engineers, plan reviewers and the regulated community. The Manual provides a framework to ensure the effective implementation of stormwater management practices to protect the vital water resources of the CNMI and Guam. The purpose of the manual is: 1) to protect the waters of the CNMI and Guam from the adverse impacts of urban stormwater runoff; 2) to provide design guidance on the most effective best management practices (BMPs) for new development sites and redevelopment sites both during and post construction; and 3) to improve the quality of the BMPs that are constructed in CNMI and Guam, specifically in regard to performance, longevity, safety, ease of maintenance, community acceptance and environmental benefit. Volume I of the manual provides designers a general overview on local stormwater issues and how to size and design BMPs to comply with stormwater performance standards.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This manual directly supports all the SSG planning and development areas for the CNMI. Managing stormwater runoff is essential to address water quality and quantity issues and to protect sensitive environmental resource areas in CNMI.

This manual directly addresses infrastructure development by providing an integrated stormwater management site design process and stormwater treatment practice criteria and standards. The manual supports land-use planning by providing information and maps about groundwater management zones, soils and infiltration characteristics and rates, and locations of existing bodies of surface water. The manual supports land-use planning and infrastructure development via the BMPs for selecting and sizing structural stormwater controls and conveyances based on site conditions.

Stormwater management directly supports resiliency and recovery planning. Properly designed stormwater management controls and conveyances help reduce flooding, capture runoff to allow for treatment if needed prior to controlled infiltration to the groundwater, thereby, reducing the risk of flooding to infrastructure. Measures in the manual can be applied to the post-constructed environment and can support recovery or climate change adaptation planning to reduce the risk of flooding under different modeled storm events (i.e., various volumes of stormwater runoff). However, the manual does not address climate change or the

expected changes in precipitation or tropical cyclone patterns. Stormwater management designs today should consider likely changes in volume and frequency of stormwater runoff due to climate change. The sizing criterion for stormwater infrastructure may need updating to adapt to anticipated climate change.

The manual indirectly supports economic development by reducing the risk of infrastructure flooding as well as the preservation of vital natural resources such as groundwater and the coral reef. Additionally, encouraging BMPs for stormwater control may require additional construction costs that will bolster the local economy.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 27

Citation: Horsley Witten Group, Inc. (2006b). *CNMI and Guam stormwater management manual, Final - October 2006, Volume II* (pp. 228). Saipan, MP: CNMI and the Territory of Guam.

Abstract: The CNMI and Guam Stormwater Management Manual aims to compile industry knowledge and experience into a single comprehensive design handbook that is useful to engineers, plan reviewers and the regulated community. The Manual provides a framework to ensure the effective implementation of stormwater management practices to protect the vital water resources of the CNMI and Guam. The purpose of the manual is: 1) to protect the waters of the CNMI and Guam from the adverse impacts of urban stormwater runoff; 2) to provide design guidance on the most effective best management practices (BMPs) for new development sites and redevelopment sites both during and post construction; and 3) to improve the quality of the BMPs that are constructed in CNMI and Guam, specifically in regard to performance, longevity, safety, ease of maintenance, community acceptance and environmental benefit. Volume II of the manual provides detailed information on how to select and locate BMPs at a development site, how to prepare effective landscaping plans for stormwater practices, BMP construction specifications, step-by-step BMP design examples and other assorted design tools.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This manual directly supports all the SSG planning and development areas for the CNMI. Managing stormwater runoff is essential to address water quality and quantity issues and to protect sensitive environmental resource areas in CNMI.

Volume II of this manual contains the technical information to design, landscape, and construct stormwater management treatments with BMPs. This volume of the manual is much more specific than Volume I and provides many tools for developers and construction planners to select and implement stormwater controls for their project's specific location and environmental conditions.

In general, Volume II supports the SSG planning and development principles in the same manner as Volume I. The following synthesis applies to Volumes I and II.

This manual directly addresses infrastructure development by providing an integrated stormwater management site design process and stormwater treatment practice criteria and standards. The manual supports land-use planning by providing information and maps about groundwater management zones, soils and infiltration characteristics and rates, and locations of existing bodies of surface water. The manual supports land-use planning and infrastructure

development via the BMPs for selecting and sizing structural stormwater controls and conveyances based on site conditions.

Stormwater management directly supports resiliency and recovery planning. Properly designed stormwater management controls and conveyances help reduce flooding, capture runoff to allow for treatment prior to controlled infiltration to the groundwater, thereby, reducing the risk of flooding to infrastructure. Measures in this manual can be applied to the post-constructed environment and can support recovery or climate change adaptation planning to reduce the risk of flooding under different modeled storm events (i.e., various volumes of stormwater runoff). However, the manual does not address climate change or the expected changes in precipitation or tropical cyclone patterns. Stormwater management designs today should consider likely changes volume and frequency of stormwater runoff due to climate change. The sizing criterion for stormwater infrastructure may need updating to adapt to anticipated climate change.

The manual indirectly supports economic development by reducing the risk of infrastructure flooding as well as the preservation of vital natural resources such as groundwater and the coral reef. Additionally, encouraging BMPs for stormwater control may require additional construction costs that will bolster the local economy.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 28

Citation: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management. (n.d.-b). *Soil erosion and stormwater sedimentation: A guide for landowners and developers in the CNMI* (pp. 1). Saipan, MP: Bureau of Environmental Quality, Division of Coastal Resources Management.

Abstract: This poster provides background and information about stormwater management and erosion. The poster depicts several erosion control Best Management Practices.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	
Economic Development	
Infrastructure Development	

Synthesis: This poster directly supports land-use and resiliency planning and infrastructure development. The poster gives information about soils found in CNMI and the effects of soil erosion and sedimentation on lagoons and reefs.

The poster indirectly supports economic development via encouraging land-owners and others involved in earth moving activities to practice stormwater BMPs. This may support companies specializing in erosion control and the BMPs serve to reduce risks to various economic activities from flooding and erosion.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 29

Citation: Duenas, Camacho & Associates, Inc. (2012). *Final Environmental Assessment for the siting of a solid waste transfer station on Tinian, CNMI* (pp. 77). Hagatna, Guam: CNMI, Office of the Governor, Capital Improvement Projects Program Office.

Abstract: The Commonwealth of Northern Mariana Islands (CNMI) Capital Improvement Projects (CIP) Program Office, Office of the Governor proposes to construct a solid waste transfer station on Tinian, CNMI. This Environmental Assessment (EA) examines the potential impacts of the "No Action" Alternative, and "Proposed Action" Alternatives, including the preferred alternative. The proposed action is to construct a solid waste transfer station with supporting infrastructure within an approximately three-acre site. The transfer station would accommodate ancillary activities including waste separation and recycling. Non-recyclable waste and certain other waste would be hauled from the transfer station by the Tinian government to the proposed new sanitary landfill at Atgidon in western Tinian for disposal.

The Proposed Action Alternatives are located at three different sites on Tinian. Alternative 3 (Site C), located near the Commonwealth Utilities Corporation power plant, is the preferred alternative based on siting criteria for a solid waste transfer station. The proposed action would be consistent with the CNMI's Coastal Resource Management Program. No federally-listed threatened or endangered species or critical habitat occur in or near any of the proposed sites and the CNMI (State) Historic Preservation Officer has concurred with a determination of "No Historic Properties Affected" for the Proposed Action Alternative. A FONSI was signed and issued by the U.S. Department of the Interior, Office of Insular Affairs in 2013 (Pula, 2013).

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This EA supports SSG land-use planning and economic and infrastructure development. The EA provides an environmental impact analysis for four alternative sites to locate the solid waste transfer station. The EA describes the infrastructure associated with transfer station development and construction. Also, materials recovery and recycling methods support economic development opportunities.

The EA does not support resiliency or recovery planning. The EA does not consider the potential effects of climate change or incorporate adaptive planning principles. However, the EA does provide several best management practices as mitigation to reduce all environmental impacts to less than significant.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 30

Citation: Naval Facilities Engineering Command, Pacific. (2014). *Commonwealth of the Northern Mariana Islands joint military training solid waste study. Final (Version4)* (pp. 152). Joint Base Peral Harbor-Hickam, HI: Department of the Navy.

Abstract: This report discusses solid waste management as associated with the proposed action to establish a series of live-fire and maneuver ranges, training areas, and support facilities on the islands of Tinian and Pagan within the CNMI. Solid waste on Tinian is currently transported by residents and business entities to the Tinian Municipal Dump, an open and non-compliant dump site near San Jose located south of the Tinian International Airport. This site does not comply with Resource Conservation and Recovery Act (RCRA) Subtitle D regulations and operates under a notice of violation issued by the CNMI Division of Environmental Quality. As such, the current Tinian Municipal Dump would not suffice as an option for the US military to dispose of CJMT-generated municipal solid waste (MSW). The CNMI Department of Public Works is required to maintain the Tinian Municipal Dump in accordance with an Administrative Order issued by the CNMI Division of Environmental Quality, which requires the application of daily cover material and prohibits burning wastes, among other operational requirements. The Administrative Order was issued in 2010 as a cease-and-desist action serving to document the findings of violations of the CNMI solid waste regulations.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Resiliency Planning
Infrastructure Development	Recovery Planning
	Economic Development

Synthesis: This solid waste management plan is an appendix to an EIS prepared by the Department of the Navy to analyze the environmental impacts associated with developing live-fire training on Tinian and Pagan Islands in the CNMI.

The plan supports SSG land-use planning and infrastructure development. The document provides a good summary of existing solid waste management facilities on Tinian and the anticipated changes in waste types and volumes associated with increased military presence. The current Tinian dump does not meet compliance with federal statutes for anticipated military-associated wastes. The plan proposes the construction of a solid waste transfer station and recycling center within the base camp. Waste will then be shipped for disposal at the Marpi landfill on Saipan.

The plan does not consider resiliency or recovery planning for the existing infrastructure. In general, the plan does not cover economic development in connection with the proposed action. However, the plan briefly discusses the potential negative impacts of developing a waste to energy plant due to an existing surplus of electrical energy production on Tinian.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 31

Citation: Townsend, T., Carson, D., & Scott, N. (2016). *Sustainable approaches for materials management in remote, economically challenged areas of the Pacific* (No. EPA/600/R-16/303) (pp. 76). Cincinnati, OH: US Environmental Protection Agency.

Abstract: This report examines the challenges of materials management in remote areas of the Pacific and covers Saipan, Tinian, and Rota in the CNMI. The first section of the report outlines the current state of solid waste management overall in the US Pacific island territories, primarily based on site visits. Steps involved in this work included a review of selected existing published information related to the subject; site visits to Guam, Saipan, Tinian, Rota, Tutuila, and Apia; and an assessment of the technical and economic feasibility of different solid waste management technologies for remote, economically challenged areas in the US Pacific island territories.

The second part of the document provides guidance to remote, economically challenged areas in the US Pacific island territories (and other similar locations) focused on management practices that promote sustainable materials management and minimize risk to human health and the environment.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Resiliency Planning
Infrastructure Development	Recovery Planning
Economic Development	

Synthesis: The report directly supports SSG land-use planning and infrastructure development in the CNMI, especially for Tinian and Rota. The report gives excellent summaries of the solid waste facilities on Saipan, Tinian, and Rota. Proper land-use planning is important to manage existing dumps and landfills and is critical to properly siting future landfills to protect ground water and marine resources from pollutants. The report supports infrastructure development by providing several design and operational approaches to reduce environmental impacts. Resource recovery and recycling methods provided in the report support economic development.

The report briefly mentions hazards associated with open dumps near marine environments. However, the plan generally lacks discussion about resiliency and recovery planning for existing or future solid waste management infrastructure. Also, adaptive planning for climate change is not explicitly discussed in the solutions for solid waste management provided in the report.

Remote, economically challenged areas in the Commonwealth of the Northern Marianas Islands (CNMI) face unique challenges with respect to solid waste management. Islands are remote and isolated, thus limiting options for pooling resources among communities in the form of regional waste management facilities and resulting in greater costs for waste management compared to the mainland US. Construction costs are elevated because the

necessary transport of facility components (e.g., landfill liner materials). Recycling can be challenging in remote, economically challenged locations because transportation costs often outweigh recoverable market value. Adding to these economic limitations, the gross domestic product and per capita income of the Pacific territories is less than half than in parts of the US.

Landfills designed to meet the minimum criteria for municipal solid waste landfills at 40 CFR Part 258 (herein referred to as Subtitle D requirements) are currently operated on Guam and Saipan. Waste disposal on the other islands (including Tinian, Rota, Tutuila, Aunu'u, Tau, Ofu, and Olosega) occurs through some form of unlined landfilling or open dumping or off-island transport of wastes. Site visits to Tinian and Rota found that the local government authorities maintained disposal sites at distinct locations and that these facilities were being upgraded from open dumping to more controlled sanitary landfills. A preferred waste management solution is one focused on waste reduction and enhanced materials recovery through recycling and energy recovery.

The environmental and human health risks posed by improperly managed solid wastes are described. Fundamentals, such as understanding local waste characteristics, opportunities for waste reduction, and waste collection are reviewed.

Several design and operational approaches are required to reduce environmental impacts from landfills. Site location is critical to avoid sources of drinking water and sensitive environments. Waste compaction, cover soil placement, and proper configuration of the landfill disposal area help minimize issues such as fires, odors, and disease vectors, and can reduce the potential for off-site migration of pollutants from leachate and landfill gas. Landfill gas problems can be reduced through implementation of good cover soil practices and installation of gas vents constructed with locally available materials. Lined municipal solid waste landfilling capacity can be preserved by the construction of non-municipal landfills accepting only certain non-hazardous, non-municipal waste materials, operating in compliance with 40 CFR 257, and by sustainable management practices that divert certain materials from the waste stream.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 32

Citation: Hiney, S., & Hawley, T. (n.d.). Case Study: Success of Saipan's solid waste management system serving as an example to other South Pacific Islands. Solid Waste.com.

Abstract: The US EPA issued the CNMI a compliance order to close the Puerto Rico Dump and a new landfill was needed. About 33 percent of Saipan's waste stream is garment waste and other easily divertible products. To implement new solid waste diversion, recycling, and disposal systems, the Lower Base Refuse Transfer Station and the Marpi Soild Waste Facility were constructed. Environmental safeguards at the facilities include: 1) daily six-inch soil cover; 2) landfill liner systems include a geosynthetic clay liner, a welded 60-mil high-density polyethylene geomembrane, geocomposite drainage layer and overlying soil operations layers; and 3) a leachate collection system was installed to facilitate detection, sampling and removal of any leachate generated from the landfill. The landfill design has been successful.

Applicable/Relevant to CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This report supports infrastructure development. The report indirectly supports land-use, resiliency, and recovery planning and economic development. Solid waste management and containment is critical for protecting valuable natural resources from potentially toxic materials contained in the landfill. Landfill design and construction should be considered during infrastructure resiliency and recovery planning to ensure the landfill will continue to function as expected even under new climate conditions. New economic opportunities may be developed from diverted materials.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 33

Citation: Chou, L. W. (1989). *Typhoon water source analysis for west coast of Saipan Mariana Islands* (Miscellaneous Paper No. CERC-89-12) (pp. 54). Vicksburg, MS: US Army Corps of Engineers, Waterways Experiment Station.

Abstract: The Coastal Engineering Research Center of the US Army Engineer Waterways Experiment Station (WES) was requested by the US Army Engineer Division, Pacific Ocean (POD) to conduct a Typhoon Water Surface Analysis for the Flood Insurance Study of Saipan, Commonwealth of the Northern Mariana Islands. A comprehensive investigation to determine the frequency of occurrence of typhoon-induced flood elevations for the west coast of Saipan was performed. Since Saipan is located within the region subjected to typhoons similar to those considered in a previous stage-frequency analysis for Agana Bay, Guam, the synthetic typhoon ensemble used in that study was utilized in this investigation. The surge time-histories of the storms were computed using the WES Implicit Flooding Model (WIFM). Deepwater wave conditions associated with each storm were calculated using a wave hindcast model. Predicted still water levels (swl) were calculated by combining surge and astronomical tide time-histories, and the ponding water levels caused by deep water wave breaking on and over the reef. Wave setup for each storm was estimated using procedures presented in the Shore Protection Manual (SPM 1984). Stage-frequency relationships were established using the probability of occurrence of each storm event in the ensemble and the maximum swl generated by the storm.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This report does not directly support SSG planning or development areas, but does indirectly support lands-use, resiliency, and recovery planning for the CNMI. Although the report is somewhat dated, the information is still relevant to potential flooding from surge and wave action. However, the report does not discuss climate change or the anticipated changes in storm frequency or severity. Information in this report may indirectly influence economic and infrastructure development by identifying areas prone to storm-induced flooding.

The objective of this study was to determine the 100-yr flood elevations at seven numerical gage locations on the west coast of Saipan. The study reports total water level with and without wave-induced setup for seven locations at return periods of 10, 50, 100, and 500-years. Results show that for the total water level without setup, the 100-yr water level varies from 6.3 ft at gage location 4 to 6.7 ft at gage location 3. For total water level plus wave-induced setup, the 100-yr water level varies from 7.2 ft at gage location 4 to 7 .7 ft at gage location 3. Based on the most accepted scenarios within the climate change community of practice, this report would be expected to under-predict flood hazards.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 34

Citation: US Army Corps of Engineers. (2004). *Saipan Lagoon erosion study, Saipan Island, Commonwealth of the Northern Mariana Islands* (pp. 49). Honolulu, HI: US Army Corps of Engineers, Honolulu District.

Abstract: To evaluate shoreline conditions the US Army Corps of Engineers (USACE) measured shoreline profiles along two beach areas in American Memorial Park and North San Jose to Susupe. Work presented in this atlas builds on the previous USACE work. The specific objectives of the Saipan Lagoon Shoreline Erosion Study are: 1) review and analysis of existing beach profiles with emphasis on identifying beach erosion and accretion trends; 2) a field investigation of shoreline conditions consisting of photographically documenting and accurately locating shoreline features conditions and problems; and 3) preparation of report atlas describing shoreline conditions and presenting the shoreline profile analysis. This atlas consists of text describing the shoreline, photographs illustrating shoreline features, shoreline profile analysis, and topographic maps and vertical aerial photographs at a scale of 1:200.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	
Economic Development	
Infrastructure Development	

Synthesis: This report directly supports land-use and resiliency planning and economic and infrastructure development for specific Saipan shorelines. The report does not address recovery planning.

Beaches along the west shore in the study region are protected by a broad reef and lagoon and are characterized by low prevailing wave energy and are narrow and composed of fine to medium grained calcareous sand. Weather conditions associated with easterly trade winds and southwest monsoons do not significantly contribute to beach erosion. However, these typically calm west coast beaches are susceptible to severe erosion caused by tropical cyclones.

The report documents the conditions of specific shoreline segments along the west coast. In some areas, erosion threatens infrastructure and the economic activity associated with the tourism industry. The report recommends several treatments to slow or mitigate erosion. Although dated, information in this report may serve as a basis for future shoreline planning and conservation efforts.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 35

Citation: van Beukering, P., Haider, W., Wolfs, E., Liu, Y., van der Leeuw, K., Longland, M., … Massey, E. (2006). *The economic value of the coral reefs of Saipan, Commonwealth of the Northern Mariana Islands* (pp. 163). Saipan, MP: CNMI Office of the Governor, Coastal Resources Management Office.

Abstract: The purpose of the study was to determine an economic valuation of the coral reefs and associated resources on Saipan. The results were derived via five major research methodologies: 1) household survey; 2) discrete choice experiment; 3) total economic value calculation; 4) spatial analysis; and 5) sustainable financing. The Total Economic Value, representing the entire economic importance of Saipan's marine environment, was estimated at $61.16 million per year with the tourism industry being the greatest beneficiary of the coral reef ecosystem services. Additionally, the spatial analysis showed that, in general, the more valuable the reef, the poorer the condition and the greater the threats. Combining all five research areas, the report makes three policy recommendations: 1) tackle the problems of non-point and point source pollution; 2) make use of the cultural importance residents place on marine ecosystems to improve coral reef management; and 3) develop a comprehensive system of user fees for visitors of the Marine Protected Areas on Saipan.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Recovery Planning
Resiliency Planning	Infrastructure Development
Economic Development	

Synthesis: The report directly supports land-use and resiliency planning for the natural environment. Although the report does not directly support resiliency or recovery planning for the built environment, resilient and heathy reefs provide ecosystem services that benefit the built environment such as attenuation of wave energy. Therefore, healthy coral reefs are an important consideration for resiliency planning for the built environment. The report supports economic development by estimating monetary values for the goods and services provided by the reef, in general, and for specific locations. This valuation can direct management efforts to protect locations that are economically important to encourage sustainability and to evaluate user fees and other tools to fund conservation activities. The economic valuation of the reef increases awareness of the value of this common resource.

The report does not support recovery planning or infrastructure development.

This report focuses mainly on the natural environment and several methods are used to assign economic values to the reef in general and for specific locations. The household survey aimed to determine the nature and level of the use and non-use values of coral reefs, from the perspective of Saipan residents. The most important threats perceived by the residents, by far, is water pollution caused by runoff and sewage operations. The discrete choice experiment was used to estimate the economic values of non-market values. Results suggested that residents place a similar value on the ability of the reefs to provide local

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reactional benefits and to supply culturally significant fish species. Results also indicate that residents may support expanding the Marine Protected Area in the lagoon but are more concerned about the effects of pollution. The Total Economic Value (TEV), representing the entire economic value of Saipan's marine environment, was estimate at $61.16 million per year. Market values make up 73% of the TEV, with 27% non-market values. With an annual value of $43.31 million, the tourism industry is by far the greatest beneficiary of the coral reef services. Additionally, the report provides maps that depict the spatial variation in economic values across the reef. The authors conclude that, in general, the more valuable the reef, the poorer the condition and the greater the threats. The authors explored possibilities for sustainable financing for reef management at Managaha Island, LaoLao Bay and the Grotto.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 36

Citation: Denton, G. R. W., Morrison, R. J., Bearden, B. G., Houk, P., Starmer, J. A., & Wood, H. R. (2009). Impact of a coastal dump in a tropical lagoon on trace metal concentrations in surrounding marine biota: A case study from Saipan, Commonwealth of the Northern Mariana Islands (CNMI). *Marine Pollution Bulletin*, *58*(3), 424–431.

Abstract: Solid waste disposal facilities can pose significant environmental hazards, especially when located near bodies of water and when inadequately managed. The Puerto Rico dump on Saipan served as the primary waste disposal site for over 50 years. Operations were typically ineffectively managed, with minimal control on the materials dumped and no impervious lining or leachate control. Trace metal enrichment of subtidal sediments around the base of the dump had previously been identified. This study examines the metal status of dominant ecological representatives collected close to the dump and other known or suspected sources of trace element contamination in the lagoon including two marinas, a sea port (Port of Saipan) and dry dock area, and a power plant. Surface sediments and biota were collected from 12 sites over a two week period in June 2003 and tested for metals concentrations. Concentrations were high near the dump and sediment concentrations of most metals were significantly corelated to each other except for arsenic. The data for metal concentrations in the biota tested did not raise any significant public health concerns when evaluated against the risk-based consumption limit health advisories for methylmercury recommended by the US Environmental Protection Agency.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Recovery Planning	Infrastructure Development
	Economic Development

Synthesis: The article directly supports land-use planning by identifying metals concentrations in sediments and the biota. This information can be used to plan appropriate land-uses that are compatible with existing levels of contamination. The information can directly support recovery planning. For example, around the dump metal contaminats accumulate in bottom deposits and are mobilized from the area by physical disturbances (e.g. typhoons, storm surge) and may wash on shore, contaminating upland soils. Recovery planning can identify potential areas of concern to monitor for potential contamination following certain types of physical disturbance.

The article does not support resiliency planning or infrastructure or economic development.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 37

Citation: Damlamian, H., & Kruger, J. (2010). *Three dimensional wave-current hydrodynamic model for the management of Saipan Lagoon, Saipan, Commonwealth of the Northern Mariana Islands* (SOPAC Technical Report No. 439) (pp. 73). Suva, Fiji: South Pacific Applied Geoscience Commission.

Abstract: The purpose of the project was to establish a numerical model describing the water flow in Saipan lagoon and to undertake a coastal erosion assessment. Data collection was from April to June 2010. The field data was used to calibrate the coupled three dimensional wave-current hydrodynamic numerical model, which reproduces the observed coupling between offshore waves and lagoon currents. The model was run for two seasons April to September (calm) and October -March (energetic). Seasonal models were run to model the dispersion of pollutants discharging for the Sadog Tasi outfall. The overall impact of the seasonality is that Saipan lagoon is flushed relatively well from October - March compared to the April - September when the pollutant plume may reside in the Managaha marine conservation area at levels of up to 0.35% of the initial concentration of pollutants set at 100%.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Resiliency Planning
Infrastructure Development	Recovery Planning
	Economic Development

Synthesis: This report directly supports land-use planning and infrastructure development. The numerical model describes the water flow in the lagoon and can be used for coastal erosion assessments and to understand the distribution of pollutants from the Sadog Tasi Sewer outfall. This report projects future trends to guide land-use planning and infrastructure development decisions.

The report does not address resiliency or recovery planning or economic development. However, the report indirectly supports resiliency planning for reef resources by modeling the distribution of pollutants

The report presents detailed current maps for two seasonal scenarios (calm and energetic) for various sections of Saipan lagoon including Tanapag Lagoon, Garapan Lagoon, Puntan Muchot, Sugar Dock channel and Garapan pier, and Chalan Kanoa Lagoon. The report also includes maps modeling the distribution of various pollutants from the Sadog Tasi outfall for the two scenarios (calm and energetic).

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Document 38

Citation: Page, G., Swanenberg, A., Maddalene, T., & King, K. (2014). *An analysis of issues affecting the management of coral reefs and the associated capacity building needs in the Commonwealth of the Northern Mariana Islands* (pp. 113). Portland, ME: CNMI Coral Reef Management Network and National Oceanic and Atmospheric Administration Coral Reef Conservation Program.

Abstract: The primary purpose of this assessment is to examine issues that affect capacity to implement the priorities expressed in the *Commonwealth of the Northern Mariana Island's Coral Reef Management Priorities* (PSD) and to present a set of near-term recommendations to address persistent capacity gaps and barriers. Management of coral reefs in the CNMI will require a long-term strategy to build adaptive capacity within the current governance system as well as an appreciation for what may be needed to change the existing system. The report presents the context for coral reef management and why reefs are extremely valuable and important to the economy, culture and future of the CNMI residents and visitors. Although capacity to manage the reefs has increased, gaps are still persistent and additional adaptive capacity is needed to meet uncertain and dynamic management challenges. The report offers a set of recommendations to serve as a "road map" for the continued development of adaptive capacity and a strategy for the development of a long-term capacity building action plan.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Recovery Planning
Resiliency Planning	Infrastructure Development
Economic Development	

Synthesis: This report supports land-use and resiliency planning and economic development for CNMI's coral reefs. The focus of this report is the natural environment and how to protect the health and ecological and economic value of the coral reef ecosystem. The plan supports land-use planning to mitigate land-based activities that negatively affect the reef. By monitoring and developing management strategies to improve reef health, the plan supports resiliency planning for the natural environment. And by conserving the reef, the plan supports economic development and sustainability of ecosystem services and goods derived from the coral reef.

The report does not support SSG planning and development areas for the built environment and, in particular, does not support recovery planning and infrastructure development.

The report provides social and historical contexts and summarizes the economic value of CNMI's coral reefs. An assessment of coral reefs is provided and biophysical pressures and drivers that are affecting reefs are described. The report identifies the CNMI agencies responsible for reef management and examines the political and legal context that support management capacity, identifies shortfalls and makes recommendations to improve adaptive capacity for effective management. The plan identifies political, legal, and biological areas to improve adaptive to effectively manage and conserve CNMI's coral reefs over short-, medium-, and long-terms.

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Document 39

Citation: Spalding, M. D., McIvor, A. L., Beck, M. W., Koch, E. W., Möller, I., Reed, D. J., … Woodroffe, C. D. (2013). Coastal ecosystems: A critical element of risk reduction: Coastal ecosystems and risk reduction. *Conservation Letters*, *7*(3), 293–301.

Abstract: The conservation of coastal ecosystems can provide considerable coastal protection benefits, but this role has not been sufficiently accounted for in coastal planning and engineering. Substantial evidence now exists showing how, and under what conditions, ecosystems can play a valuable function in wave and storm surge attenuation, erosion reduction, and in the longer term maintenance of the coastal profile. Both through their capacity for self repair and recovery, and through the often considerable co-benefits they provide, ecosystems can offer notable advantages over traditional engineering approaches in some settings. They can also be combined in "hybrid" engineering designs. Ten recommendations are made to encourage the utilization of existing knowledge and to improve the incorporation of ecosystems into policy, planning and funding for coastal hazard risk reduction.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Recovery Planning
Resiliency Planning	Economic Development
Infrastructure Development	

Synthesis: This article directly supports land-use and resiliency planning and infrastructure development. The article focuses on the integration of natural ecosystems with the built environment to develop appropriate coastal defense strategies. The article discusses using legal processes to change building codes and land-use zoning laws to reduce risk. Resiliency is mostly discussed in relation to the natural environment and the article highlights the importance of healthy ecosystems that can self-repair following a disturbance event. The article concludes with recommendations to work toward increasing combined natural and engineered flood risk reduction to protect infrastructure.

The article does not directly support economic development or infrastructure recovery planning. However, the article does include several suggestions for funding infrastructure development via grants and federal assistance programs.

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Document 40

Citation: Allied Pacific Environmental Consulting. (2016). *Saipan lagoon use management plan user survey and mapping report* (pp. 50). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: This report assesses the recreational and commercial uses of the Saipan Lagoon to identify areas of user conflict and to provide guidance for management decision-making. This report provides supplemental information for the update of the Saipan Lagoon Use Management Plan (SLUMP) and it identifies priority issues and management projects to assist the Division of Coastal Resources Management balance habitat conservation with economic activity. Information in this report was derived from participatory mapping techniques where selected lagoon users with expertise in multiple lagoon uses provided survey responses and mapping feedback. Maps were produced for each of the identified twenty uses which were grouped into recreational activities, commercial activities, and extractive uses. Based on mapped use-data, the authors recommend: 1) implement management to avoid overcrowding and user conflicts; 2) protect priority locations and resources; 3) prioritize water quality and erosion control; and 4) continue frequent stakeholder engagement.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This report supports land-use planning for the Saipan lagoon. The report identifies several recreational activities, commercial activities, and extractive uses that occur within the lagoon and offers suggestion to reduce user conflicts.

The report does not support other SSG planning and development areas such as resiliency and recovery planning for the built environment or economic and infrastructure development. The report does indirectly support economic development by providing information regarding activities occurring within the lagoon environs that have economic value.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 41

Citation: Horsley Witten Group, Inc., & Hofschneider Engineering Corporation. (2017a). *Draft state of the lagoon report in support of the 2017 Saipan Lagoon use management plan update* (pp. 139). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: Saipan Lagoon is one of CNMI's most treasured environmental, economic, and recreational resources. The Saipan Lagoon Use Management Plan (SLUMP) outlines a strategy for the Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management (DCRM) to follow over the next decade as part of its mission to ensure sustainable use and quality of the Lagoon. Originally developed in 1985, the SLUMP has been updated over the years to adapt to declining ecosystem health, eroding beaches, water quality challenges, and an expanding number of users. This 2017 effort to update the SLUMP involved: 1) an extensive review of recent studies and management programs that provide more current information on the condition, regulatory issues, and user demands on the Lagoon; 2) a survey of Lagoon users to identify perceived issues and a community vision for how the Lagoon should be managed; and 3) a two-day forum to present the state-of-the-lagoon and solicit input from users and managers on preferred management actions. This report focuses on recommendations and associated actions identified by a wide range of agencies, legislative leaders, and others with a stake in Lagoon use management, such as the Saipan Chamber of Commerce, marine sports operators, fishermen, hospitality groups, and the community.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	
Economic Development	
Infrastructure Development	

Synthesis: The SLUMP supports land-use and resiliency planning and infrastructure and economic development for Saipan Lagoon. Resiliency planning primarily focuses on the natural environment and the report touches on reef health and the status of the lagoon shoreline. Community resiliency is considered in a short review of the Climate Change Vulnerability Assessment for Saipan (Green et al., 2014). However, this report only briefly discusses resiliency in terms of the built environment and no goals or objectives are identified in the plan for increasing infrastructure resiliency. Infrastructure improvements to marinas and to stromwater management infrastructure were identified as important. Plans to improve infrastructure presents an opportunity to develop infrastructure that is resilient to anticipated climate changes. Stated goals of the plan are to support sustainable economic development and establish a sustainable funding mechanism for lagoon management. The report also provides details regarding current user activities that are associated with economic activity.

The report does not discuss recovery planning for the built environment.

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The SLUMP identifies several top management priorities to balance habitat conservation and lagoon user activities. For the 2017 SLUMP update, a Technical Advisory Group worked with a consortium to develop management goals and recommendations based on priorities identified by stakeholders during public forums. Management goals include: 1) improve user safety and quality of experience; 2) protect resources and habitat while supporting sustainable economic development; 3) improve water quality; 4) promote education and communication; and 5) establish a sustainable funding mechanism. Twelve management recommendations are provided to achieve these goals.

The SLUMP includes a report on the state of the Lagoon in Appendix A. This report provides information essential for SSG planning and development for Saipan specifically and CNMI in general. The report provides a good summary on the anticipated effects of climate change and how resilient reefs, shorelines, and communities are to these expected changes. Information from these reports is synthesized to provide insight into how the lagoon is likely to change and the potential effects to lagoon users and resources. Information from several recent reports and interactive mapping tools is incorporated into the report to inform and recommend sustainable use of lagoon resources. The report discusses the condition of Saipan's watersheds and the challenges with infrastructure and sources of pollution. While this discussion is focused on Saipan Lagoon, the information can apply to broader areas on Saipan as well. The watershed discussion provides an opportunity to investigate and plan resilient infrastructure that minimizes negative impacts to the health and resilience of the natural environment.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 42

Citation: Fletcher, C. H., Barbee, M., Dyer, M., Genz, A., & Vitousek, S. (2007). *Managaha Island shoreline stability assessment* (pp. 90). Saipan, MP: CNMI Office of the Governor, Coastal Resources Management Office.

Abstract: The purpose of the Managaha Island Shoreline Stability Assessment is to evaluate coastal erosion hazards and potential management responses on the island of Managaha, Saipan. Managaha Island is a registered National Historic site, a Marine Conservation Area managed by the Department of Lands and Natural Resources Division of Fish and Wildlife, and an important tourist destination with visitor facilities managed under a 10 year lease by Tasi Tours & Transportation, Inc. Recent studies by the US Army Corps of Engineers and the Commonwealth of the Northern Mariana Islands Coastal Resource Management Office have documented erosion of the shoreline along the southeast, east, and northeast side of Managaha Island. The report documents patterns of shoreline change and offers various mitigation methods available to manage erosion.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: The report supports land-use planning and infrastructure and economic development but is limited to Managaha Island.

The report does not support resiliency or recovery planning for the built environment.

Managaha Island is registered as a National Historic site and is designated as a Marine Conservation Area. The Island is an important tourist destination and center of economic activity. Shoreline erosion threatens natural resources and causes the collapse of trees and threatened bird nesting habitat. Chronic erosion also exposes buried debris and presents health and safety concerns for visitors. The report examines the patterns of sand movement around the island due to wind, waves, and tide. Hydrodynamic models indicate two hot spots for high current velocity; along the southeast coast and along the northeast coast of the island, and low velocities to the west. These are consistent with measured patterns of shoreline change. Methods to mitigate shoreline erosion are available and the report summarizes several options within context of Managaha Island and the management goals envisioned by the stakeholders. The authors recommend additional monitoring to better determine rates of sand erosion and accretion around the island and to implement a sand back-passing system without a groin.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 43

Citation: Perreault, J. A. (2007). *Reconnaissance study of the hydrology of American Memorial Park, Island of Saipan, Commonwealth of the Northern Mariana Islands* (US Geological Survey Scientific Investigations Report No. 2007–5042) (pp. 31). Reston, VA: US Geological Survey.

Abstract: American Memorial Park's estuarine system provides critical habitat for various migratory and resident waterfowl, including two Federally-listed endangered species: the Marianas gallinule (*Gallinula chloropus guami*) and the nightingale reed warbler (*Acrocephalus luscinia*). A reconnaissance study was undertaken during August and September 2005 to better understand the hydrology of American Memorial Park. The goals of the study were: 1) to describe the occurrence and salinity of surface and ground water within the park; 2) to develop a hydrologic model of the park area of the island, with emphasis on the 27-acre estuarine system; and 3) to identify additional data needed to further develop this model.

CNMI SSG Planning and Development:

Supports	Deficient
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Economic Development
	Infrastructure Development

Synthesis: This report does not directly support SSG planning and development areas. Information in the report is focused on the hydrology of American Memorial Park's estuarine system. However, the report provides an excellent overview of Saipan's ground-water resources and hydrological functions that may be applicable to the SSG planning and development areas.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 44

Citation: Horsley Witten Group, Inc. (2009). *CNMI erosion and sediment control field guide, version 1.0 for contractors and site inspectors* (pp. 45). Saipan, MP: CNMI Division Environmental Quality and Coastal Resources Management Office.

Abstract: This field guide was designed for contractors in the CNMI involved in clearing, grading, stockpiling, and other earth moving activities at all construction sites, to help contractors implement 11 erosion and sediment control (ESC) standards of the 2006 CNMI/Guam stromwater manual. The guide explains the importance of ESC as part of the construction process, summarizes ESC practice design, installation, and maintenance tips, outlines inspection and project closeout considerations, and serves as a reference for use in the field. The guide relies primarily on graphical illustrations for multi-lingual users. This guide is not a substitute for detailed engineering designs or technical specifications.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	Economic Development
Infrastructure Development	

Synthesis: This guide directly supports land-use and resiliency planning and infrastructure development. Managing ESC during construction activities is critical to address water quality issues and to protect sensitive environmental resources, especially coral reefs.

The guide directly addresses infrastructure development by providing best management practices (BMPs) and requirements to reduce erosion and sedimentation for a variety of construction activities and environmental conditions. The guide provides many examples of measures and methods to mitigate potential erosion. The guide supports land-use planning and infrastructure development via the BMPs for selecting and sizing ESC controls based on site conditions.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 45

Citation: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management. (2016). *2016-2020 Section 309 assessment and strategy report* (pp. 135). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: This report satisfies regulatory requirements to develop and submit under the Coastal Zone Management Act (CZMA) § 309 an Assessment and Strategy document to the National Oceanic and Atmospheric Administration (NOAA) for evaluation every 5 years to be eligible for coastal management funding. Assessments and strategies for 2016–2020 were developed on the basis of information gained by survey questionnaires, research, interviews with resource managers in several key agencies, stakeholder meetings, and written comments. As such, the report provides a factual basis for CNMI coastal management program priorities and a strategy framework to ensure program progress. The report was written to help the Division of Coastal Resource Management recognize issues that may be affecting CNMI coastal areas, identify areas where the CRM program can be strengthened, and determine the effectiveness of past efforts.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This assessment and strategy report directly supports the SSG planning and development categories.

The report has many recommendations for land-use planning and identifies many areas where regulations have been or need to be strengthened to ensure smart, safe growth and to reduce impacts to the natural and built environment due to coastal hazards under current and future climate conditions. The authors discuss interagency on-going interagency efforts to reduce exposure risks to coastal hazards via regulations and enforcement measures. The plan also considers proposed and future land-uses, such as increased military training activities, that may pose threats to coastal resources.

The report also highlights resiliency planning for natural resources, such as coral reefs, wetlands, and watersheds, and ties the health of these critical assets to the protective functions they provide for coastal resources (e.g., wave energy/action attenuation). The report does not discuss resiliency planning for the economy or infrastructure.

The report explores infrastructure development via regulating appropriate land-uses through a permitting process within coastal management zones termed “Area of Particular Concern” (APC). Proposed development in the Coastal Hazards APC is evaluated to determine whether the application is compatible with existing standards. Moreover, the DCRM will be

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updating regulatory language related to its Coastal Hazards APC and Shoreline APC that suggest additional buffer requirements that are sensitive to the relative vulnerability of shoreline parcels to sea level rise, storm surge, and chronic coastal erosion.

The report also identifies issues with disaster recovery centers, low-lying roadways, and other vital infrastructure that is currently sited in areas that may be affected by coastal hazards such as flooding. The report does not go further to support recovery planning for infrastructure or economic activity.

Economic activity is discussed in regard to the tourist industry and to marine resources, especially the coral reef. Monetary values associated with these activities are provided. The authors discuss some of the challenges of balancing economic activity and development with smart, safe growth and natural resources protection.

This report is an essential document for SSG planning and development. Coastal resources are essential to the health and well-being of CNMI communities as well as the economy. The assessment showed that management efforts should be focused on four CMZA enhancement areas: 1) Coastal hazards; 2) Cumulative and secondary impacts; 3) Ocean Resources; and 4) Wetlands. Specific strategies to address these priority areas are presented for the 5-year period (2016-2020) covered by this report. Lastly, this report is valuable to SSG planning and development as it provides many useful references to existing CNMI regulations and identifies many areas where regulations can be improved to more effectively manage CNMI coastal resources.

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Document 46

Citation: US Army Corps of Engineers. (2017). *Garapan area shoreline assessment study, final* (pp. 66). Honolulu, HI: US Army Corps of Engineers Honolulu District.

Abstract: This report documents the analysis of shoreline change for the Saipan Lagoon Shoreline (SLS) due to concerns about erosion and the need to protect coastal ecosystems, upland development, and infrastructure. This report provides planning and conceptual design guidance for the development of Living Shore Line (LSL) projects for Saipan Lagoon. A shoreline advance of approximately 20 feet was typical along several portions of the SLS between 2013 and 2017. The three reaches that had the greatest erosion were: 1) South of Sugar Dock; 2) North of Saipan World Resort; and 3) The southern shoreline of American Memorial Park. By 2070, predicted sea level rise may be 1.1 ft to 7.2 ft higher than today in the study area. Given this amount of uncertainty, LSL projects for the SLS should be designed with adaptive management strategies. A wide range of planning measures are discussed to provide a basis for selection of appropriate shore protection measures for the SLS. Measures range from green or soft solutions, to gray or hard solutions. Conceptual plans for 5 reaches of SLS are described.

Applicable/Relevant to CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This report directly supports land-use, resiliency, and recovery planning for the natural and built environment of the Saipan Lagoon. Although the report is focused on the Saipan Lagoon, many of the concepts for shoreline protection can be applied regionally in CNMI. The plan addresses infrastructure development directly and describes the combination of soft and built solutions to prevent current shoreline erosion as well under expected higher mean sea level conditions. Additionally, the resiliency and recovery potential of the infrastructure is discussed in terms of post-storm needs to retain viability and integrity in terms of functionality under various sea level conditions. These analyses and discussions are specific to Saipan but are likely applicable to the CNMI region. The report discusses the costs of each of five recommended treatments for the duration of the project life. Broader economic development implications are supported by protecting shorelines, upland developments, and existing infrastructure.

This report discusses details of shoreline advance for Saipan Lagoon especially for the reaches experiencing the greatest erosion such as Sugar Dock with 21 feet or recession, north of Saipan World Resort with 15 feet of recession, and the southern shoreline of American Memorial Park with an average of 32 feet of recession. Fundamental planning and conceptual design guidance for developing and implementing LSL projects is provided and “soft” erosion control measures were developed to include beach nourishment, dune enhancement, and vegetative measures.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

The report recommends a combination of soft and hard shoreline protection measures for five problematic areas: 1) American Memorial Park (beach nourishment with vegetation); 2) Makaka Beach (vegetation); 3) Fishing Base (beach nourishment with vegetation); 4) Quartermaster Road (beach nourishment with T-head groins); and 5) Sugar Dock (beach nourishment). Costs for each treatment are provided for the initial construction and the total costs of operations and maintenance over a 50-year project life.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 47

Citation: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management. (n.d.-a). *Erosion control best management practices: A guide for landowners and developers in the CNMI* (pp. 1). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: This brochure provides background and information about erosion, sediment control, and stormwater management for landowners and developers. The brochure provides general information about erosion management and includes links to additional on-line resources and to Division of Coastal Resource Management and Division of Environmental Quality permit applications.

Applicable/Relevant to CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	Economic Development
	Infrastructure Development

Synthesis: This brochure directly supports land-use and resiliency planning. The brochure gives information about soils found in CNMI and the effects of soil erosion and sedimentation on lagoons and reefs.

The poster indirectly supports green infrastructure and economic development by encouraging land-owners and others involved in earth moving activities to practice stormwater BMPs. This may support companies specializing in erosion control and the BMPs serve to reduce risks to various economic activities from flooding and erosion. This brochure does not support recovery planning.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 48

Citation: Herrmann, K., & Gombos, M. (2009). *Laolao Bay Conservation Action Plan, Draft* (pp. 45). Saipan, MP: CNMI Office of the Governor, Division Environmental Quality, Coastal Resources Management Office, and Division of Fish and Wildlife.

Abstract: Conservation and management of the coral reef ecosystem is a priority concern of the CNMI government. This report describes a three-year Local Action Strategy for Laolao Bay Watershed and serves as a roadmap for collaborative and cooperative action among federal, commonwealth, and non-governmental organizations to identify and implement priority actions to reduce threats to valuable coral reef resources. A Conservation Action Planning (CAP) team used the CAP tool to undergo a comprehensive and strategic process for site-specific threat identification and action planning. The report also contains the 2012 CAP addendum and workplan.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	Infrastructure Development
Economic Development	

Synthesis: This CAP directly supports land-use and resiliency planning and economic development. The plan identifies several land-use types within the watershed and potential effects to the coral reef from human activities. The CAP supports resiliency planning for the natural environment by monitoring the status of several key resources and by reducing negative impacts to marine resources in Laolao Bay. The CAP discusses the resources and ecosystem services and the socioeconomics to support economic development.

Although the CAP does not directly support recovery planning or infrastructure development, the information in this plan could serve as background information knowledge for these types of efforts.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 49

Citation: Bickel, A. (2012). *Talakhaya/Sabana Conservation Action Plan* (pp. 74). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Environmental Quality.

Abstract: Conservation and management of the coral reef ecosystem is a priority of the CNMI government. This CAP describes the outcomes of a collaborative process whereby community stakeholders, government agencies, and non-governmental organizations identified critical watershed assets, threats to the assets, prioritized conservation goals, and strategies to achieve goals. Through the process, eight resource targets were selected, and three high-priority threats were identified. The five strategies to manage the threats are: 1) revegetate critically eroded areas; 2) implement engineering actions to decrease erosion; 3) raise awareness and education about the negative effects to the watershed from fire and poaching; 4) create effective law enforcement measures; and 5) collect species population information for more informed policy decisions.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Infrastructure Development	Recovery Planning
Economic Development	

Synthesis: The Talakhaya/Sabana CAP supports land-use and infrastructure and economic development. The Takahhaya/Sabana watershed is relatively un-developed and local industry is limited to small scale farming and ranching operations. However, some prohibited activities, such as illegal hunting and the use of fire to clear vegetation, are degrading the watershed. The CAP identifies several strategic actions and objects aimed to improve public education and outreach regarding land-use activities that support critical watershed resources. The CAP identifies strategic actions and actions to improve road infrastructure to reduce erosion and impacts to marine resources. Several strategic actions and objectives support job creation to monitor and enforce land-use policies and to monitor critical watershed resources such as marine fish and revegetation efforts. Although the CAP does support infrastructure and economic development within the watershed, the overall influence of the plan on Rota's built environment and economy may be minimal.

The Talakhaya/Sabana CAP does not address resiliency or recovery planning for the natural or built environment. Climate change and adaptive planning are not considered in the CAP.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 50

Citation: CNMI Division of Environmental Quality. (2013). *Garapan watershed Conservation Action Plan* (pp. 40). Saipan, MP: CNMI Office of the Governor, Division of Environmental Quality.

Abstract: Conservation and management of the coral reef ecosystem is a priority of the CNMI government. This Conservation Action Plan CAP describes the outcomes of a collaborative process whereby community stakeholders, government agencies, and non-governmental organizations identified critical watershed assets, threats to the assets, and strategies to reduce impacts of the threats. The goal of the Garapan CAP is to maintain and improve the valuable natural resources that exist in West Takpochao Central subwatershed and to coordinate efforts between stakeholders to provide the most benefits to the natural resources and the community that uses them. CAP actions can be grouped into six categories: 1) implementing best management practices; 2) improving engineering and infrastructure; 3) improving regulations and enforcement; 4) conducting education and awareness programs; 5) continuing research and monitoring; and 6) improving community stewardship and incentive programs.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Recovery Planning
Resiliency Planning	
Infrastructure Development	
Economic Development	

Synthesis: The Garapan CAP supports land-use and resiliency planning and infrastructure and economic development. The CAP summarizes current issues with land-use planning, infrastructure, and land-based activities that degrade reef resources, which in turn degrade the resilience of the natural environment and economic opportunities based on healthy, intact ecosystems. The CAP identifies key objective and strategic actions to improve existing regulations and enforcement efforts to reduce activities that negatively impact watershed and marine resources. The CAP summarizes key infrastructure within the watershed, such as drinking water wells, wastewater assets, and paved and unpaved roads. The plan addresses infrastructure improvements and retrofits to improve water quality but does not address how to improve infrastructure resiliency to future climate conditions. Several objectives and strategic actions are aimed at maintaining and improving the resiliency of natural systems through education and outreach, stewardship incentives, and research and monitoring. The Garapan CAP does not address recovery planning.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 51

Citation: Federal Emergency Management Agency. (2005). *Integrating historic property and cultural resource considerations into hazard mitigation planning: State and local mitigation planning how-to-guide* (pp. 202). Washington, DC: US Department of Homeland Security.

Abstract: This guide offers practical steps to integrate historic properties and cultural resources into hazard mitigation planning. The guide builds off the Federal Emergency Management Administration (FEMA) hazard mitigation guide book series. The guide is presented in four phases: 1) organize resources; 2) assess risks; 3) develop a mitigation plan; and 4) implement the plan and monitor progress. Protecting historic properties and cultural resources is often overlooked in mitigation planning. However, historic properties and cultural resources are often valuable economic assets that increase property values and attract businesses and tourists. Integrating historic preservation planning and hazard mitigation planning will help to ensure the future growth of safe and sustainable historic communities.

CNMI SSG Planning and Development:

Supports	Deficient
	Land-use Planning
	Resiliency Planning
	Recovery Planning
	Infrastructure Development
	Economic Development

Synthesis: Although this planning guide does not directly support SSG planning and development in the CNMI, it does offer a practical step-by-step planning process that can be applied in the CNMI.

In general, the guide does support land-use by integrating historic properties and areas of high cultural value as identified by community stakeholders. Hazard identification and characterization help planners define actions to improve the resiliency and recovery of these important assets. Improving these assets contributes to infrastructure and economic development of local communities.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 52

Citation: Skeele, R. (2015). *Public shoreline access guide for Saipan, Tinian, and Rota* (pp. 38). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: This guide is designed to help the public locate shoreline access points on the islands of Saipan, Tinian, and Rota. The islands of CNMI contain incredibly diverse and beautiful shorelines. This guide aims to provide the public with information regarding the recreational opportunities available at the various shoreline access points on Saipan, Tinian, and Rota. These sites include locally or nationally managed beach parks, scenic cliffs, boat ramps and marinas, and even small earthen paths leading to secluded pocket beaches.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Infrastructure Development	Recovery Planning
	Economic Development

Synthesis: This guide supports land-use planning and infrastructure development in CNMI and describes activities and assets at shoreline access points on Saipan, Tinian, and Rota. The guide does not discuss land-use in terms of zoning or with a view toward development, but it does provide an excellent resource for established beach activities. Infrastructure is descried for several locations, but the guide does not consider the future state of these assets in terms of climate change.

The guide does not support resiliency or recovery planning or economic development.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 53

Citation: Duenas, Bordallo & Associates, Inc. (2007). *Public land use Master Plan update - Phase 1* (pp. 58). Saipan, MP: CNMI Department of Public Lands.

Abstract: This document is Phase 1 of the Public Land Use Master Plan Update for the CNMI Department of Public Lands (DPL). Phase 1 includes: 1) updates the Geographic Information System (GIS) for public lands; 2) review of the CNMI economy and public lands projections of homestead applicants; 3) alternative goals and selects goal for the homestead program; and 4) public land use planning criteria (partial).

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This master plan directly supports land-use planning and economic and infrastructure development. The plan does not support resiliency or recovery planning. Considerations for climate change are lacking from this document.

The Master Plan update describes processes used to develop the DPL Unified GIS and includes descriptions of geodatabases for Saipan, Tinian, Rota, Anatahan, Alamagan, Pagan, and Agrihan. Thematic maps and tables available include: 1) public land inventory; 2) public land inventory detail by parcel and summary; 3) public land existing land uses; and 4) public existing land use by parcel and summary.

The plan describes the relationship between the DPL and the economy and describes the relationship between a healthy economy with economic opportunities for residents with the homestead program. DPL program and policies are a significant influence on CNMI's economy; therefore, CNMI's economic health is an essential consideration for public land use planning. The plan provides an overview of the CNMI economy in 2007.

This plan provides a review and recommendations for site planning criteria for all proposed public land uses which require the reservation of DPL public lands such as roads, utilities, major infrastructure, schools, public health clinics, police and fire stations, parks, playgrounds and other recreational facilities, and government administration facilities. Such criteria are not provided in the Saipan Comprehensive Land Use Plan and Zoning Law (1993).

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 54

Citation: MAKERS. (2007). *Garapan and Beach Road Revitalization Plan* (pp. 50). Saipan, MP: Commonwealth Zoning Board.

Abstract: Garapan and Beach Road are critical to the future of Saipan's tourism economy but need urgent attention. Infrastructure is in poor condition, businesses in some areas are not family friendly, and the general appearance is run down. The plan is proposed to become part of the land use plan for Saipan. The plan is intended as a guide for use by CNMI agencies, landowners and developers to revitalize Garapan and Beach Road so these areas are more attractive for visitors and residents. The plan provides a vision of what visitors and residents should see in 10 years. This plan calls for public and private actions to achieve the vision. The actions go far beyond just zoning. There are short, medium and long-term actions related to regulations, circulation and capital improvements, property development, and management oversight. By presenting actions in a coherent framework, this plan will facilitate discussion and development of consensus on the highest priority actions. Portions of this plan recommend zoning actions for incorporation into the Saipan Zoning Law.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	Recovery Planning
Resiliency Planning	
Economic Development	
Infrastructure Development	

Synthesis: This report supports land-use and resiliency planning and infrastructure and economic development in the Garapan district on Saipan. The plan explores land-use planning and zoning controls to combine business, cultural and civic activities into a cohesive community that supports visitor and resident needs and promotes economic activity. A goal of the plan is to upgrade infrastructure and utilities. Recommendations for stormwater management, in-ground utilities, and the use of typhoon resistant concrete all support resiliency planning for the built environment. Although the plan recommends some actions to improve infrastructure resiliency, it lacks and overall strategy for adaptive planning for changing climate conditions, especially for the potential of sea-level rise and more frequent marine inundation.

The plan integrates infrastructure development with economic development for this area and incorporates many SSG principles for open space, walkable areas, energy conservation, and a suitable mix of business, and civic and community activities.

This report does not support recovery planning for the built environment.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 55

Citation: CNMI Emergency Management Office. (2010). *Standard State Mitigation Plan, Commonwealth of the Northern Mariana Islands, pre-final May 2010* (pp. 493). Saipan, MP: CNMI Emergency Management Office.

Abstract: The plan addresses the risks associated with hazards in the CNMI, discusses hazard mitigation implementation for the CNMI, satisfies the Federal requirements for hazard mitigation planning funds, and identifies and prioritizes state-level and local mitigation activities. The base plan describes the hazards in the CNMI, governmental coordination, and general mitigation measures. Subsequent chapters contain more detailed information about each hazard and existing mitigation programs, successful mitigation projects and activities, and short- and long-term mitigation goals and objectives.

The purpose of the CNMI Disaster Mitigation Planning Process is to provide an organized and coordinated consistent set of goals for reducing or minimizing the loss of human life and property, major economic disruption, degradation of ecosystems and critical habitats, and the destruction of cultural and historical resources from natural disasters.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This plan directly supports all areas of SSG planning and development.

Land-use planning and zoning laws support interagency coordination among regulatory and development agencies that incorporate hazard mitigation in land use management. Mitigation efforts are primarily implemented via land-use regulations and brief summaries of applicable regulations are provided in the plan. However, adaptation planning for climate change is not incorporated into discussions about land-use planning and zoning laws.

The plan addresses resiliency planning in the general categories of hazard mitigation measures via prevention, property protection, natural resources protection, and projects to improve existing structures. Specific actions to improve the resiliency of the built environment are identified throughout the plan. Adaptation planning for climate change to improve infrastructure resiliency and recovery to anticipated hazards is not well developed.

Recovery planning following disaster is a primary focus of the plan. Recovery planning spans public safety, re-establishing vital services including government functions, lifeline utility systems, medical assistance and response, and transportation for goods and fuel delivery.

The plan provides a summary of recent economic history and current status of the CNMI. A goal of mitigation is to reduce disruption to local and regional economies and the amount of

public and private funds spent to assist with recovery. The plan provides as assessment of economically important assets and critical facilities with related community vulnerability assessments. The plan provides loss estimates and replacement costs for various types of hazards. Measures to improve the resiliency of the built environment support economic development.

The plan provides a comprehensive summary of existing critical and important infrastructure in the CNMI. Several mitigation actions are recommended to reduce impacts from typhoons, flooding, earthquakes, and tsunamis and to improve infrastructure pre-disaster resiliency and post-disaster recovery potential. Measures also include new regulatory provisions to improve structural integrity and safety of infrastructure.

The SSMP was developed in accordance with the regulatory requirements of Public Law 106-390 (Disaster Mitigation Act of 2000), Public Law 93-288, as amended (Robert T. Stafford Disaster Relief and Emergency Assistance Act), and the Interim Final Rule, 44 CFR Parts 201 & 206, and inclusion of appropriate updated information and data available.

As stated in 44 CFR Parts 201 and 206, the purpose of updating this document is to demonstrate the CNMI's goals, priorities, and commitment to reduce risks from natural hazards and to serve as a guide for state and local decision makers when they commit resources to reduce the potential impact of these identified hazards. This plan must be approved by the Federal Emergency Management Agency (FEMA) for the CNMI to be eligible to receive Hazard Mitigation Grant Program (HMGP) funding and other types of disaster assistance under the Stafford Act.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 56

Citation: Island Training Solutions. (2011). *Rural business enterprise grant economic restoration project & report: Findings and recommendations* (pp. 19). Saipan, MP: CNMI Department of Commerce and US Department of Agriculture.

Abstract: This report provides a discussion of the change in CNMI economic and business climate conditions between the 2009 and 2011. In 2008, the CNMI Department of Commerce developed a Comprehensive Economic Development Strategy (CEDS). In 2009, an Economic Restoration Summit (ERS) targeted Agriculture, Aquaculture, Education/Educational Tourism, and Call/Data Centers as industries for development to aid in supplementing the CNMI's sole economic driver of tourism. While the 2009 ERS report provided information and recommendations towards economic development, it provided minimal comparative examples of implementation measures taken in similar economic conditions. Many of the recommendations made in the 2009 Summit failed to recognize the fiscal constraints on the CNMI, as well as intricate details on the implementation of particular policies which would yield positive economic impact to the islands. In 2010, a grant was secured to aid in funding the 2011 ERS. This report includes a background of each targeted industry, discussion on reports presented during the 2011 ERS, and findings and recommendations associated with each industry.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This report directly supports economic and infrastructure development. The report recommends that the public and CNMI government agencies be aware of CNMI's Capital Improvement Projects to understand planned infrastructure which may either support or hinder the development of a particular industry. The report also supports land-use planning by examining lands available to develop these industries, especially agriculture and aquaculture.

The report does not support resiliency or recovery planning.

The 2011 ERS findings state that aquaculture, eco-tourism and educational-tourism present the greatest potential to expand CNMI's economic base. The report notes that the requirements of development must be carefully crafted and executed to develop an environment that encourages public and private investment into these industries.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 57

Citation: CNMI Homeland Security and Emergency Management. (2014). *Standard State Mitigation Plan, Commonwealth of the Northern Mariana Islands, October 2014* (pp. 434). Saipan, MP: CNMI Homeland Security and Emergency Management, Office of the Governor.

Abstract: The 2014 CNMI SSMP is an update to the Commonwealth's 2010 plan. For the update, information and sections from the 2010 SSMP remained largely unchanged in the 2014 SSMP, reflecting little change in the CNMI's key identified threats and hazards but also highlighting planning deficiencies experienced throughout the update, including limited time and resources common among small government agencies. Key updates to the 2014 SSMP include: 1) addition of climate change as a new hazard; 2) described new planning bodies involved in the 2014 SSMP update; 3) inclusion of new Mitigation Actions; 4) revision/update of Facilities Assessment Matrix; and 5) inclusion of recent CNMI demographics and statistical data. The CNMI, through preparedness funding available to Homeland Security and Emergency Management (HSEM), will perform a more thorough, comprehensive update to the SSMP within the 5 year planning cycle.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This plan directly supports all areas of SSG planning and development.

Per the authors, very little changed between the 2010 SSMP and the 2014 SSMP update. Major changes to the 2014 document are included in Table 3-2 (pp. 22-24). Therefore, the SSG planning and development analysis for the 2010 SSMP remains valid.

However, the 2014 SSMP update address climate change and associated hazards in Chapter 5. The document incorporates *Climate Change Vulnerability Assessment for the Island of Saipan* (Green and Skeele, 2014) and provides a thorough analysis of potential sea level rise and marine inundation. Additionally, the plan briefly addresses the importance of adaptation planning to mitigate for future anticipated hazards to coastal infrastructure, properties, beach resorts, and low-lying development.

The purpose of the CNMI Disaster Mitigation Planning Process (DMPP) is to provide an organized and coordinated consistent set of goals for reducing or minimizing the loss of human life and property, major economic disruption, degradation of ecosystems and critical habitats, and the destruction of cultural and historical resources from natural disasters. The DMPP process is to be the basis for intergovernmental coordination related to natural hazard mitigation at the state and local municipal levels. The identified goals of the planning process for disaster mitigation in the CNMI include the following: 1) to promote sustainable development by reducing the vulnerability to natural hazards in existing and planned

development; 2) to improve public awareness and decision making for land use planning by accurately mapping hazard-prone areas; 3) to improve hazard risk management by the insurance industry and to help maintain adequate protection against any catastrophe for the region; and 4) to promote community-based disaster preparedness and prevention activities with support from both the public and private sector.

At the highest level, the hazard mitigation goals of the CNMI are to: 1) save lives and minimize injuries against all hazards, but recognizing that the CNMI is most vulnerable to impacts from typhoons and tropical storms; 2) reduce potential damages to public and private property; 3) reduce adverse impacts on the environment and natural resources; and 4) reduce financial burden on the community, businesses and government

For comparison against SSG planning and development principles and for quick reference, the recommended comprehensive hazard mitigation objectives for the CNMI are included below.

Objective 1: Secure, strengthen, and maintain essential government facilities, identified lifeline utility systems and access for emergency medical assistance and response, and transportation systems to ensure the delivery of necessity goods and fuel.

Objective 2: Review and improve polices and enforcement of building standards and codes, particularly the IBC, UFC, and NFIP requirements.

Objective 3: Improve inter-agency and inter-island coordination and communication.

Objective 4: Participate in public awareness and education activities that improve implementation of the strategy and in activities promoted by the CNMI HSEM and preparedness partners at all sectors and levels of government.

Objective 5: Address post-disaster pollution control.

Objective 6: Improve fresh water resources.

Objective 7: Ensure that adequate shelter is available to all residents and visitors.

Objective 8: Build and maintain geographic information system and data to improve upon existing risk assessment data.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 58

Citation: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management. (2015b). *DCRM permitting in the CNMI* (pp. 2). Saipan, MP: Bureau of Environmental and Coastal Quality, Division of Coastal Resources Management.

Abstract: Permits are required for development activities with Areas of Particular Concern (APC) as delineated by the Division of Coastal Resources Management (DCRM). DCRM issues three types of permits: 1) temporary permit for emergency repairs; 2) APC permit for all non-major developments within or that may adversely impact an APC; and 3) major siting permit for all major developments, uses, or activities that may cause significant adverse impacts to coastal resources.

CNMI SSG Planning and Development:

Supports	**Deficient**
Land-use Planning	
Resiliency Planning	
Recovery Planning	
Economic Development	
Infrastructure Development	

Synthesis: This brochure directly supports land-use planning and infrastructure development by outlining permit requirements and the application process. Although the brochure does not address resiliency and recovery planning and economic development, the DCRM permitting process directly supports these SSG planning and development areas.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 59

Citation: Northern Marianas Housing Corporation. (2015). *5 Year Consolidated Plan (2015 -2019) for the CNMI community planning development programs* (No. OMB Control No: 2506-0117) (pp. 218). Saipan, MP: Northern Marianas Housing Corporation.

Abstract: This plan complies with statutory planning requirements for programs funded through the US Department of Housing and Urban Development (HUD). The CNMI Housing Corporation is responsible to administer all HUD-funded programs in CNMI including the Consolidated Plan process and the use of Community Development Block Grant (CDBG), HOME Investment Partnerships Grant (HOME), and Emergency Solutions Grant (ESG) funds. These programs address priority needs and goals for housing, services, and public facilities that serve low- and moderate-income populations. Goals in the plan aim to improve the quality of life through economic development projects, public facilities, energy efficient projects, and recreational facilities.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This plan supports land-use planning and economic and infrastructure development. Although land-use planning is not a primary focus of the plan, the SSG planning area is indirectly supported via discussions regarding various HUD-funded programs and locations of housing assistance programs, homeless shelters, and the application of building codes to homes.

The status of the CNMI housing markets and economy are provided to set the context for recommending economic development measures. For example, the plan summarizes outcomes from the CNMI Economic Restoration Summit that identified four specific industries for future development: 1) Agriculture; 2) Aquaculture, 3) Education; and 4) Data/call centers. Other measures for economic development are also included in the plan. The plan allocates CDBG non-housing community development funds ($922,384) for up to two economic development projects within five years (2015-2019).

The CNMI identified the need to improve infrastructure such as street lighting, rehabilitation of water reservoirs, road repairs, and erosion management. These problems directly affect village residents and pose health and safety hazards, and Capital Improvement Project funding is deemed insufficient to address the problems given the condition of existing infrastructure. In addition, economic development may pose a stress on existing infrastructure such as power, water, sewer, roads, hospitals, airports, and schools. The plan allocates CDBG non-housing community development funds ($922,384) for infrastructure improvements.

The plan does not address resiliency or recovery planning for housing or facilities improvements. Discussion about climate change and adaptive planning are also missing.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 60

Citation: CNMI Department of Public Lands. (n.d.). *Annual report 2017* (pp. 40). Saipan, MP: CNMI Department of Public Lands.

Abstract: This annual report documents act6ivities by Department of Public Lands (DPL) including the Homestead Division, Land Claims Division, Planning Division, Real Estate Division, Compliance Division, Accounting Division, and Administrative Division.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: The DPL annual report supports land-use planning and economic and infrastructure development. The report highlights significant DPL accomplishments for 2017 including administrating the Homestead program, collecting fees for use of public lands, executing various types of contracts including the development of telecommunications infrastructure. A contract was awarded to update the Public Lands Master Plan, which will have significant influence on SSG planning and development areas for the future.

Although resiliency and recovery planning are supported via regulations and zoning laws, this report does not address these SSG planning areas. The timing may be right to incorporate principles of SSG and climate change adaptive planning to the pending update of the Public Lands Master Plan.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 61

Citation: Horwath HTL. (2017). *Tourism development in the US Commonwealth of the Northern Mariana Islands* (pp. 45). Saipan, MP: Mariana Visitors Authority.

Abstract: This study reviews tourism development in the CNMI, identifies and analyzes key issues, examines best management practices used in other resort destinations, and offers recommendations. Recommendations are categorized into short-term urgent actions and long-term actions to promote sustainable tourism development.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This plan supports land use planning and economic and infrastructure development. The plan offers recommendations for types and locations of developments to improve visitor experience and to sustain tourism development. The plan makes many recommendations for improving many aspects of CNMI's infrastructure to support economic and tourism development.

This plan does not support resiliency or recovery planning. However, ensuring that infrastructure is designed and constructed with resiliency and recovery principles will potentially reduce impacts to the tourism industry.

The tourism industry has experienced a revitalization since 2014 with strong surges in demand from the Chinese and Korean markets. Accompanying the boom in demand, hotel performances as well as general tourism spending improved significantly, translating to more a prosperous economic environment. At the same time, the CNMI welcomed a large number of Chinese investors, particularly after the issuance of the casino license to Imperial Pacific International Holdings Limited from China. However, this growth was accompanied by several issues of concern, including: 1) inadequate infrastructure negatively affecting some visitor experiences; 2) hotels operating at near or over capacity and products need refurbishment; 3) an increase in organized crime and drugs; 4) inflated employment terms; 5) proposed hotel development demands may exceed CNMI's resource base; 6) proposed development strains infrastructure including public utilities; and 7) an insufficient work force.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 62

Citation: Commonwealth Economic Development Strategic Planning Commission. (n.d.). *2016-2021 Comprehensive economic development strategy* (pp. 41). Saipan, MP: CNMI Department of Commerce.

Abstract: The CNMI Department of Commerce developed the 2016-2021 Comprehensive Economic Development Strategy (CEDS). The purpose of the CEDS is to develop a comprehensive economic planning document which considers the jurisdictions of human, physical and natural assets towards an integrated economic plan for a five (5) year forward looking period. The CEDS document is contemplated through a collaborative effort between the public and private sectors, governed through a CEDS Commission which is intended to consider all aspects of the CNMI's economic planning.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Recovery Planning
Resiliency Planning	
Economic Development	
Infrastructure Development	

Synthesis: This strategic plan directly supports economic and infrastructure development. The plan emphasizes the relationship between economic activity and health with functional and adequate infrastructure. Investing in structural infrastructure is necessary to support economic development. The plan evaluates and prioritizes 33 infrastructure and economic development projects to guide planning efforts until 2021.

The plan does not directly assess land-use or resiliency planning, but information in the plan supports these SSG planning areas. Although not overtly mentioned in the plan, economic development is linked to zoning laws and regulations that support compatible development and help to encourage new economic investment and to enhance property values. Also, some proposed projects will improve infrastructure resilience such as subsurface powerlines. However, purpose-designed infrastructure resiliency is lacking from most project descriptions.

Recovery planning is not supported by this plan.

The 2016-2021 CEDS provides updated information regarding CNMI's economy including impacts from the Casino Law and the US Public Law 110-229 which phases out the CNMI's non-resident labor pool. The CEDS discusses economic synergies, labor dynamics, and the impacts from military buildup. A Strengths, Weakness, Opportunities, and Threats (SWOT) analysis is provided. Project proposals were solicited from CNMI agencies and the public. To ensure objectivity in project ranking, the CEDS commission developed a systematic approach which considered the overall impact of the project to the community. The evaluation criteria were premised on elements of the SWOT analysis, but also assessed cost-benefit of the project and its contribution to the overall economic development of the CNMI.

DISCOVERED DOCUMENT SUMMARY for CNMI SSG

Document 63

Citation: Commonwealth Zoning Board. (n.d.). *The Commonwealth Zoning Board FY 2014 annual report* (pp. 23). Saipan, MP: Commonwealth Zoning Board.

Abstract: This annual report highlights the operations and achievements of the Saipan Zoning Office, its permitting and enforcement activities, its challenges, as well as future goals to assist Saipan's economy through improved and organized developments.

CNMI SSG Planning and Development:

Supports	Deficient
Land-use Planning	Resiliency Planning
Economic Development	Recovery Planning
Infrastructure Development	

Synthesis: This annual report directly supports land-use planning and economic and infrastructure development. The zoning laws and permit requirements work in coordination to ensure land-use planning is implemented to support compatible development within appropriate zoning districts, to enhance property values, and to encourage new economic investment. Although dated, the annual report summarizes permitting activity for 2014 and shows an increase over the pervious six years in permits issued for commercial developments. The report also highlights many challenges with enforcement.

The report does not directly address resiliency or recovery planning.

The Zoning Office administers the mandates of the Board relative to Saipan's land use planning and the Zoning Law of 2013. This is done through the provision of services to commercial and residential developers, property owners, and the business community. Helping people understand the often complex land use regulations and permitting process is essential. This is accomplished through various public out-reach and village meetings conducted by the Zoning Office staff to continuously educate the public about the Zoning Law and regulations.

APPENDIX E – WORKSHOP PROCEEDINGS

Proceedings from *Smart, Safe Growth* Workshops, Saipan, 17-19 July 2018

Members from the principal CNMI planning, regulatory, and infrastructure authorities attended three days of stakeholder participation on Saipan to discuss Smart, Safe Growth strategies as a means to guide Commonwealth economic growth over the next 20 years. Daily agendas and participation lists are provided herein. Workshops were deemed the most productive and effective approach to finalize the framework of the *Guidance Manual*, to ensure project alignment with local government vision, needs, and programs.

During workshops it was presented that the intent of Smart, Safe Growth strategic applications is to provide a common framework for planning and regulatory thought among CNMI authorities. It was further presented that SSG in general, the core principles, and the *Guidance Manual* are not intended as regulatory documents. Emphasis for this *SSG* project remained on "guidance" and "tools" to help steer (rather than specifically regulate) planning and economic growth.
Attendees were universally supportive of Smart, Safe Growth (*SSG*) Principles and the *Guidance Manual*. All acknowledged that the *Guidance Manual* will foster forward thinking and promote alignment among CNMI agencies that have over-lapping jurisdictions in planning and review/approval of economic development initiatives.

"*Development*" was discussed in the major categories of *Master Planning*, *Public Infrastructure*, and *Commercial/Residential*. It was universally acknowledged among attendees that SSG Principles and the *Guidance Manual* are applicable across all development categories.

Participants were strongly in favor of the Regulations Review (Appendix A), and of revisions to strengthen regulations for application of SSG Principles to benefit regulatory due process to influence *Smart, Safe Growth* in the CNMI.

Figure E.1 Smart, Safe Growth Workshop at the CNMI BECQ, July 2018.

Participants were in universal accord that CNMI government planning and regulatory authorities must play the primary role to guide economic growth over the next 20 years. This was expressed in contrast to prevailing circumstances of market-driven growth.

The newly-formed Office of Planning and Development (OPD) was acknowledged as the flagship agency that will promote cohesion and solidarity among CNMI authorities for the implementation of SSG Principles for economic expansion. It was further acknowledged that OPD and other CNMI agencies with regulatory and

planning authority must have the support of the Governor and Legislature if healthy and sustainable economic growth is to be achieved in the CNMI.

Representatives of OPD indicated that the new office is charged with preparation of the *Comprehensive Sustainable Development Plan* as a priority mandate. The OPD Director acknowledged that Master Planning and all agency-specific planning initiatives will benefit from incorporation of SSG Principles. It was suggested that OPD become the approval authority for all agency-specific planning documents as well as Master Planning initiatives.

Among attendees, it was acknowledged across the board that the prevailing planning and regulatory operational scheme in the CNMI is generally reactive to market-driven development pressure and that this must shift to agency-driven, top-down control. This issue was especially important to the utility provider, Commonwealth Utilities Corporation, whose representatives expressed that demands for utility services are driven by market forces, not planning for achievable future availability of infrastructure.

Among regulatory representatives it was indicated that developers are receptive to improved planning and development principles that may require increased initial capital costs but that result in savings over the long-term. However, it was noted that when clear government guidance at early stages of project review is lacking, developers mostly proceed independently, and later there is disinclination to change major project aspects when government imposes additional and unforeseen requirements.

Figure E.2 Abandoned buildings remain unutilized and new construction continues to consume limited open space.

Numerous practical actions to implement SSG Principles in the near-term, to guide economic growth, were presented by attendees. These suggestions took the general form of proposed elements for the *Guidance Manual*. Notable contributions were:

- Provide a flow-chart of how and where SSG Principles would be incorporated into government due process;
- All planning and regulatory agencies must utilize a common GIS database and software application - this will facilitate consistency and reliability of information among all parties;
- OPD was suggested as steward of the GIS database;

- An official CNMI government-selected climate change scenario for sea-level rise is essential;

Figure E.3 Coastal erosion and sea-level rise pose challenges to the existing built environment and to future coastal development.

- The CNMI Climate Change Working Group must be re-established and should be organized under the Office of Planning and Development;

- NOAA has recently published an update on sea-level rise trends (2017);

- Areas of Particular Concern (APCs) coastal flooding hazards that are presently defined by FEMA must be re-defined and setbacks re-adjusted in accordance with the official CNMI government climate change scenario for sea-level rise;

- Funding was universally expressed as a concern among attendees - inconsistency in funding levels, timing, and continuity across fiscal years impedes agencies' ability to maintain consistent agency function for program delivery.

Many representatives discussed practices of SSG currently in place, or awareness of hazards that should be addressed according to SSG Principles. Notable contributions included:

- DPW is updating the CNMI Building Code using IBC 2012 as a basis, tailored for the CNMI;

- CUC currently applies "hardening" in infrastructure planning for the most sensitive areas, including concrete *vs* wooden utility poles, underground utilities to new well sites, concrete water storage tanks *vs* steel tanks, and back-up power capabilities for critical infrastructure;

Figure E.4 Seawall protects the shoreline and provides open, recreation space.

- HSEM expressed concern regarding shoreline development and the consequences of limited evacuation routes due to limited roadway infrastructure, especially for schools located in shoreline areas;

- CHCC indicated that back-up power is available and also that water is available, but private clinics have neither so that CHCC has a greatly increased patient load during emergency situations.

The proposed SSG Checklist (Appendix D), to be used to gauge a proposal, planning document, or project conformance with SSG principles, was universally supported by workshop attendees. Many comments/suggestions for improved checklist usability were beyond the scope of services for this SSG project, but were proposed as agency-specific enhancements at a later date:

- Include list of government agencies relevant to each specific criteria so that planners and permit applicants know where to seek guidance and answers;
- Provide drop-down menus that indicate applicable regulations for each particular criteria or concern;
- Provide a hyper-link "*App*" to a centralized source that includes checklist reviews in process and completed checklists;
- Weighted and scored criteria so that higher ratings (greater conformance to SSG Principles) receive greater incentives;
- Recommendations for inclusion of cumulative impacts;
- Provide checklist to project proponents at earliest stages of project development, so that the context and focus of regulatory review will be made known. For distribution to developers, eliminate the column of "*Yes*", "*No*", "*N/A*", so that proponents cannot self-determine applicability of criteria.
- Follow-on training workshop(s) on use of SSG Checklist and *Guidance Manual*.

Figure E.5 Smart, Safe Growth workshop at the CNMI CUC, July 2018.

Workshops were well attended each day for the 08:00-11:30 morning interactive sessions. Afternoons were used for agency-specific meetings which typically concluded by 16:00.

APPENDIX F - GLOSSARY

Adaptive Management: A systematic decision process that promotes flexible decision-making that can be adjusted in the face of uncertainties as outcomes from management actions and other events or trends become better understood.

Aquifer: An underground layer of water-bearing permeable rock, rock fractures, or consolidated materials (gravel, sand, or silt) that contains or transmits groundwater.

Best Management Practice (BMP): Methods or techniques found to be the most effective and practical means in achieving an objective (such as preventing pollution) while making optimum use of resources.

Climate Change: A change in global or regional climate patterns, in particular a change apparent from the mid-late 20th century onwards and attributed largely to the increased levels of atmospheric greenhouse gases produced by the use of fossil fuels.

Climate Change Adaptation: A broad range of human policies and activities primarily intended to reduce the risks (realized and expected) posed by accelerated changes in climate.

Climate Change Scenario: A scenario is a coherent, internally consistent and plausible description of a possible future state of the world. It is not a forecast; rather, each scenario is one alternative image of how the future can unfold. A set of scenarios is often adopted to reflect, as well as possible, the range of uncertainty in projections.

Ecosystem: The complex of living organisms, their physical environment, and all their interrelationships in a particular unit of space.

Ecosystem Services: Benefits people obtain from ecosystems. These include: provisioning services such as food and water; regulating services such as moderation of floods, drought, land degradation, and disease; supporting services such as soil formation and nutrient cycling; and cultural services such as recreational, spiritual, religious, and other non-material benefits.

El Nino-Southern Oscillation (ENSO): An extended interaction between the trade winds flow and ocean currents in the tropical Pacific that results in a somewhat periodic variation between below-normal and above-normal sea surface temperatures and dry and wet conditions over the course of a few years.

Energy Star: A program managed by the US Environmental Protection Agency and US Department of Energy that provides certification to buildings and consumer products which meet certain standards of energy efficiency. Energy Star provides simple, credible, and unbiased information that consumers and businesses rely on to make well-informed decisions to save money and reduce emissions.

Extreme Weather: Weather phenomena that are at the extremes of historical occurrence and are rare for a particular place or time; especially severe or unseasonal weather.

Geographic Information System (GIS): A relational database capable of sharing and using data describing places on the earth's surface. It is the combination of computer hardware, software, personnel and procedures capable of capturing, storing, manipulating, analyzing and displaying geographically referenced data in layers. These layers may express information such as roads, soils, land use parcels, utilities, zoning, etc.

Green Infrastructure: A cost-effective resilient approach to managing wet weather impacts. Green infrastructure uses vegetation, soils, and other elements and practices to reduce and treat stormwater at its source and restore some of the natural processes required to manage water while delivering environmental, social, and economic benefits.

Greenhouse Gas: Various gaseous compounds such as carbon dioxide and methane that absorb infrared radiation, trap heat in the atmosphere, and contribute to heating of the earth (the greenhouse effect).

Hardening (shoreline): Installation of engineered vertical structures such as seawalls, sloped riprap (e.g., rocks) revetments, groins, jetties or breakwaters along a shoreline to stabilize soil and sediment and prevent erosion.

Hardening (infrastructure): Enhancing the physical strength and structural integrity of infrastructure to make it less susceptible to damage from extreme wind, flooding, earth movement or flying debris.

Hazard Mitigation: Any sustained action taken to reduce or eliminate the long-term risk to life and property from hazard events. It is an on-going process that occurs before, during, and after disasters and serves to break the cycle of damage and repair in hazardous areas.

Infrastructure: The basic physical and organizational structures and facilities needed for the operation of a society or enterprise. These include buildings, roads, bridges, power, water and wastewater systems, airports and harbors.

Leadership in Energy and Environmental Design (LEED): An internationally recognized green building certification system run by the US Green Building Council that provides third-party verification that a building or community was designed and built using strategies aimed at improving performance across all metrics that matter most: energy savings, water efficiency, CO_2 emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts. LEED provides building owners and operators a concise framework for identifying and implementing practical and measurable building design, construction, operations and maintenance solutions.

Natural Hazard: Naturally occurring physical phenomena caused by either rapid or slow onset events which might have a negative effect on humans or the environment. Hazard events can be geophysical (earthquakes, landslides, tsunamis, volcanic activity), hydrological (droughts and floods), meteorological (extreme temperatures, typhoons, storms/wave surges), or biological (disease, infection, infestation and invasive species).

Natural Protective Feature: Features of the natural environment, such as beaches, reefs, forests, wetlands, that provide some protective function to the natural and built environment from natural hazards. These features can attenuate energy (e.g., a reef dissipating wave run-up energy), capture excessive rainfall, and provide other ecosystem functions that buffer the natural and built environment from fluctuations in weather and other natural hazards.

No-regrets Strategies: Actions that can be implemented now that will yield an immediate short-term benefit and will likely have a long-term benefit under multiple climate scenarios without being certain about future climate conditions.

Permitting: Government regulatory function that provides an authoritative document (permit) granted for specific permissions for a proposed activity or service, following agency reviews and analyses in accordance with regulations and policies.

Renewable Energy: Energy produced from sources that are replaced rapidly by a natural process on a human timescale. The most common examples include wind, solar, geothermal, biomass and hydropower. This is in contrast to non-renewable sources such as fossil fuels.

Retreat/Relocate: The progressive abandonment of a location and the move to a new location, over time, especially with reference to infrastructure.

Retrofit: Installation of upgrades to equipment or facilities after a period of use to improve safety or serviceability.

Safe Growth: A set of strategies and principles applied to communities over time aimed at reducing the vulnerability to risks posed by natural hazards.

Sea Level Rise (SLR): Long-term increase in mean sea level relative to a stable landmass due to climate change, as derived from coastal tide gauges.

Sea Level Change (SLC): Changes in mean sea level due to any variety or combination of short-term variability, extreme storm events, and long-term change.

Sea Surface Temperature (SST): Water temperature close to the ocean's surface. The exact meaning of surface varies according to the measurement method used, but is generally between 1 millimeter (0.04 in) and 20 meters (70 ft) below the sea surface.

Sea Surface Temperature, Mean: The arithmetic average temperature of the ocean surface at the global scale, for a specified depth range.

Sea Surface Temperature, Anomalies: Departures from average sea surface temperatures for any specified period, typically annual.

Smart Growth: A set of strategies and principles aimed at creating great communities with increased economic and social opportunities, a range of lifestyle choices and personal freedoms, good return on public investments, a thriving natural environment, which together lead to increased community health and well-being.

Smart Safe Growth (SSG): A set of development and conservation strategies to improve communities, strengthen economies, protect the natural environment, and improve resilience and recoverability of the built environment. The complementary outcome of smart growth and safe growth.

Stormwater: Surface water generated from precipitation events that flows over land or impervious surfaces such as paved streets, parking lots, and building rooftops, and does not soak into the ground, but runs down-slope in drainage ways, stream channels or pipes

Recovery: The amount of time and resources required following a disaster to repair damage to the built environment and to restore essential services and community function.

Resilience: The amount of stress the built environment can withstand before something breaks (i.e., how far can it bend). A resilient built environment can withstand current and future weather events with minimal or no damage.

Vulnerability: The degree to which a resource, asset or process is susceptible to adverse effects of natural disasters, including vulnerability to changes in climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed; sensitivity and adaptive capacity (IPCC 2014).

Watershed: A discrete area of land defined by a ridge line (divide) that channels rainfall to streams, rivers or drainage infrastructure and eventually to outflow points such as reservoirs, bays and the ocean.

Wastewater: Water affected by human use from any combination of domestic, industrial, commercial, or agricultural activities. A byproduct of domestic, industrial, commercial or agricultural activities.

Wetland: Areas of land saturated with water. Areas where water covers the soil, or is present either near the surface of the soil all year or for varying periods of time during the year, including the growing season.

Zoning: Legislative process that divides land areas into different zones (such as residential, commercial, industrial, agricultural) according to specified uses. Each zone is regulated as to density, location, size, type of buildings, and activities permitted therein.