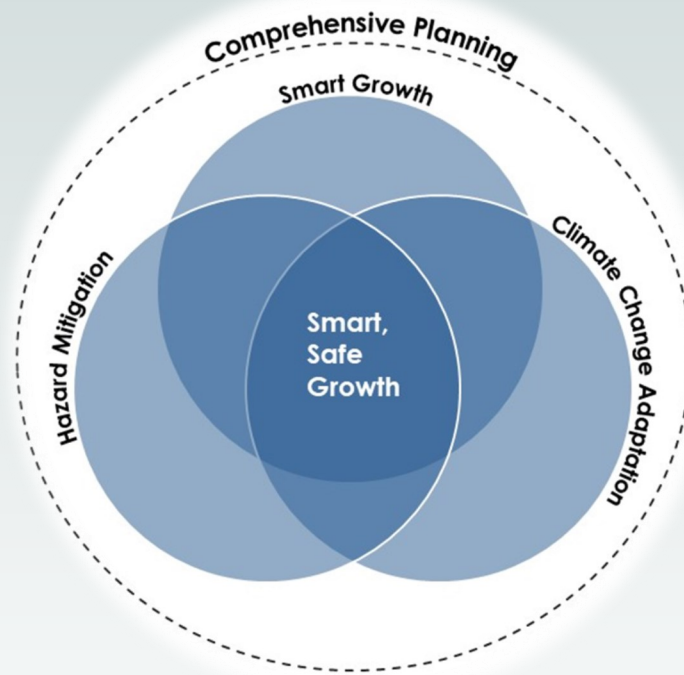


Advancing the Doctrine and Practice of **Smart, Safe Growth** in the CNMI Final Summary Report



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FOREWORD

As we enter the third decade of the new millennium it is not rational 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 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 with increased frequency. Costs to communities and governments continue to soar as wildfires, tropical cyclones, droughts and floods occur with ever-increasing frequency and magnitude. Observed impacts and risks of future loss and damage of property and economic opportunity as well as impacts to society and the environment are 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 homes, businesses, and infrastructure on Saipan just three years earlier. The rapid succession of two major typhoon events has been debilitating to socio-economic well-being in the Marianas. *Yutu* and *Soudelor* are harsh reminders of the importance of planning and constructing for resiliency and recovery among the small islands and small economies of the tropical Pacific.

In the conventional cycle of disaster-recovery-repeated damage, 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 cycle. 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. The 2018 *Guidance Manual for Smart, Safe Growth* provided a point of departure from the prevailing planning and regulatory practices of Pacific Islands governments. The intent of this current work is to implement the US EPA and FEMA interagency agreement of 25 September 2019 to further usher in a new era of thought and initiative among the Pacific Islands Countries, Territories, and the Commonwealth of the Northern Mariana Islands for a sustainable approach to natural disaster preparation, response, and recovery.

ACKNOWLEDGEMENTS

Preparation of this *Smart Safe Growth and Yutu Recovery Assistance Final Report* for 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 9 Pacific Islands Office via Order No. 68HERH20P0065. Many thanks are extended to the many interested and engaged members from the CNMI government agencies who participated throughout the work and attended the on-site workshops to establish the framework for how “guidance” will be useful to regulatory and planning officials. Technical and editorial commentary were provided by Director Kodep Ogumoro-Uludong and Lead Planner Erin Derrington of the Office of Planning and Development, as well as Benjamin Johanson of FEMA. Ms. Derrington’s comments were particularly comprehensive, in-depth, and insightful. The collective effort of these attentive reviewers and those from US EPA staff added greatly to the quality of this work. Michelle Baker of the Region 9 Land, Chemicals & Redevelopment Division is credited with overall project success, exercising her leadership and managerial duties throughout with dedication and competence.

TABLE OF CONTENTS

1.0 INTRODUCTION & BACKGROUND	1
2.0 SMART, SAFE GROWTH	3
3.0 HIGHLIGHTS OF PROJECT TASKS	8
3.1 Task 1 – Project Initiation	8
3.2 Task 2 – Develop and Deliver SSG Training to Local Agency Personnel	8
3.3 Task 3 – Assist with Incorporating SSG Principles into Long-term Recovery Planning and the Comprehensive Sustainable Development Plan	12
3.4 Task 4 – Develop Project Evaluation Tool Based on SSG Principles	26
3.5 Task 5 – Develop and Deliver Final Report	29
4.0 COMPLETED & RECOMMENDED SSG IMPLEMENTATION ACTIONS	29
4.1 Completed Actions (2018 – 2022)	30
4.2 Recommended Near-Term (1-3 years) Actions	33
4.3 Recommended Medium-Term (4-6 years) Actions	37
4.4 Recommended Long-Term (7-10 years) Actions	41
5.0 CASE STUDIES; POLICIES, STRATEGIES, ACTIONS, AND INNOVATIVE INCENTIVES IMPLEMENTED TO ADVANCE SSG	42
5.1 Policy-based Initiatives	43
5.2 Strategy-based Initiatives	45
5.3 Action-based Initiatives	46
5.4 Innovative Incentives-based Initiatives	48
6.0 CONCLUDING REMARKS	49

ACRONYMS

AGOL	ArcGIS Online
APC	Area of Particular Concern
BECQ	Bureau of Environmental and Coastal Quality
BMPs	Best Management Practices
CAP	Conservation Action Plan
CCWG	Climate Change Working Group
CDBG-DR	Community Development Block Grant – Disaster Recovery
CDBG-MIT	Community Development Block Grant – Mitigation
CEDS	Comprehensive Economic Development Strategy
CNMI	Commonwealth of the Northern Mariana Islands
CSDP	Comprehensive Sustainable Development Plan
DPL	Department of Public Land
DPW	Department of Public Works
EDA	Economic Development Administration
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
GMP	Green Mountain Power
GPO	GeoPlatform Online
HUD	US Department of Housing and Urban Development
IAP	Initial Action Plan
IBC	International Building Code
IRP	Infrastructure and Recovery Program
MAT	FEMA Mitigation Assessment Team
NES	Nimbus Environmental Services
NIBS	National Institute for Building Sciences
NOAA	National Oceanic and Atmospheric Administration
OPD	Office of Planning and Development
PDAC	Planning and Development Advisory Council
PR&G	Principles, Requirements, and Guidelines
RWG	Resilience Working group
SAGE	Systems Approach to Geomorphic Engineering
SDG	Sustainable Development Goal
SE/DRR TF	Socio-economic/Disaster Risk Reduction Task Force
SLR/SLC	Sea Level Rise/Sea Level Change
SLR50_ONDTY	Sea Level Rise 50 Years – October, November, December, Typhoon Year
SOW	Scope of Work
SSG	Smart, Safe Growth
SSMP	Standard State Mitigation Plan
TWMP	Talakhaya Watershed Management Plan
US EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
WA	Watershed Assessment

1.0 INTRODUCTION & BACKGROUND

Natural hazards pose significant risks to socio-economic advancement as communities develop and grow. Frequency of disaster events caused by extreme weather and other conditions related to climate change is steadily increasing, with increasing loss and recovery costs. State and local governments must now respond to increased number and severity of natural hazards such as severe storm events, extreme precipitation, wave inundation, extreme heat, drought, and wildfires. These events threaten life and property and cause billions of dollars in damage each year.

The National Oceanic and Atmospheric Administration National Centers for Environmental Information reports that in 2021 damages from natural disasters cost the US Government an estimated \$145 billion, which was the third highest disaster-related costs since 2005 (Figure 1.1).

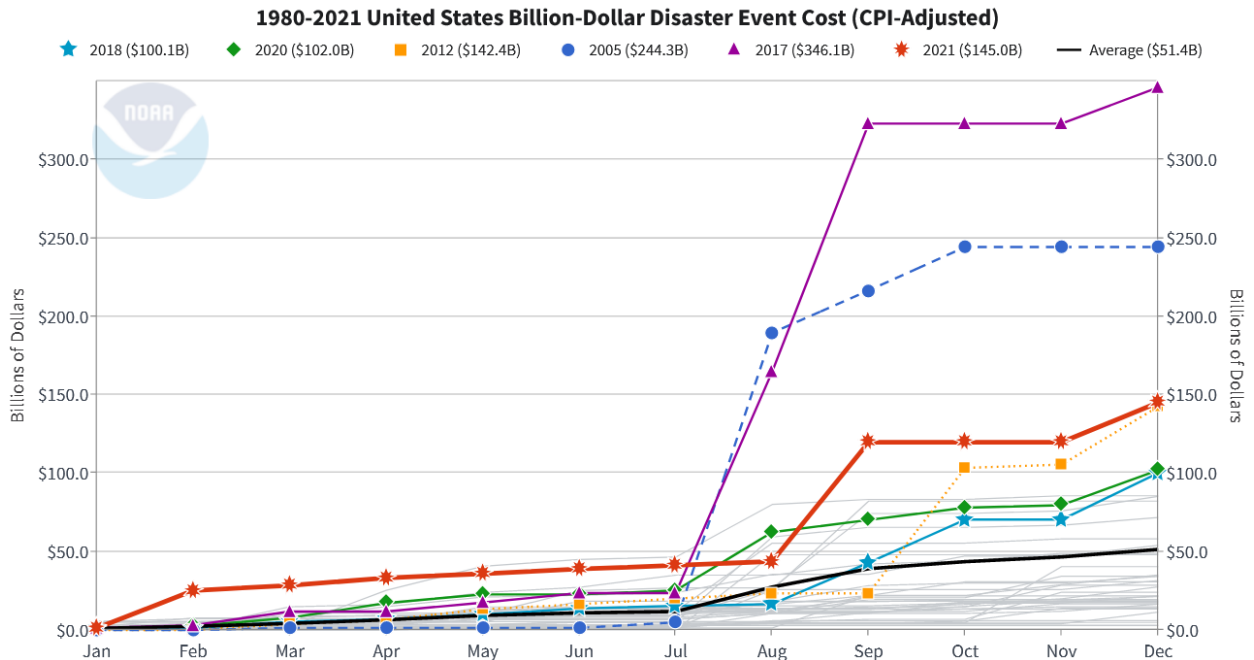


Figure 1.1 Month-by-month accumulation of estimated costs of each year's billion-dollar disasters, with colored lines showing 2021 (red) and the previous top-5 costliest years. (Source: NOAA Climate.gov 2022).

In 2015, damages caused by *Super Typhoon Soudelor* to Saipan communities was initially estimated at \$20 million¹; however, the costs of that disaster are difficult to fully capture. *Super Typhoon Soudelor* is estimated to have resulted in a \$9 million dollar deficit in fiscal year 2015².

¹ Makiene, J. (2015, August 5). In Wake of Typhoon Soudelor, Saipan gets U.S. aid; storm heads for Taiwan. *Los Angeles Times*. <https://www.latimes.com/world/asia/la-fg-typhoon-soudelor-saipan-taiwan-20150805-story.html#:~:text=Saipan%20and%20the%20islands%20of,number%20was%20expected%20to%20rise.>

² Chan, D. (2016, January 5). Soudelor triggered \$9M deficit in FY'15-report. <https://www.saipantribune.com/index.php/soudelor-triggered-9m-deficit-in-fy15-report/>

As of December 2020, the Federal Emergency Management Agency (FEMA) awarded just under \$60.5 million dollars for individual and public assistance following the disaster.

In 2018, before recovery from *Super Typhoon Soudelor* was complete, *Super Typhoon Yutu* again damaged communities in the Commonwealth of the Northern Mariana Islands (CNMI) causing an estimated \$800 million in damages³. As of December 2020, FEMA has awarded over \$325 million in individual and public assistance and over \$10 million in hazard mitigation assistance. 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.



Figure 1.2 Storm-damage to the power distribution system from *Super Typhoon Soudelor* (left) and wreckage from *Super Typhoon Yutu* (right).

Smart, Safe Growth (SSG) is an integrated and complementary set of development strategies focused on improving the resiliency and recoverability of the built environment. Through SSG, state and local governments work with stakeholders, including residents, community organizations, planners, recovery organizations, developers, and builders to develop communities and infrastructure that maximize public health and safety, provide economic opportunity and life-style choices, and that can withstand changes in climate and extreme weather events. Together, these outcomes reduce the burden of recovery on society and economies following a natural disaster.

In 2016, FEMA and US Environmental Protection Agency (US EPA) contracted Nimbus Environmental Services (NES) to work with local agencies to produce a *Guidance Manual for Smart, Safe Growth (Guidance Manual)* for the CNMI that introduced SSG and discussed adaptation measures, recommendations for government action, planning resources, regulatory

³ Perez, J. (2019, June 11). FEMA estimates \$135 M for NMI. *Saipantribune.com*.
<https://www.saipantribune.com/index.php/fema-estimates-135m-for-nmi/>

instruments, and tools to work towards SSG in communities of the Commonwealth of the Northern Mariana Islands (CNMI). In 2020, FEMA and US EPA continued to provide assistance to CNMI through a contract to NES entitled “EPA SSG and Typhoon Yutu Recovery Assistance for CNMI”. This *Final Report* details work completed under Task 5 of Contract 68HERH20P0065: “Develop and Deliver Final Report”.

This Task 5 *Final Report* and the *Guidance Manual* aim to assist the CNMI Government to evaluate planning and development initiatives for conformance with SSG Principles in a manner that is consistent and standardized. Information presented here can be integrated into regular CNMI government activities and policies such as updates to planning documents and regulations. This approach supports continued incremental change over the long-term and empowers CNMI communities to implement smart, safe growth.

Purpose and Use of this Final Report

The purpose of this *Final Report* is to document activities accomplished under Tasks 1–5 to support CNMI’s SSG implementation and long-term recovery planning. The CNMI’s 2021-2030 Comprehensive Sustainable Development Plan (CSDP), prepared by the Office of Planning and Development (OPD) in coordination with the Planning and Development Advisory Council (PDAC), identifies SSG as guiding standard for government planning. Today, government agencies often prepare planning documents independently of each other and within the context of their own agency mandate, although as of the publication of this report OPD and the PDAC, which includes the majority of regulatory agencies, have launched an online permitting system that aims to support a more streamlined and consistent approach to plan and project development and permitting. While SSG integration across agencies is ongoing, this *Final Report* documents initial efforts to increase useability and use of this guidance and the accompanying revised evaluation tool in planning and project implementation. The outcomes of this project provide a single focused reference for agency leaders on how SSG should be integrated within and among CNMI agencies activities.

Section 2 of this *Final Report* provides an introduction to SSG along with a list of key terminology, the SSG Principles, and SSG benefits. Section 3 describes the highlights of Project Tasks 1–5. Section 4 provides short-term, medium-term, and long-term recommendations, as well as actions completed over the past 5 years. Section 5 provides case studies/examples of strategies, actions, policies and innovative incentives implemented by other communities to advance SSG. Section 6 presents concluding remarks.

This *Final Report* is intended to serve as a future reference for CNMI agency staff, US EPA, and FEMA so the agencies can review and update efforts as needed to support conformance with SSG Principles into CNMI work culture in a consistent and standardized manner.

2.0 SMART, SAFE GROWTH

The SSG approach 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 the twelve SSG Principles into development-related policies and planning initiatives. 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 into planning and development documents through Comprehensive Planning.

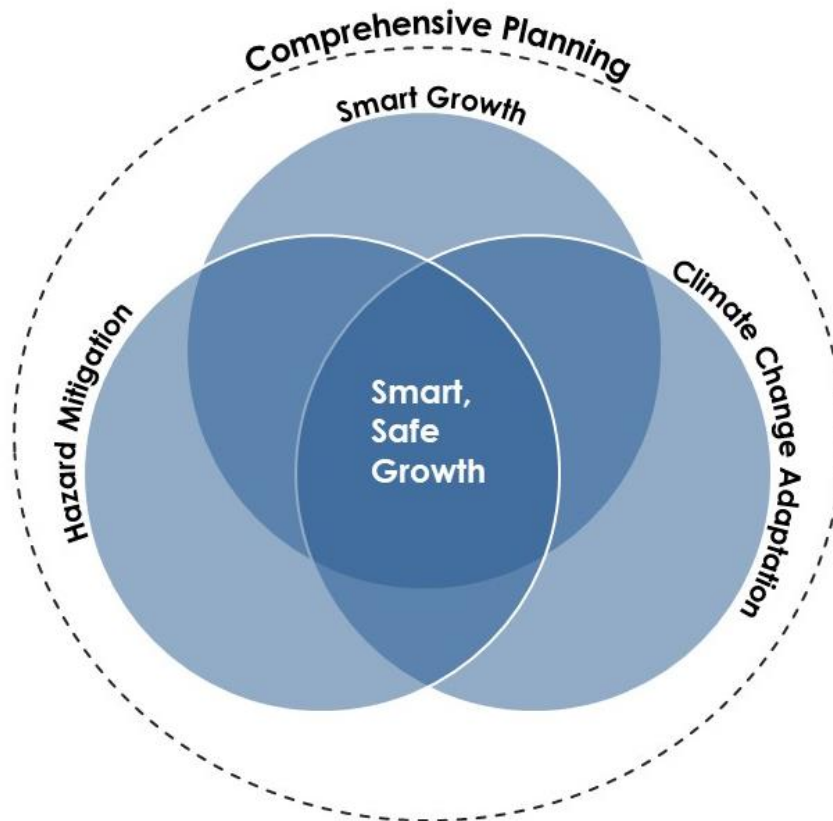


Figure 2.1 Smart, Safe Growth emerges from an overlap of strategies and practices.

SSG outcomes can be 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 (e.g., retrofitting existing structures and enhancing structural resilience for new construction) and non-structural solutions (e.g., land use measures to encourage development in least vulnerable areas and living shorelines).

Figure 2.1 graphically presents the emergence of Smart, Safe Growth through the complementary integration of a range of planning and implementation strategies. Comprehensive planning actions can drive the three pillars of SSG toward integration, to obtain a greater degree of SSG

effectiveness. Without comprehensive planning, the pillars of Hazard Mitigation, Smart Growth, and Climate Change Adaptation may be achieved in part independent of the others, but without integration among them SSG cannot be achieved.

Abridged List of Key Terminology

Many of the terms used in this *Final Report* are commonly used among several communities of practice, albeit with slightly varied interpretations. To help the users of this *Report*, an abridged list of key terms with definitions is provided here for convenience. The reader is also recommended to review the *Guidance Manual* (2018) for additional explanation of terminology.

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. Hazard Mitigation 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 unscathed or with minimal damage.

Recovery

The amount of time and resources required to repair damage to the built environment and to restore essential services, stable economic activity, and community function.

Smart Growth

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

Smart, Safe Growth

Smart, Safe Growth is a set of complementary 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 system sensitivity, adaptive capacity, and the character, magnitude, and rate of climate variation to which a system is exposed (Intergovernmental Panel on Climate Change 2014).

Smart, Safe Growth Principles

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.

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 “ <i>CNMI Sustainable Development Manual: Best Management Practices</i> ” 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.

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 socio-economic disruption. It is recognized that implementing SSG measures proactively may increase near-term costs. However, if planning, design, and construction practices today do not adjust for climate change, damages and recovery costs will eventually and rapidly outpace the cost of implementing SSG actions.



Source: FEMA 2018.

Although it is often difficult for fiscally-constrained governments to invest in long-term strategies, every dollar invested in mitigation activities today will save on future post-disaster recovery costs. The National Institute of Building Sciences (NIBS) reports in the *Natural Hazard Mitigation Saves: 2019 Report* that every \$1 of federal grant funds invested in hazard mitigation results in a \$6 national benefit. The NIBS also found that rebuilding to minimum requirements in building codes saves on average \$13 per \$1 spent on mitigation, while exceeding building code minimum requirements saves \$4 per \$1 spent. Additionally, FEMA's *Building Codes Save: A Nationwide*

Study estimates \$132 billion could be saved in property losses based on past and forecasted growth in the use of modern building codes from 2000–2040.

With this guidance in mind, 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 emergency response for fire safety, search and rescue, medical operations, disaster management, and other related services including disaster debris management, when planning and implementing impact mitigation and prevention measures. Also, when the built environment incurs less damage, business disruption and revenue loss are reduced, which facilitates the speed and effectiveness of community economic recovery.

In addition to helping 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. It also means less disaster debris is generated. Providing system redundancy for critical infrastructure and restoring 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 protection is critical to allow adequate water infiltration to recharge and maintain groundwater supplies for drinking and agriculture and to 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 landfills. In addition, investing in on-island capacity to manage disaster debris supports risk reduction and recovery efforts (e.g., composting facilities for trees, clean wood and food waste, and reuse and recycling infrastructure). When interconnected resiliency objectives are included in planning new development, and prioritizing its maintenance, and mitigation investments for existing structures, SSG Principles can support more sustainable development and the well-being of social, economic, and environmental systems.

3.0 HIGHLIGHTS OF PROJECT TASKS

3.1 Task 1 – Project Initiation

Task 1 – Project Initiation was conducted to discuss the Scope of Work (SOW), clarify details of the technical assistance, determine the schedule for initiation and completion of each task of the technical assistance work order, and to elicit background information from US EPA, FEMA, and the CNMI.

Activities

NES communicated with US EPA, FEMA, and CNMI partners via email, telephone conference, and video conference, throughout the period required to complete Task 1. In coordination with the project team, NES developed a draft and final project schedule, and US EPA and the local CNMI leads provided existing materials, regulations, policies, and plans which provided background and informed the overall technical assistance.

Deliverables

NES delivered a project schedule that included all tasks listed in the SOW. On 9/30/2020 the period of performance was extended one year to 3/17/2022 due to unavoidable delays caused by the Coronavirus disease 2019 pandemic. The schedule was updated as appropriate throughout the project. The project period of performance was subsequently extended to 03/17/2023, again due to unavoidable delays caused by the pandemic.

3.2 Task 2 – Develop and Deliver SSG Training to Local Agency Personnel

Task 2 – SSG Training for local CNMI agency personnel was prepared and delivered in July 2022 to increase local knowledge about SSG and strengthen local capacity to effectively plan and move towards SSG development. The training was intended to help the CNMI communities build intellectual capital and obtain knowledge to improve resiliency and speed recovery periods.

Activities

NES communicated with US EPA and CNMI partners via email, telephone conference, and video conference, throughout the period required to complete Task 2. NES worked with partners to develop draft and final workshop agendas for one (1) on-site training event during the project period. The agenda for the Workshop included the CNMI CSDP, tools for advancing SSG, prioritization of proposed revisions to CNMI regulations, use of the SSG Project Evaluation Tool and beta-testing of the newly developed Survey123 platform, and a “Train-the-Trainer” session.

Draft agendas and training materials, including Microsoft PowerPoint presentations and associated Microsoft Word files of activities to engage training participants, were provided to partners and comments received were utilized to develop final training products.

In coordination with the Office of Planning and Development, NES conducted the Workshop over two weeks from 19-28 July on Saipan. During the first week, the Workshop opened each day with an Introduction Module to orient participants to the purpose and structure of the training modules and all the modules incorporated best management practices (BMPs) for effective training including activities to engage participants in the learning process. The Workshop was designed to reach a large number of CNMI agency staff as well as staff from federal agencies who work with the CNMI. Participants could attend the training modules in person or online. Training Modules 1-4 were delivered each of the first three days of the Workshop (19-21 July). These training modules focused on introducing SSG, how the SSG framework integrates with the CSDP, and the importance of incorporating SSG Principles into regulations and plans, to help the CNMI to shift prevailing practices toward a more sustainable and resilient future. On 22 July, a “Train the Trainer” module was delivered. The second week of the Workshop (25-28 July), NES provided training and tutorials for the SSG Project Evaluation Tool and collected feedback from participants to enhance useability and use of this product.

Training Module 1 provided overview and primer for SSG including the 12 SSG Principles. The purpose of the module was to provide an overview of the relationship between natural hazards and changing climate conditions and to emphasize that actions to increase the resiliency of the built environment implemented today will help increase the sustainability and well-being of communities in the future. Participants were introduced to the 12 SSG Principles as a framework that can help CNMI move toward sustainable development and safer, more resilient communities. To activate the learning process, participants were asked to generate 1-2 learning goals for Training Modules 1-4. To engage participants, each was asked to reflect on and share with the group how severe weather had affected their jobs and lives and to complete a puzzle involving the 12 SSG Principles.

Training Module 2 introduced the recently approved CSDP. Training Module 2 was largely organized around the CSDP and introduced participants to planning themes, the concept of sustainable development, including sustainable development goals (SDGs) and objectives, development guidelines, and tools to implement the CSDP. Participants were introduced to the relationship between the CSDP and CNMI agency action plans, how SDGs were customized using data from the CNMI Resources Report, and how data from future Resources Reports will feed into the adaptive management framework to adjust agency performance when needed to meet the stated SDG objectives. Training Module 2 highlighted that SSG was adopted in the CSDP as a development guideline to provide standards and strategies for how to implement or improve current practices to achieve sustainable development. Learning engagement activities included a handout with fill-in-the-blank questions for each section of the CSDP and an information scramble puzzle. Participants were also asked to reflect on and share how they anticipate using the CSDP in the course of their agency duties.

Training Module 3 introduced the *Guidance Manual* that was finalized in 2018. The learning objectives for this module were to introduce the organization of the *Guidance Manual* and how to find and use the information and tools to integrate SSG into work practices. Training Module 3 covered highlights from each chapter of the *Guidance Manual*. The training emphasized the emergence of SSG from three areas of practice - smart growth, hazard mitigation, and climate change adaptation – and the emergence of the 12 SSG Principles from the extensive body of knowledge from these areas of practice.

Other themes addressed in the Training Module 3 included progress toward SSG and sustainable development will be incremental, government and community support is critical to success, CNMI needs to shift toward a cycle of planning and sustainable, resilient development to reduce the socio-economic burden of overlapping recovery efforts, and implementing the strategies and tools in the *Guidance Manual* will help CNMI continue on its course toward SSG implementation and sustainable development. To engage the participants with the resources and tools available in Chapter 7.0 of the *Guidance Manual*, NES developed a case-study activity that involved an impaired water body and asked participants to recommend tools and resources to help improve the water quality. Other engagement activities included a handout with fill-in-the-blank questions for each chapter in the manual, an information scramble puzzle, and a reflection on how participants might use the *Guidance Manual* in the course of their agency duties.

Training Module 4 focused on the relationship between the CSDP and SSG as a development guideline and the importance of integrating SSG Principles into CNMI regulations. Learning objectives included understanding how the CSDP and the *Guidance Manual* integrate and to locate and use tools and recommendations in the CSDP and the *Guidance Manual* to make recommendations for SSG implementation. Participants were asked to reflect on and share how they currently use BMPs to implement SSG and this led to many robust discussions and realizations that many agency staff already implement SSG within the scope of their duties. Some participants observed that SSG does not have to be complicated or costly, but can be small, incremental efforts that, over time, have demonstrated effect. Participants used the regulations review provided in Chapter 6.0 of the *Guidance Manual* and worked in teams to recommend a prioritized list of regulations to revise for better alignment with SSG Principles. Feedback

regarding this activity was overwhelmingly positive and participants expressed surprise that many CNMI regulations are not well-aligned with SSG Principles.

Overall, Training Module 4 emphasized that revising CNMI regulations to support SSG Principles and SDGs will help CNMI achieve its growth priorities and overall sustainable development vision. At the end of Training Module 4, participants were asked to review their learning goals and encouraged to follow up with questions or to seek additional resources if they did not achieve their learning goal.

Training Module 5, Train the Trainer, was delivered as a one-time event on Friday, 22 July. The aims of this training module were to teach selected CNMI agency staff on learning principles and BMPs for delivering effective training, thus building skills among agency staff to train others about SSG. Participants identified their learning goals, which were reviewed at the end of the module. Training others is an important pathway to change work culture and current practices toward SSG and sustainable development, and will help accelerate movement toward more sustainable, resilient communities. Learning engagement activities included a cross word puzzle to review learning principles and a role-playing exercise to practice delivering effective praise.

To practice the learning principles and BMPs and to become better versed with SSG, participants were given the opportunity to practice delivering sections of Training Modules 1-4. Participants were grouped by tables and each table was assigned one training module to present with each participant presenting one to two slides each. They were given handouts of the slides with notes and were given 30 minutes to prepare. Following lunch, each group presented their assigned module. Many participants commented that they enjoyed this challenging and stimulating activity and that it required a deeper understanding of the SSG material for presentation. In addition, all participants heard the SSG training modules twice and from different perspectives helping to broaden and reinforce their learning.

Training Module 6 focused on introducing and using the SSG Project Evaluation Tool developed in the Geographic Information System (GIS) application ArcGIS Survey123 Desktop Connect. The module was repeated each day from 25-28 July to allow for maximum attendance by CNMI agency staff. The learning objectives for the module were to introduce the Evaluation Tool, to learn how to input data and access hyperlinked resources, and to demonstrate the knowledge to complete an evaluation. Each morning, NES provided a short presentation to describe the purpose of developing an Evaluation Tool and to demonstrate how to input data, including some common input errors, to complete an evaluation. Following the presentation, the rest of the training module was dedicated to helping the participants work through the Evaluation Tool using real projects. Participants indicated they had a greater understanding of the tool following the training. NES was able to make several changes to the Evaluation Tool during the week based on feedback from the group.

The training was exceptionally well attended. There were 90 in-person attendees according to sign-in sheets. Each training day was live-streamed with video and audio, and although it was not possible to precisely account for virtual attendees, it was estimated that ~40 attended virtually.

Deliverables

NES delivered a draft and final Workshop agenda and training materials and conducted the workshop. Final training materials delivered included the PowerPoint slide decks with presentation notes for each module and participant engagement activity handouts in Microsoft Word. In addition, following the Workshop, NES recorded a narration for each of the training modules in PowerPoint and delivered the narrated PowerPoint slide decks and a version of the narration as a video file (mp4). Workshop materials were provided to US EPA and OPD and are available on the OPD website.

3.3 Task 3 – Assist with Incorporating SSG Principles into Long-term Recovery Planning and the Comprehensive Sustainable Development Plan

Task 3 – Assist with incorporating SSG Principles into long-term recovery planning, is intended to help break the conventional cycle of disaster-recovery-repeated damage by providing a point of departure from the prevailing planning practices of the CNMI in order to enhance hazard mitigation strategies, increase resilience, reduce vulnerability to hazards, and reduce time to restore community function following disasters. Key components of the work were to acquire, review, and provide comments on FEMA-led data collection and analysis on building and infrastructure systems impacted by Typhoon *Yutu* and other natural disasters and make recommendations on how to incorporate the FEMA information into the CSDP, and to review selected CNMI planning documents and make recommendations for incorporation of SSG Principles into planning efforts.

Complete documentation of Task 3 is provided in a separate Task 3 Summary Report.

Activities

NES communicated with US EPA, FEMA, and CNMI partners via email, telephone conference, and video conference, throughout the period required to complete Task 3. NES acquired and reviewed FEMA-led data collection and analysis on building and infrastructure systems impacted by Typhoon *Yutu* and other natural disasters (described below) and made recommendations on how to incorporate the FEMA information into the CSDP. The OPD provided NES selected documents for review and recommendations for incorporation of SSG Principles into planning efforts, as presented and briefly discussed below. A brief summary of NES comments on each plan is provided below. The full analysis and recommendations for each listed document are provided in the Task 3 Summary Report.

FEMA Mitigation Assessment Team

To further SSG and resilience adaptation planning efforts FEMA conducted an extensive and comprehensive structural performance evaluation for buildings in the CNMI impacted by Super Typhoon *Yutu*. This FEMA-led initiative aims to provide a retrospective of structural performance,

to include strengths and weaknesses, of buildings during extreme wind events, in order to develop recommendations for building repairs and new construction to mitigate damage potential during future extreme wind events. This initiative was conducted by a FEMA Mitigation Assessment Team (MAT) assigned to the CNMI following Super Typhoon *Yutu*.

The MAT operates under a standardized set of protocols following a site-specific natural disaster event. The MAT assigned to the Super Typhoon *Yutu* event analyzed structural performance as the most important factor in recovery costs and community disruption. Improvements to structural performance have the greatest potential to reduce recovery costs and lessen community impacts for future tropical cyclone events.

The MAT prepared eight post-*Yutu* structural performance evaluation documents that incorporated revised micro-wind zone data. Under Task 3, NES provided comments/suggestions on where to incorporate the technical content from the MAT, and the CNMI Special Wind Region Maps, into the CNMI Comprehensive Sustainable Development Plan were provided. The MAT documents are included in the Task 3 Summary Report Appendix A and are also available in the OPD on-line library. MAT documents reviewed by NES include:

Fact Sheets (3) [available from www.fema.gov](http://www.fema.gov) -

CNMI MAT 1: Maintenance and Retrofit Options for Roof Coverings, Opening Protection Systems, and /Exterior Building Elements

CNMI MAT 2: Maintenance and Retrofit Options for Key Building Systems

CNMI MAT 3: Permitting and Inspection Process for Disaster-Resilient Residential Homes

Recovery Advisories (2) [available from www.fema.gov](http://www.fema.gov) -

CNMI RA-1: Code-Based Wind Resistant Roofing for Homes

CNMI RA-2: Mitigating Wind Damage to Existing Critical Facilities

Summary Reports (3) [available from the data library at https://opd.gov.mp](https://opd.gov.mp) -

SR1: Codes, Standards, and Permitting (FEMA P-2177)

SR2: Performance of One- and Two-Family Dwellings (FEMA P-2178)

SR3: Performance of Public Buildings and Critical Facilities (FEMA P-2179)

Each document provides a discussion on structural vulnerabilities to extreme wind events and guidance and resources to building owners for how to retrofit/repair a building to better withstand damage during future tropical cyclone events.

The MAT documents provide an excellent basis for government development of codes and standards. The MAT results provide strong justification for enforcement of existing codes. MAT products are also excellent practical training materials for inspection personnel. The use of these MAT documents in the planning and permitting processes will lead to gradual improvements to structural integrity and resiliency of buildings in the CNMI to future natural disasters.

In addition to the MAT documents, FEMA prepared the *CNMI Special Wind Region Maps* (2020) to assist design engineers with structural design criteria for building wind loads that meet

requirements of the 2018 International Building Code adopted by CNMI. Wind loads during extreme wind events are dependent on topography and building location. The *CNMI Special Wind Region Maps* are provided through an inter-active FEMA web-based system which allows engineers and planners to see the recommended maximum design wind speed at a specified location. Structural engineers then use this value in the building structural design.

Comprehensive Sustainable Development Plan (2021)

The Comprehensive Sustainable Development Plan represents the ten-year visions goals and objectives of the CNMI leadership, agencies, and stakeholders to work towards the shared outcome of “sustainable development”. The CSDP is intended to frame adaptive management planning practices across twenty planning elements. The visions, goals, and recommendation of this plan use the guiding principles of Smart Safe Growth supported by “right- sized” sustainable development goals and cross-cutting principles specific to the CNMI.

The current effort to develop the CSDP 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. Regulatory and planning instruments are the drivers that will help incorporate SSG Principles into CNMI’s planning and regulatory processes.

NES provided three (3) reviews for CSDP documents:

Draft 1 Review (August 2020)

The OPD began preparation of the CSDP by developing *Vision, Values, Goals, and Objectives*. Most NES comments were SSG-specific on incorporating additional SSG doctrine at this early stage of CSDP development. Recommended revisions included:

- The word “Resiliency” was under represented in the document. Unpack this term and provide more information, e.g., “Disaster-Resilient Communities and Economies” and the term resilience added to the vision, e.g., “to increase ownership of resilient, sanitary, and affordable homes”.
- Align the Public Land Use Plan (PLUP) with the CSDP and add language that the PLUP will promote safe resilient communities.
- Incorporate the concepts that the disaster-rebuild cycle helps perpetuate poverty and consider actions/steps to break the cycle by incorporating SSG into capital improvement and other building projects.
- Clearly link SSG to zoning plans and regulations and to redevelopment especially for housing and Garapan revitalization (towards less risky areas).
- Expand the vision statement to include language that: addresses actions for disaster risk reduction; conservation helps protect/promote ecosystem services and green infrastructure and helps to mitigate the impacts from extreme weather events; plan/build to withstand future climate conditions to achieve sustainability and resiliency.

- Expand the goals/objectives to address climate change and projected changes to future precipitation patterns.

Draft 2 Review (November 2020)

Overall, the document is very good. However, it was difficult to understand the Sustainable Development Goals framework from the United Nations and how it connects to the CNMI planning effort, how the Secretariat of the Pacific Regional Environment Programme indicators played a role in developing the 3-5 year objectives (per the 2019-2020 Resources Report), and how these tied back to PL 20-20 "planning element visions". Recommended revisions included:

- Clarify the relationships between these planning frameworks and how 10-year goals and 3-5 year objectives relate back to each SDG. Recommend developing a table to include in an Appendix (see Section 4.1 for an excerpt of the table developed as the Implementation Plan in the final CSDP).
- Broaden the vision statement to include natural resources conservation for preserving a high quality of life for residents and to support sustainable development.
- More explicitly tie Disaster Risk Reduction to the planning element vision.
- Add target SDG #1.5 – “By 2020, build the resilience of the poor and those in vulnerable situations and reduce their exposure and vulnerability to climate-related events and other economic, social, and environmental shocks and disasters”.
- Demonstrate a 1:1 relationship between the Goals/Objectives included in the Implementation Plan and the bulleted task lists developed for each SDG in Section II.
- Improve the organizational scheme between information presented in the SDG tables and bulleted lists in Section II and the Implementation plan to improve public understanding of how the planning strategy is implemented.
- Revise the goals to explicitly include SSG Principles.
- Revise the first goal statement that discusses the Commonwealth Utilities Corporation Master Plan to explicitly include incorporating SSG into the plan.
- Reword some of the objectives to include explicit references to SSG Principles and /or resilient infrastructure.

Draft 3 Review (June 2021)

Overall, this draft of the CSDP does an excellent job integrating Smart, Safe Growth as a major theme and framework to advance towards sustainable development in the CNMI.

Recommended revisions included:

- Numerous comments/suggestions on where to incorporate the technical content from the FEMA MAT, and the CNMI Special Wind Region Maps into the CSDP.

- Provided language for inclusion of the MAT products into the Development Guidelines section of the CSDP (see Attachment 1 to the review, included in Appendix B).
- Incorporate these MAT findings/recommendations into the next update of the Resources Report that underpins the CSDP.
- Include the Survey123 Project Evaluation Tool into the CSDP to replace the Checklist from the *Guidance Manual* that is referred to in this Draft of the CSDP.
- Administrative/editorial comments on the CSDP that are intended to help improve readability and consistency of the document were provided.
- As was discussed at the July 2022 training workshops, it is further recommended that the five-year CSDP updates include opportunities to mainstream SSG tool use in objectives and action items in future updates and consider including a task to update the SSG Guidance regularly to incorporate updates to relevant regulations and policy guidance.

Comprehensive Economic Development Strategy

The purpose of the Comprehensive Economic Development Strategy (CEDS) is to develop a comprehensive strategic economic planning document which considers the jurisdictions human, physical and natural assets towards an integrated economic plan for a five year forward looking period. This plan can then be leveraged to support funding requests through the Economic Development Administration. As reflected in the 2019 disaster response update, the CEDS mission is to serve as a catalyst for positive and sustainable economic development in CNMI by driving market diversification, ensuring resilient infrastructure, and attaining an educated community through effective leadership, planning, community coordination, and partnership with all stakeholders.

NES found that the CEDS needs substantial revision to meet US Economic Development Administration (EDA) guidelines for developing an impactful CEDS. Because the 2019 CEDS for CNMI lacks strategic goals, it was difficult to comment on evaluation criteria for prioritizing projects for the action plan.

Recommended revisions included:

- To substantially incorporate SSG into the CNMI CEDS work SSG Principles into the strategic goals and develop evaluation criteria for how well projects promote SSG and resilience.
- Update the CEDS to include/incorporate other CNMI planning efforts (per EDA guidelines) and develop goals and evaluation criteria to prioritize projects that further more than one planning effort, such as the US Department of Housing and Urban Development (HUD), CEDS, and the Standard State Mitigation Plan (SSMP).
- Add severe tropical cyclones to the threats list.

- Link the CEDS and the HUD Consolidated Housing Plan to integrate SSG to allow optimization of funding for sustainable innovative economic and community development projects.
- Links to several example documents and websites to help with continuing to improve the CEDS were provided.

Standard State Mitigation Plan

The SSMP provides goals, priorities, and commitments to reduce risk from natural hazards and serves as a guide for decision makers when they commit resources to reduce the potential impact of these identified hazards.

States and Territories must have an approved SSMP as a condition of receiving non-emergency Stafford Act assistance and FEMA mitigation grants. Plans must include a description of the planning process used to develop the plan, risk assessments, an overview of the type and location of all natural hazards that can affect the jurisdiction, an overview and analysis of the Territories vulnerability to the hazards, an overview and analysis of potential losses to the identified vulnerable structures, a mitigation strategy that includes a description of the pre- and post-disaster hazard mitigation policies, programs, and capabilities to mitigate the hazards, an identification, evaluation, and prioritization of cost-effective, environmentally sound, and technically feasible mitigation actions and activities being considered, and identification of current and potential sources of Federal, State or Territorial, local, or private funding to implement mitigation activities.

The SSMP must also include a section on coordination of local mitigation planning, a plan maintenance process, a plan adoption process, and assurances that the jurisdiction will comply with all applicable Federal statutes and regulations in effect for the periods for which it receives grant funding. The plan must be reviewed and updated every five years.

NES found that the SSMP could benefit from substantial revision in the next update to integrate the SSG framework and ensure that planning and mitigation projects consider climate change and future weather-related hazards.

Recommended revisions included:

- Improve the Disaster Mitigation Planning Process goals to address both current and future hazards.
- Add a discussion of the vulnerability of the existing power transmission lines and the potential for disruption to power distribution following severe weather and link to SSG methods for improving the resiliency of the built environment.
- Describe public early warning systems' capabilities for each island and improvements needed.
- Improve mapping including addition of critical facilities onto hazard maps.

- Include private property on some of the hazard maps and target mitigation projects to help home owners improve the storm resistance of their properties. Include loss estimates for private properties in the loss estimates section (now only includes loss estimates for public infrastructure).
- Numerous administrative/editorial comments to help improve readability and consistency of the document were also provided.

HUD Community Development Block Grant – Disaster Recovery Program Action Plan (2020) 2018 Disasters Typhoon Mangkhut and Super Typhoon Yutu

The Community Development Block Grant – Disaster Recovery (CDBG-DR) Program Action Plan Presents an action plan that details how the CNMI will utilize funds provided by the US Department of Housing and Urban Development (\$243,946,000) and how it will address long term recovery efforts. The action plan provides a local needs assessment and describes connection to unmet needs, local programs and requirements, local consultation through a citizen participation plan, demographics, impacts, and how it will address housing, infrastructure, and economic development.

NES provided a general comment that even though this is the “Needs Assessment” it should be strategically linked back to the OPD efforts and project planning within the SSG framework to establish coordination/consistency between these planning efforts, which is a requirement of the CDBG-DR Action Plan. These comments were submitted to the Northern Mariana Housing Corporation’s project team as they worked to update the CDBG-DR.

Recommended revisions included:

- Integrate SSG into various sections of the CDBG-DR as detailed.
- Include the SSG Principles and sustainable development BMPs as criteria for prioritizing and selecting projects.
- Plan mitigation and resiliency projects under expected future climate conditions (e.g., stronger storm winds, increased flooding, sea-level rise/inundation).
- Utilize the most recent hazard maps for project planning and selecting appropriate mitigation actions.

CNMI Garapan Watershed Management Plan 2020

The Garapan Watershed Management Plan 2020 is an integrated plan developed to consider key watershed benefits and identify ways to maintain or improve them over the next 5 years. This plan builds off the accomplishments and challenges of two previous conservation action plans (CAPs) developed in 2013 and 2015 as well as updated monitoring data, and existing project within the watershed. The plan is centered around improving surface and lagoon water quality.

NES found that the plan is well developed in terms of SSG and clearly linked several objectives and activities to evaluating projects for and incorporating SSG Principles into proposed projects. The plan discussed climate change and aims to address anticipated future stormwater volumes and sea level rise. Consistent with US EPA recommendations, the CNMI Watershed Working Group embraced an integrated approach to developing this plan via multiple workshops with participants from several key CNMI agencies. The ten- and five-year objectives/activities are well developed.

Recommended revisions included:

- Explicit discussion on the status of developing Total Maximum Daily Load (TMDL) for priority pollutants and the justification for including them or not in the current plan.
- The watershed groups refer to the *Guidance Manual*, Chapter 7 and additional web-based resources listed in the reference tab of the review of the plan for tools and resources to help develop green infrastructure projects.
- Ensure green roof design/installation will meet all applicable 2018 International Building Code (2018 IBC) and International Residential Code requirements for wind. Installing a green roof in the CNMI with such severe storms may be challenging and should be carefully evaluated/considered when setting goals.
- Consider changing regulations to allow pets only at limited beaches. Consider pet waste stations on popular beaches and public education programs.
- Improve the indicators for evaluating progress by establishing a numerical target to work towards for each appropriate objective and indicator of progress/outcomes.
- Monitor Savana areas and if cover increases over time consider reforestation to reduce wildland fire risks and further forest conversion to grasslands.

Achugao Watershed Existing Conditions and Opportunities

The information in this report will be the basis for watershed planning for the Achugao Watershed. The report focuses on conditions of the watershed including land use/cover, Areas of Particular Concern and historic sites, infrastructure, hydrology, climate vulnerability, hydrodynamics, geology and soil, ecology, and water quality. The report does a good job bringing information for several resources into a single document for evaluation. Although some information is outdated, the authors do a good job of identifying information gaps and what requires updating. The list of potential restoration projects in the report identifies many specific projects to manage the watershed that are consistent with SSG Principles.

Recommended revisions included:

- The interim report can be improved by using the adopted flood scenario for Saipan (SLR50_ONDTY) that is available as a GIS layer on the Bureau of Environmental and Coastal Quality (BECQ) online Permitting Application. The adopted flooding scenario incorporated anticipated changes in severe storms (i.e., climate change) and changes in

sea level rise and change. Using the adopted flood scenario will help align the future watershed plan with SSG and sustainable development planning goals/BMPs.

- When planning (green) infrastructure projects, especially for stormwater management, consider and incorporate projected changes in precipitation patterns due to climate change, and, designing projects, especially with a longer-term planning horizon, to handle anticipated changes.
- The plan touches briefly on the savanna land cover and the fire cycle within the watershed. This is a very complex social and ecological issue and it was recommended that the issue be treated in greater detail in the watershed plan. Wildlife fire and removal of vegetation can cause increased sedimentation/pollution on reefs via erosion. For more information, Dr. Clay Trauernicht at the University of Hawaii Manoa recently wrote an excellent editorial regarding the impacts of [climate change and wildland fire in Pacific Islands](#). Wildfires have the potential to cause ecological and economic damage to the coral reefs in CNMI and the Achugao Watershed planning process and the plan is an excellent opportunity to address these important social and ecological issues.
- Investigate how vegetative cover affects ground water infiltration and recharge to manage the watershed and maximize ecosystem service benefits.
- Incorporate future, anticipated climate conditions when planning projects, especially for infrastructure and stormwater runoff projects.
- Incorporate permeable paving materials where appropriate to minimize impermeable surfaces as development continues.
- Where appropriate, maximize the use of development incentives to increase conformance with SSG Principles and Sustainable Development BMPs.
- Adjust inputs to the Watershed Treatment Model to accommodate projected changes in precipitation patterns (e.g., fewer, but heavier rainfall events), especially when planning stormwater infrastructure projects.
- Investigate regulatory controls and public education to help alleviate the problem of dog feces contaminating waters. Links to the City of San Diego's well-developed program to control dog waste at beaches were provided.
- Numerous administrative/editorial comments to help improve readability and consistency of the document were also provided.

Laolao Bay Watershed Existing Conditions and Opportunities

The information in this report is intended to provide the baseline information for a new Integrated Watershed Management Plan for the Laolao Bay Watershed, primarily to address water quality and to improve impaired waters. The report focuses on conditions of the watershed including land use/cover, infrastructure, hydrology, climate vulnerability, hydrology and climate, geology and soil, ecology, and water quality.

The report does a good job discussing the status of projects previously implemented under the Conservation Action Plan (CAP) for the watershed. The report provides a very good synopsis of the progress towards meeting the objectives developed in the CAP and areas that still need additional work/progress.

The report also provides an excellent summary of the status of current conditions within the watershed and provides many suggestions/solutions to improve existing conditions that align well with SSG Principles. The field notes in Appendix A, including sketch diagrams/maps and photographs, provide context for the recommendations.

The report does not specifically identify or discuss areas within the watershed designated as Areas of Particular Concern (APC).

Recommended revisions included:

- The interim report can be improved by clearly discussing how FEMA flood zones and the adopted flood scenario for Saipan (SLR50_ONDTY) are used, in conjunction or separate to characterize flood and inundation risk. Using the adopted flood scenario will help align the future watershed plan with SSG and sustainable development planning goals/BMPs.
- When planning green infrastructure projects, especially for stormwater management, the plan should consider anticipated changes in precipitation patterns as the climate continues to change. Project designs should be developed to manage anticipated increases in rainfall per event and the potential for increased stormwater runoff.
- Incorporate permeable paving materials where appropriate.
- Add a discussion about APCs within the watershed and how these designations are relevant to management of the watershed.
- Address wildfire risk during the watershed planning workshop and add a discussion of existing wildfire fuel loads and current fire risk, and include additional fire prevention activities in the plan.
- Monitor savanna areas, and if cover increases over time expand existing or implement new restoration actions/programs to reforest non-native grasslands/savannas to reduce wildland fire risks and further forest conversion to grasslands.
- Where appropriate, maximize the use of development incentives to increase conformance with SSG Principles and Sustainable Development BMPs.
- Adjust inputs to the Watershed Treatment Model to accommodate projected changes in precipitation patterns (e.g., fewer, but heavier rainfall events), especially when planning stormwater infrastructure projects.
- Numerous administrative/editorial comments to help improve readability and consistency of the document were also provided.

Talakhaya Watershed Management Plan

Overall, this plan is written from a slightly different perspective from the other watershed management plans. The Talakhaya Watershed Management Plan (TWMP) is focused more on current land-use practices, community stewardship, and plant and animal communities. There is less focus on impaired waters and potential causes/control of pollutants. The plan does not include a Watershed Treatment management (WTM) analysis to estimate potential annual pollutant loads similar to the other watershed plans/assessments.

The TWMP provides good context for integrated watershed management planning, which is consistent with the Comprehensive Sustainable Development Plan. However, the TWMP does not mention the CSDP, OPD, or the Watershed Working Group. It appears that this plan was written before or at the same time the CSDP was being drafted. In addition, although the TWMP has many elements that are consistent with SSG Principles, there is no mention of the *Guidance Manual* or SSG Principles.

The strongest components of this plan are the links to community stewardship/engagement and inventory/monitoring of the natural communities (including assessing restoration targets). The plan lacks in addressing potential causes of pollutants and offering objectives/actions to control those pollutants (except for sediment) to improve water quality.

Recommended revisions included:

- The plan can be improved by adding a section describing changes in climate that will likely have an effect on the watershed (e.g., changes in tropical cyclone intensity/frequency, rainfall patterns, etc.).
- Integrate the CSDP and SSG Principles, and mentioning OPD and the Watershed Working Group as partners, into the section of Integrated Watershed Management Approach.
- Develop a Watershed Treatment Model to estimate annual watershed pollutant loads. If there are information gaps that prevent the use of a WTM, identify the information gaps and add to the objectives to gather the information.
- Include design elements based on projected climate conditions, especially for drainage, for all infrastructure projects. Determine if sea level rise (SLR) and sea level rise (SLC) are relevant to this document and address if necessary.
- Under Strategy 5 address failing septic systems to help improve water quality.
- Include improvement of impaired waters as an indicator of successful watershed management.
- Numerous administrative/editorial comments to help improve readability and consistency of the document were also provided.

LaoLao Bay Watershed Action Plan – Draft

The LaoLao Bay Watershed Action Plan – Draft provides 10-yr goals and short-term actions intended to inform the implementation strategy that will be included in the final watershed management plan. These are based on a review of achievements of the 2012 Conservation Action Plan, stakeholder input garnered during the 2019 watershed workshop, and findings summarized in the interim watershed characterization report.

The draft plan was reviewed specifically through a nature-based solution lens at the request of OPD. Numerous resources were provided that support nature-based solutions that include general information, systems for designing hybrid approaches (nature-based and structural solutions working together), implementation guidelines, and incentive programs for private landowners used in other US locations.

It was noted that each project identified in the Action Plan has significant issues with private land ownership that must be resolved before a project can move from the planning to implementation phase.

Recommended revisions included:

- Educate private landowners regarding:
 - o Benefits of living shorelines.
 - o The current rules for US Army Corps of Engineers (USACE) Nationwide Permit 54, which incentivizes the adoption of nature-based solutions by reducing permit approval time.
- Evaluate opportunities within the CNMI regulations/permitting processes that will support private landowners to install or promote nature-based solutions for coastal management.
- Consider the anticipated effects of climate change when developing projects to enhance sustainability and resilience and designing drainage systems.
- Adopt National Oceanic and Atmospheric Administration (NOAA) guiding principles for living shorelines and utilize an approach similar to the NOAA and USACE Systems Approach to Geomorphic Engineering ([SAGE](#)) which evaluates local conditions to derive balanced hybrid approaches for structural and nature-based solutions for coastal management.
- Utilize the Federal Highways *Nature-based solutions for coastal highway resilience: An implementation guide* to help attenuate wave action/energy to reduce future roadway inundation/erosion.
- Evaluate existing regulations/permits for connecting driveways to roadways for opportunities to revise to improve drainage for future driveway connections.

HUD CNMI Community Development Block Grant Mitigation (CDBG-MIT) Program Initial Action Plan for Public Comment 2022

The CDBG-MIT Action Plan was developed in order to access the CDBG-MIT funds for use on strategic hazard mitigation activities. The activities described in the plan are informed by, and compatible with the strategies embedded in the CNMI SSMP, which is the primary resource for guiding local-long-term planning and hazard reduction efforts.

This NES review was based in accordance with the criteria developed by HUD for CDBG-MIT Action Plans Checklist. The checklist pertains to the CDBG-MIT funds allocated to grantees recovering from qualifying 2018 disasters (86 FR 561).

The Draft Initial Action Plan (IAP) does an excellent job identifying plan elements that are required by HUD and developing the information throughout the document. Per HUD requirements, mitigation actions are focused in most impacted and distressed areas on Saipan and Tinian that were affected by the 2018 typhoon. The needs assessment is clear and easy to follow.

The Draft IAP also does an excellent job developing the hazard profiles that align well with the CNMI State Standard Mitigation Plan (SSMP). The IAP acknowledges where 2018 SSMP information is outdated and identifies recently completed, on-going or planned updates for some hazards, such as wind and flooding. The plan provides a good analysis of the demographics of areas most impacted by the 2018 typhoon to assess community vulnerability.

As written, this Draft IAP strongly conforms with Smart, Safe Growth.

Chapter 3.0 provides the methods and analysis for composite risk/vulnerability scores across the islands to identify community assets and infrastructure most in need of mitigation actions following the 2018 typhoon that will focus benefits on low to moderate-income communities per HUD requirements. The prioritization scheme is clear and easy to follow.

Recommended revisions included:

- Improve the description of the methods and the datasets used to generate the composite flood risk index presented in Chapter 3.0. The main data source to generate the composite flood index is a report by Dobson et al (2020b), which used NOAA data regarding sea level rise to project a hazard risk index. The projection used by NOAA/Dobson et al. for sea level rise is not clear. Section 2.1.5 of the IAP discusses the CNMI-specific SLR mapping layer (scenario SLR50_ONDTY) recommended by the ad-hoc sea level rise planning committee. The IAP states that this CNMI-specific SLR mapping layer was also incorporated into the final composite flood risk index (page 53). However, in Chapter 3.0, Figure 40 lists the data sources used to generate the final composite risk index and the CNMI-specific SLR mapping layer is not listed. If the CNMI-specific SLR mapping layer was included in the analysis, add this data source to Figure 40 and include a reference to the dataset in the text on page 59. If the CNMI-specific SLR mapping layer was not

included in the analysis, edit the text in the last paragraph on page 53 to state that these layers were not used in the composite flood analysis.

- NES acknowledges that the CNMI is currently working to update flooding projections and that once this initiative is completed there should be a unified source for future planning and project designs. However, until that information is available, hazard mitigation and future project planning should continue to consider the CNMI-specific SLR mapping layer (SLR50_ONDTY).
- The plan states that as “CDBG-MIT strategies and activities move into the implementation phase, any project will be passed through the lens of ‘Smart, Safe, Growth’ prior to implementation.” The responsibility for this evaluation/review should be specifically assigned to a staffing role within the Northern Marianas Housing Corporation to ensure this action is completed as stated in the plan. The position(s) identified for evaluating projects through the SSG lens should work with OPD to obtain training on how to evaluate projects for SSG conformance.

USACE Draft Post Disaster Watershed Plan (WA)

The intent of the WA is to provide recommendations both within and outside of USACE authorities that will help to rehabilitate and improve the resiliency of damaged infrastructure and natural resources, reducing risks to human life and property from future natural hazards. The WA assessed the drivers of social, life loss, economic, and environmental risks through engagement with the public and other Federal and CNMI agencies, subject matter expert consultation, and research with the most recent reports available.

Overall, the Watershed Assessment (WA) is well organized and closely follows the framework outlined in the document to generate project recommendations. The planning and evaluation processes were well described and easy to follow. The supporting risk analyses graphics are informative, and it is easy to grasp a large amount of summarized information.

Overall, the WA did an excellent job addressing climate change and identifying potential impacts as the climate continues to change. The recommendations for actions provided in the WA conform strongly to the SSG framework.

Recommended revisions included:

- An area for improvement is the description of the analysis for the People and Structures at Risk. The analysis is interesting in that the team incorporated future SLR scenarios to estimate future impacts to populations, roads, and structures. However, the test does not state the timeframe for these future conditions nor the expected change in sea level at the future date. The information is provided in Appendix B, but the WA can be enhanced by including that information in the main body of the document.
- Improve discussion on how the different SLR datasets may affect impact analyses. The WA analysis is similar to the analyses in other recently released reports (e.g., the CNMI Community Development Block Grant Mitigation Action Plan and the CNMI Coastal

resilience Assessment). However, the WA uses the SLR projections developed by the USACE and the other reports use SLR data from NOAA. It is unclear how these data sets differ and how that may affect the different impact analyses. The WA did not consider CNMI-specific SLR mapping layers (SLR50_ONDTY) that were informally adopted by the ad-hoc CNMI sea level change planning committee.

USACE Federal Register (FR) 87 NO. 107; Modernization of Army Civil Works Policy

The FR deals largely with modernization of the USACE policies on engagement with Native Americans, Tribes and Disadvantaged and Underserved communities.

Of particular relevance to SSG is Section III Potential Rulemaking Actions, Part B Principles, Requirements and Guidelines (PR&G).

Section III Part B paragraph 2 (pg. 33760) discusses the entire range of SSG Principles, without putting on the SSG label. It is doubtful that the USACE is even marginally aware of the notion of SSG.

Recommended revision:

- Request the USACE to research SSG and formally adopt SSG as the basic framework for revision and modernization of the PR&G (a scenario similar to what the CNMI OPD has done). This action would advance the SSG doctrine at a significantly large scale.

Deliverables

NES provided US EPA and CNMI a draft and final Task 3 Summary Report.

3.4 Task 4 – Develop Project Evaluation Tool Based on SSG Principles

Task 4 – The Project Evaluation Tool based on SSG Principles was developed as an easy to use, streamlined Project Evaluation Tool for CNMI to score proposed projects based on how they incorporate and advance SSG Principles. This tool allows CNMI to make better decisions about which projects to prioritize for funding and implementation, including projects funded by federal disaster assistance as well as projects included in the CNMI Capital Improvement Plan. The tool will help CNMI integrate the SSG Principles into practice across the CNMI government in a uniform, cohesive, and standardized manner.

Activities

NES communicated with US EPA and CNMI partners via email, telephone conference, and video conference, throughout the period required to complete Task 4. NES utilized the *CNMI Smart*,

Safe Growth Checklist for Review and Development Projects – Government Facilities, Commercial, Residential checklist included in the *Guidance Manual* as the basis for the Evaluation Tool.

NES provided numerous drafts of the Evaluation Tool for US EPA, FEMA, and CNMI agencies review. At the request of OPD, the Evaluation Tool was reconfigured into an ArcGIS Survey123 application. ArcGIS Survey123 allows the tool to be accessed online by evaluators and centrally stores the evaluations for review and use by OPD and other relevant CNMI agency staff. The initial version of the ArcGIS Survey123 SSG Evaluation Tool was developed using the Desktop Connect application to achieve the functionality requested by OPD and US EPA. However, some functionality of the tool developed using the Desktop Connect application was lost when the tool was published to the web browser. The final version of the Evaluation Tool developed using the Desktop Connect application was published via ArcGIS Online (AGOL) and shared on the US EPA GeoPlatform Online (GPO) website in July 2022. US EPA requested that an additional version of the tool be developed using the ArcGIS Survey123 Web Designer application. The Evaluation Tool was redeveloped and the final version of the Evaluation Tool using the Web Designer application was published and shared on the US EPA GPO website in November 2022.

Both versions of the Evaluation Tool (Desktop Connect and Web Designer) are organized by the following sections:

- 1) Introduction,
- 2) Main survey – criteria evaluation,
- 3) Utilities demands, and
- 4) Final SSG conformance score.

The introduction provides the evaluator with information for how to complete the survey and background information about SSG. This section requires the evaluator to input information about the project being reviewed and requires them to certify that they are familiar with the 12 SSG Principles and that the survey was completed truthfully to the best of their knowledge.

In both versions of the Evaluation Tool, following the introduction, there are 28 evaluation criteria in the main survey arranged in 5 categories:

- 1) Climate Adaptation and Hazard Mitigation (14 criteria),
- 2) Incentives (1 criterion),
- 3) Smart Growth (6 criteria),
- 4) Environmental Protection and Ecosystem Services (5 criteria), and
- 5) Cultural Resources Protection (2 criteria).

At the request of OPD, 4 questions regarding a project's utilities demands were also included, but these questions do not contribute to the overall SSG conformance score. The final score for SSG conformance is provided at the end of the survey.

To complete the survey, the evaluator assesses the applicability of the 28 criteria to the project under review. In the Desktop Connect version, when criteria are not applicable, conditional formatting and coding allows the evaluator advances to the next criteria and no points contribute toward the SSG conformance scores. When criteria are applicable, a dropdown menu of descriptive choices appears. In the Web Designer version of the tool, it was not feasible to use conditional formatting and coding to allow the user to advance past “not applicable” criteria. Instead, the evaluator must enter 1 point or 0 points to indicate if criteria are applicable or not. The numeric value is necessary to accurately sum the applicable criteria to calculate the relative SSG conformance scores. In addition, in Web Designer version the menus with the description choices are always visible and a choice for “0 points – NOT applicable” was added for all criteria. For both tool versions, the evaluator selects a radio button from the menu choice that best matches the project’s level of conformance with SSG. Then the evaluator must enter the points value associated with the selected description into a points field.

In both versions of the tool the total number of applicable criteria and the points for all applicable criteria are automatically summed for each of the 5 categories and for the entire survey to provide the relative SSG conformance scores by category and overall. The evaluator and the project proponent can review scores to see where projects exceed, meet, or are deficient in SSG conformance. In each criteria section there are links to SSG information and resources to assist evaluators and project proponents to investigate ways to improve conformance with SSG principles if needed.

The Evaluation Tool can assist planners and project reviewers to prioritize projects that conform with SSG Principles for funding and implementation. The Evaluation Tool can also assist with communicating to project proponents areas where projects can be improved to increase conformance with SSG to work toward more resilient, sustainable development.

Deliverables

NES provided US EPA and CNMI numerous drafts and two final SSG Project Evaluation Tools, one developed using the ArcGIS Survey123 Desktop Connect application and one developed using the ArcGIS Survey123 Web Designer application. The ArcGIS Survey123 Desktop Connect application outputs an XLS form in Microsoft Excel with all the underlying code to publish the survey via AGOL on the US EPA GPO. The final XLS form for the Evaluation Tool was uploaded to the US EPA GPO and published in July with the document name “SSG Project Evaluation Tool 2022 07 26” and shared with the Region 9-CNMI SSG Evaluation Tool group.

The ArcGIS Survey123 Web Designer Application outputs a web-based form with associated GIS files via AGOL on the US EPA GPO. The final ArcGIS Survey123 Web Designer form was published to the US EPA GPO on November 18 and shared with the Region 9-CNMI SSG Evaluation Tool group.

Because there are some differences between the Evaluation Tool versions developed in the Desktop Connect application and the Web Designer application, NES prepared and delivered a memo to highlight the differences/similarities between the two versions of the tool. Both final

versions of the SSG Evaluation Tool (Desktop Connect and Web Designer) included hyperlinks to a collection of digital references to support SSG and sustainable development that are hosted on the OPD website in the SSG Highlights Reading Library.

NES designed and delivered training on how to use the Project Evaluation Tool to CNMI and federal agency personnel as part of the training delivered under Task 2.

As a final deliverable under this task, NES provided a memorandum that describes the status of the Project Evaluation Tool and proposed next steps to enhance the function.

3.5 Task 5 – Develop and Deliver Final Report

Task 5 – The *Final Report* is intended to document highlights of each task and include short-term, mid-term, and long-term implementation actions the CNMI should or did take to incorporate SSG into long-term recovery and resiliency efforts.

Activities

NES communicated with US EPA and CNMI partners via email, telephone conference, and video conference, throughout the period required to complete Task 5. NES developed two (2) draft versions of the *Final Report* and edits/comments from US EPA, FEMA, and CNMI agencies were considered and incorporated in this *Final Report*.

Deliverables

NES provided US EPA and CNMI with two draft reports and this *Final Report*.

4.0 COMPLETED & RECOMMENDED SSG IMPLEMENTATION ACTIONS

To advance the doctrine and practice 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 to SSG among agencies. The CNMI has made steady progress towards implementation of SSG since the *Guidance Manual* was prepared in 2018. Completed actions since are presented in section 4.1. Persistent effort is necessary to realize substantial SSG benefits for the CNMI within the next generation. Recommended actions in the short-, medium-, and long-term are presented in sections 4.2-4.4.

Short- (1-3 years), medium- (4-6 years) and long-term (7-10 years) actions are presented herein with a landscape-scale context for continued SSG implementation over the next decade. Incorporation of traditional environmental knowledge and environmental justice principles into all actions should be given full consideration by SSG practitioners.

Short-term actions are limited to those that are reasonably expected to be achievable in the time frame, being mainly legislative and policy changes, and administrative actions, within existing government bodies and programs. Medium-term actions are generally on-going activities such as continued implementation and regular updates of the CSDP, and completion of agency actions initiated in the short-term, such as regulation revision-promulgation. Various Plans, Strategies, and Assessments are also medium-term targets because it can take several years of government and stakeholder engagement before proposed content and action steps can be agreed upon. Buy-in must always precede actual Plan, Strategy, or Assessment preparation. Assessments usually have an additional research and field component, and depending on the complexity, it can take several years of gathering data prior to the analysis and writing phases. Long-term actions are principally follow-on implementation of Plan, Strategy, or Assessment elements, including the stand-up of new programs or agencies, and the construction of infrastructure. Some implementation actions will occur as discrete actions within a specific timeframe, and will not follow a successional progression across timeframes.

An example to illustrate how advancing SSG in practice can cross short-, medium-, and long-term implementation timeframes, is the revision of zoning laws and regulations for set-backs based on SLR/SLC, and the construction of green infrastructure shoreline in the protected belt between development projects and the ocean shoreline. For this example, legislature and regulation review/revisions would be initiated in the short-term (1-3 years). Acceptance of proposed statutory changes, i.e., “Buy-in” from the regulated developer sector and the public, and the final promulgation of new SSG-compliant zoning regulations would be achieved early or mid medium-term. In the long-term timeframe (7-10 years) in this example, government action would be taken to procure funding, designs, and construction of a green-infrastructure shoreline within set-back constraints, for a coastal area not yet encroached upon by development, and now protected under the new zoning regulations.

Examples and Case studies that include information on some of the recommended SSG implementation actions, as well as additional actions, are presented in Section 5.

4.1 Completed Actions (2018 – 2022)

Guidance Manual for Smart, Safe Growth for the CNMI (2018)

The *Guidance Manual* was completed concurrently with the establishment (“stand up”) of the Office of Planning and Development as a foundation document and continues to be the principal reference work specific to SSG for the CNMI. The *Guidance Manual* introduces SSG and discusses adaptation measures, recommendations for government action, planning resources, regulatory instruments, and tools to work towards SSG in the CNMI. The *Guidance Manual* also presents key issues and tools to facilitate leadership actions towards SSG and aims to help the CNMI Government evaluate planning and development initiatives for conformance with SSG Principles in a consistent and uniform manner.

As was discussed at the July 2022 training workshops, numerous regulatory updates have been made since the publication of the 2018 SSG Guidance. Ongoing support for SSG review, training,

and updates would help to ensure continued relevance of this guidance tool. As such, allocation of staffing resources to update the regulatory review section at minimum every five years is recommended. Such an update could correspond with the planned five-year update cycle of the CNMI Resources Report that OPD facilitates with the PDAC and planning partners to achieve the adaptive management planning approach described further in the CSDP. It is further recommended that the five-year CSDP updates include opportunities to mainstream SSG tool use in objectives and action items in future updates and consider including a task to update the SSG Guidance regularly to incorporate updates to relevant regulations and policy guidance.

Update Building Codes (2020)

The CNMI adopted the 2018 IBC on December 19, 2019, to take effect on June 19, 2020. All new buildings and repairs must meet or exceed these standards as certified by DPW. Implementation of the 2018 IBC will preserve public health and safety and provide safeguards from hazards associated with the built environment through specific guidance for the use of innovative materials and design standards. The 2018 IBC establishes improved standards for construction that will enhance resiliency of the built environment to extreme weather events and other natural hazards. To support SSG, it is recommended that building codes continue to be regularly updated and training should be provided to CNMI building code officials and the CNMI contractor community.

FEMA MAT Documents and CNMI Special Wind Region Maps (2020)

To further SSG resilience and adaptation in planning efforts, FEMA conducted an extensive and comprehensive structural performance evaluation for buildings in the CNMI impacted by Super Typhoon *Yutu*. The MAT determined that structural performance is the most important factor in recovery costs and community disruption. Improvements in structural performance have the greatest potential to reduce recovery costs and lessen community impacts for future tropical cyclone events. The MAT prepared eight (8) post-*Yutu* structural performance evaluation documents. The MAT documents are included in the Task 3 Summary Report, available in the OPD online library.

In addition to the MAT documents, FEMA prepared the *CNMI Special Wind Region Maps (2020)* to assist structural engineers with design criteria for wind loads that meet requirements in the 2018 IBC. Wind loads during extreme wind events are dependent on topography and building location. The *CNMI Special Wind Region Maps* are provided through an inter-active FEMA web-based system which allows engineers and planners to select a building location, at which the recommended maximum design wind speed is specified. Structural engineers then use this value in preparing structural designs. Inclusion of these revised geospatial layers in future updates of the SSG assessment tool may support more robust use and application of its data. It is anticipated this data will also be included in the forthcoming SSMP update.

Comprehensive Sustainable Development Plan (2021 – 2030)

Public Law 20-20 established the Office of Planning and Development in 2017 to improve government planning processes and improve effectiveness and coordination among CNMI agencies and Federal partners. This law also re-organized the Capital Improvement Program under OPD. OPD is now designated as the state agency for capital improvement planning purposes. OPD is the clearinghouse for all information related to development, planning, and resource use in CNMI. Public Law 20-20 also establishes a plan review and approval process, within OPD and the PDAC. By reviewing and appraising all CNMI plans, OPD and the PDAC serve an essential coordinating function to ensure resources, such as power and water, are committed responsibly and that infrastructure can keep pace with development pressures. OPD is the coordinating function that provides a “whole government” approach to SSG and climate change adaptation. At its inception, OPD was charged with producing the CSDP. The CSDP was approved by the Office of the Governor on 26 October 2021.

The CSDP describes four (4) planning themes: (1) Build Resiliency of Natural, Built, and Human Systems through Smart, Safe Growth; (2) Maintain Efficient Governance and Social Safety Nets; (3) Grow Inclusive, Cohesive Communities, and; (4) Leverage Partnerships and Alliances to Benefit All. SDGs, Objectives, and Action Plans are provided for each theme. The CSDP also describes all CNMI Action Plans, and provides development guidelines and processes, and recommends next steps for continued and consistent progress for SSG in the CNMI.

The approved CSDP includes an Implementation Plan in Appendix I that helps clarify the relationships between the SDGs, 10-year goals, 3-5 year objectives, and related planning elements, responsibilities, and funding status. The implementation table is easy-to-read and will help CNMI agency staff to align their plans and activities with the CSDP.


Goal #	10+ Year Goals	3-5 Year "SMART" Objectives	FY20-21 Action Items	Action Lead(s)	Partnerships	Supporting Action Plan(s)	Funding Status / Unmet Need(s)
CLEAN WATER AND SANITATION							
6 CLEAN WATER AND SANITATION  SGD 6 Ensure availability and sustainable management of safe and environmentally compliant water and sanitation for all	By 2030, the CNMI will improve water quality and reduce risk of combined sewer overflows by implementing environmentally compliant point and nonpoint source pollution control programs for existing discharge systems and support implementation of SSG to implement nature-based solutions and other cost-efficient interventions identified in the 2025 storm water management plan	Led by DPW and supported by the Built Environment Taskforce, (i) by 2023 DPW will implement updated guidelines for the MS4 storm water permit to ensure environmentally compliant and sustainable management of nonpoint source pollution conveyed by storm water infrastructure; and (ii) by 2025 DPW will draft a storm water management plan with interagency support to further enable these efforts;	Support development of stormwater management and MS4 compliance plan	DPW	BE Taskforce, BECQ	Stormwater management plan (anticipated by 2025); 2006 Stormwater Manual	Substantial infrastructure funding is being sought through numerous funding streams

Figure 4.1 Excerpt from the Implementation Plan in Appendix I of the CNMI Comprehensive Sustainable Development Plan.

Infrastructure and Recovery Program (2021)

Directive No. 2021-005 established the CNMI Infrastructure and Recovery Program (IRP). The purpose of the IRP is to assist agencies in successful and timely execution of approximately \$1 billion of Federally-funded infrastructure projects. Federal partners typically fund planning, design and construction through established program conduits using existing agencies. For the large allocation currently available to the CNMI there is potential for a complicated nesting of actions among numerous CNMI agencies. There is also currently an expectation for specific action agencies to move their projects forward in a timely manner. Given the large allocations, there is a risk of individual agencies being overwhelmed, or acting independently. The IRP serves as an over-arching liaison between Federal partners and specific CNMI agencies, to ensure an overall coordinated approach and secure technical assistance for local agencies when needed.

Review of Long-Term Recovery Planning Documents for SSG Conformance (2021-2022)

This work was intended to help break the conventional cycle of disaster-recovery-repeated damage by providing a point of departure from the prevailing planning practices of the CNMI. The review work will enhance hazard mitigation strategies, increase resilience, reduce vulnerability to hazards, and reduce time to restore community function following disasters. Details of reviewed plans and suggested improvements for incorporation of SSG Principles are provided in Section 3.3. A full account of documents reviewed is provided in the Task 3 Summary Report, and is available on the OPD on-line library.

4.2 Recommended Near-Term (1-3 years) Actions

Implementation of the CNMI Comprehensive Sustainable Development Plan

Work towards substantial implementation of CSDP short-term action items for theme objectives, planning elements, and policy recommendations.

Explore and implement methods for overcoming social and legal barriers to climate change adaptation

Barriers to the acceptance of climate change as the dominant political, social, and economic paradigm are numerous and exceedingly complex. Climate change is still far from achieving mainstream acceptance. Climate change is even further from mainstream understanding. The underlying factors of climate change are exceedingly technical and the delivery of information intelligible to a largely non-technical populace is a great challenge. Barriers to wide acceptance cannot be overcome until wide understanding is achieved. Education and outreach are the most important actions to undertake at this time to enhance the understanding of climate change in the general population.

Government-level barriers may be easier to overcome than those in the general population. Legislative actions and government function involve relatively limited numbers of people with

varying degrees of authority. In general, government members have a greater understanding of the technical aspects of climate change compared to the general population.

Strengthen Implementation and Enforcement of Building Codes

Establishment of improved building codes under legislative action was a necessary first step. Follow-on actions of implementation and enforcement are necessary if the first step is to be of benefit. Increasing the number and capacity of the CNMI's Department of Public Works (DPW) staff as the front-liners of building code authority is a primary goal. Doing the same for the review agencies with authority for planning and environmental approvals is equally important. Progress of a proposed development project from concept, through planning, design and construction, and finally operations is a multi-layered and overlapping process. Cohesion with regard to adherence to building codes is necessary among all relevant government authorities if building codes are to be effective. Technical and administrative training for a range of government staff, especially DPW, is essential.

Fully Support Infrastructure and Recovery Program

As discussed earlier, the IRP plays a critical role as liaison between Federal partners and local agencies for moving infrastructure projects through the complex phases of concept, planning, funding, design, and construction. Continued investment in project management and implementation support is recommended to assist in timely execution of federally funded projects in the CNMI.

Government Agency Revision of Regulations for Land Use Practices to Incorporate SSG

The CNMI government is well situated to implement SSG because it exercises authority over resources through land use planning, zoning, capital investment programs, building codes, permitting, and development of utilities and transportation infrastructure. Updating regulations to incorporate SSG Principles is a "no-regrets" strategy that should be pursued immediately. Proactive land use planning is one of the most cost-effective actions to reduce future vulnerabilities and to maintain future adaptive capacity. The CNMI regulations are generally robust, but may be improved by integrating SSG Principles to guide planning and development as detailed in the *Guidance Manual*.

In conjunction with regulations updates, permitting authorities should be empowered to expand coordination with comprehensive 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 services. Moreover, permitting authorities need the ability to sequence projects to ensure CNMI agencies can provide adequate oversight and inspections and enforcement.

Building capacity among community stakeholders also is critical in working towards SSG. SSG support from political leaders and agency leads will help CNMI mainstream SSG 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 resources to further SSG Principles voluntarily or via the permitting process. Through expanding understanding and capacity, SSG Principles can be incorporated into multiple planning levels to support more resilient infrastructure projects in the CNMI. These regulation revision actions will likely need to be continued in the medium-term.

Coordinate inclusion of SSG in all Long-Term Recovery Documents

The effort for incorporation of SSG Principles into relevant planning documents, as conducted under Task 3 of this project, should continue as a matter of routine function within OPD. As interagency work on SSG advances, all agencies should incorporate SSG into their relevant work and documents.

Encourage Implementation of Recommendations in MAT Documents

The MAT documents prepared by FEMA present excellent technical references for improving structural resilience in the CNMI. Although these products were prepared as *Yutu*-specific, the content and concepts can be generally applied for any structural development or retrofit.

Develop a Comprehensive Pre-incident Debris Management Plan

Management of vegetative debris, wreckage, and demolition / reconstruction debris are always of immediate concern following a tropical cyclone event. Developing a plan of action that establishes set-aside land, infrastructure, equipment, and an operational framework, in anticipation of severe weather events will greatly reduce post-storm response obligations.

Top-Down Driver for Planning Context: Establish Official Climate Change Scenario

Comprehensive, long-range planning must consider likely future 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. While a 3.16 meter sea level rise scenario has already been adopted for planning purposes, it is recommended that the CNMI Government also establish a range of specific climate scenarios for key variables that are projected to have a local impact (e.g., changes in precipitation, increased storm intensity). For example, planning to accommodate rain events beyond the 50-year storm in project planning could support more robust project design; an official standard would justify additional adaptation costs for federal projects and could be leveraged to obtain additional funding for locally-led projects, especially considering the current federal focus on adaptation planning and project implementation. Top-level government support will equip government decision-makers, planners, and project managers with a framework in which tools necessary to mitigate and adapt to anticipated changes in climate impacts can be

used. An official climate change scenario must be established to provide consistency across CNMI planning efforts and provide a basis to amend regulations and land use plans. For more information on climate change scenarios visit the Intergovernmental Panel on Climate Change [Emissions Scenarios website](#) or the [NCA4 website](#) or refer to (Keener et al., 2013). CNMI's [2021 Climate Change Report](#) provides information on local trends and projections and includes additional resource- and sector-specific recommendations that could also be incorporated further into policy, regulation updates, and project planning.

Continue Engagement with 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 for resilience 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 composed of 33 participating CNMI and Federal 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. Upon the creation of planning taskforces within OPD's PDAC, discussions with the RWG have continued through the "Socio-economic / Disaster Risk Reduction Taskforce" (SE/DRR TF).

This Taskforce and coordinated "All Planners Taskforce" and PDAC meetings continue to provide essential entry points to integrate SSG into 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 renewed. To support planning continuity, OPD is taking steps to establish a similar coordinator position to facilitate integration of SSG to address climate-related vulnerabilities in CNMI planning efforts which would further amplify their ability to support the SE/DRR TF and expand CNMI's baseline data regarding climate mitigation and adaptation needs and opportunities as well as avail of federal and regional funding opportunities to expand on this work. In 2022, CNMI joined the Climate Strong Islands Network, which supports island-specific planning, resource sharing, and coordination. Additional staffing could further amplify this partnership and facilitate updates of existing vulnerability assessments that could inform mitigation and adaptation planning needs that could be further incorporated into future CSDP updates. In the meantime, agency leads can 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 SE/DRR TF as well as the other PDAC Planning Taskforces (Natural Resources and Built Environment) should continue to receive adequate training in climate change science, be familiar with hazards identified in the CNMI *Standard State Mitigation Plan* (2018) and the *Climate Vulnerability Assessments for the Islands of Saipan* (2014) and *Rota and Tinian* (2015). In addition, agency leads must be familiar with SSG Principles, adaptation tools, and potential funding sources. 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 these climate-specific planning efforts.

Continue the GIS User's Group

Reliable access for all CNMI agencies to a consistent, accurate, and up-to-date 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. Since its creation, due to its mandate to create a centralized data library which includes geospatial systems, OPD has been facilitating regular meetings of the GIS Users Group (Marianas Mappers).

To continue to improve coordination and transfer of GIS-relevant information between agencies, and as reflected in OPD's Annual Reports, the CNMI should allocate resources to retain staffing to support the development and management of its centralized GIS and information database. Expanding the present system supporting the SSG Assessment Tool hosted by BECQ to create a CNMI-wide accessible system – perhaps one that does not require an ArcGIS account to use published layers – may be the most efficient and cost-effective way to expand accessibility and use of this system moving forward. As the clearinghouse for all planning related information, OPD appears to be the designated entity to compile and manage this growing data set, and has been working to compile and administer GIS resources and provide training and technical assistance to develop, maintain, and utilize the GIS information. Several agencies such as BECQ and the Department of Public Lands (DPL) have well-developed GIS data on natural hazards, land use practices, and several local government functions. Through OPD coordination and administration, GIS data from multiple agencies should continue to be shared to establish comprehensive GIS collections to provide consistent and standardized geospatial information for planning, development, and construction activities.

4.3 Recommended Medium-Term (4-6 years) Actions

Continued Implementation of Comprehensive Sustainable Development Plan

Work towards full implementation of CSDP medium-term action items for the 3-5 year smart objectives, planning elements and policy recommendations. Update all implementation plans. Conduct the envisioned five-year updates of the Resources Report in 2023-2024 to update implementation actions and priorities for the 2025 CSDP update.

Prepare an Updated Comprehensive Vulnerability Assessment

Vulnerability assessments currently available for the CNMI are risk-specific and typically location-specific, such as shoreline inundation, or are based on community feedback regarding perceived risk (2014 Saipan Vulnerability Assessment, 2015 Tinian and Rota Vulnerability Assessment).

The vulnerabilities of infrastructure and communities to natural hazards in the future due to changing climate conditions cover a range of land and sea scenarios. A single comprehensive vulnerability document incorporating revised information and quantitative rather than qualitative risk analysis will serve as a reference work that can be used by relevant government agencies. This will promote and maintain consistency for advancing the doctrine and practice of SSG in the CNMI. Village-level geospatially grounded risk analysis could further be developed in a comprehensive vulnerability assessment or in village-specific management plans to support communications, coordination, and action to mitigate and adapt to priority risks.

Develop and Promote SSG Implementation Through Multiple Incentive-based Strategies

Incentive strategies are provided in section 5.4. and in the *Guidance Manual*. Incentives for private-sector developers are most often economic. Profitability is the dominant criterion for private-sector developers, and investors, especially in the short-term. Incentive-based strategies to encourage developers to incorporate SSG Principles into projects to improve resiliency of the built environment over the long-term under conditions of a changing climate must be based on economic viability. SSG consistency in project scoping and development could be included in the existing permit incentives program with the Coastal Resources Management Agency Board for major siting projects and could be expanded to support SSG alignment with other projects as well.

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 on western shores of Saipan. Sea level changes will also increase the loss of coastal ecosystems and beaches, which will have negative consequences for the CNMI tourism sector, artisanal fishery, and public health due to loss of open recreational open space.

While agency leadership has already *endorsed* the 3.16 meter sea level rise scenario, formerly adopting government endorsed standards to avoid and address coastal flooding based on SLR and SLC is strongly recommended. A government-adopted 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 earlier 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 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 adaptive capacity to reduce vulnerabilities of development to 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.

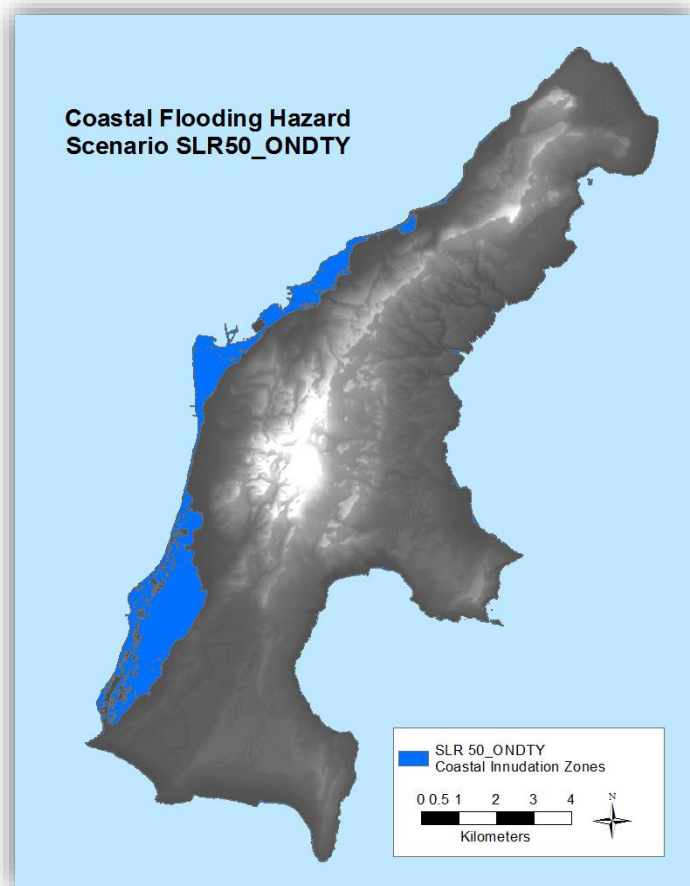


Figure 4.1 Projected coastal flooding hazard zones based on the selected SLR and SLC scenario SLR50_ONDTY.

An *ad hoc* sea level planning committee was convened by the OPD and facilitated by NOAA to select and agree on a recommended flood hazard scenario for new infrastructure and development. The committee, comprised of representatives from the PDAC’s Planning Taskforces including the State Hazard Mitigation Officer and other representatives from the Hazard Mitigation Grant Program, BECQ, DPW, DPL, and the Department of Land and Natural Resources, endorsed a scenario (Table 4.1) with a standard of cumulative sea-level change (SLC) of 3.16 meters above the current level by the year 2067, which incorporates 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 year SLR + OND Seasonal 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 US-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 US 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 as an executive order or regulatory requirement with standards for SLR and SLC, all CNMI agencies should incorporate the coastal flooding hazards into plans and regulations updates. In 2022, Kauai County, in the State of Hawaii, adopted a new building ordinance to amend construction and design standards to address future impacts from sea level rise on annual high-wave run up and passive flooding (see section 5.1 for a case study). Also Maui County, in the State of Hawaii, adopted rules to expanded shoreline set backs to address accelerated coastal erosion due to projected sea level rise. These shoreline set-back requirements exceed State of Hawaii requirements and help maximize protection for property owners from coastal erosion and preserve coastal resources and access. Moreover, CNMI should support land exchange programs and encourage investment in nature-based solutions to address impacts from enacting such policies and to promote resilience and adaptation to climate change. Section 5.1 for case studies for Maui and Kauai Counties.

For the CNMI, coastal flooding hazard maps are developed, updated, and maintained by the BECQ and are available on line at: [DCRM Maps](#). Updates to the flood hazard zone maps are currently underway, with OPD coordinating data collection and community outreach needs with BECQ’s Division of Coastal Resources Management, which administers high hazard flood zones as an APC, as well as DPW’s Floodplain Administrator, the State Hazard Mitigation Officer, and the Hazard Mitigation Grant Program. The continued coordination of this group to support updated data collection and regulatory and policy revisions is critical to help identify and mitigate risks of coastal and terrestrial flooding to reduce risks to people as well as the built and natural environment.

Require Mandatory Sea-level Rise Disclosures for Sellers and Lessors of Real Property

In 2022 Hawaii became the first state in the nation to enact a law requiring sellers of real property to disclose during the transaction whether the property lies in an area susceptible to impacts from

a projected 1-meter (3.2-foot) increase in sea level⁴. This recommendation is dependent of an official government SLR/SLC scenario. Regulations governing real estate transactions should be revised to include a sea-level rise disclosure as part of the due diligence requirements when selling or leasing coastal property vulnerable to changing sea conditions.

Develop Technical Guidance Manual for Soft Shorelines and Living Breakwaters

Green (soft) infrastructure and living breakwaters are widely regarded as fundamental adaptation strategies to improve resiliency to SLR/SLC for coastal areas. The science and technology of green infrastructure are well developed. Policies and practices and examples for living shorelines are provided in section 5. A technical guidance manual for the CNMI that presents planning and design criteria for a range of applications, and present and future climate scenarios, will provide developers and government personnel with a practical tool for selecting options to improve resiliency of the build coastal environment.

4.4 Recommended Long-Term (7-10 years) Actions

Implementation, Review and Update of the Comprehensive Sustainable Development Plan

Work towards full implementation of CSDP 10+ year goals. Complete the 10-year review and update of the CSDP.

Update the CNMI Strategic Energy Plan and Support Utility Micro-grids

In December 2022, CNMI announced plans to update the Strategic Energy Plan. The updated plan will be a road map for developing cost-effective energy management solutions. The draft Strategic Energy Plan summarizes existing technologies, provides an energy analysis, explores energy options and strategies, reviews energy policy, and provides recommendations. The updated plan will provide roadmaps for recommended actions, with timelines, for Saipan, Tinian, and Rota. The update of this plan is timely with the release of the Biden-Harris Administration National Initiative to Advance Building Codes. Plan reviewers and authors should ensure the draft Strategic Energy Plan conforms to new Department of Energy guidance to support resilient and efficient building code adoption (see Section 5.1 for links to the initiative).

The plan addresses establishing microgrids under limited conditions at new homestead developments. Microgrids support a flexible and efficient electrical grid by enabling integration of growing deployments of distributed energy resources such as renewables like solar. The draft Strategic Energy Plan targets expanding energy production via rooftop solar photovoltaic systems. Expanding the use of microgrids in coordination with increased rooftop solar PV energy production, and if feasible, is recommended. Because microgrids are able to operate while the main grid is down, microgrids can strengthen grid resilience and help mitigate grid disturbances as well as function as a grid resource for faster system response and recovery. In addition, the

⁴ H.B. 554 HD1, 2021 Thirty-first Legislature, Regular Session (HI 2021).
https://www.google.com/search?q=Hawaii+HB+554+HD1&rlz=1C1CHBF_enUS826US826&oq=Hawaii+HB+554+HD1&aqs=chrome..69i57j69i64.10477j0j7&sourceid=chrome&ie=UTF-8#ip=1

use of local sources of energy to serve local loads helps reduce energy losses in transmission and distribution, further increasing efficiency of electricity delivery. Microgrid information and examples are provided in section 5.3.

Planning and Funding Horizons for Utilities and Services

Planning horizons are steered by the durability of the planned structure and are often coupled with estimated capacity to serve an intended population over a period of projected growth. For example, traditional planning and engineering practice would specify the materials to construct a bridge are selected to last 50 years and the number of lanes (bridge width) are based on the expected population growth in the area over the same period. However, with the progression of climate change, traditional planning and engineering practices have far less future certainty than once relied upon.

Under the expectations of a changing climate, planners will need to look at longer and more uncertain planning horizons in an attempt to account for and adjust to changing natural hazards. Climate conditions of the future may be increased precipitation or stronger storm winds and a bridge built today should be designed to manage those anticipated conditions.

In short, to protect today's investments the designs of today must address the anticipated climate change-driven 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 50-year horizons and utilize an established climate change scenario. Continued coordination within the Built Environment Taskforce can further help to align utility planning and implementation projects so improvements can be incorporated into scheduled system upgrades for roads, stormwater, water/waste water, broadband, and energy projects in particular.

The current planning envelope in CNMI for buildings, utilities, and services ranges between 30 and 50 years with some large-scale projects aimed at 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.

5.0 CASE STUDIES; POLICIES, STRATEGIES, ACTIONS, AND INNOVATIVE INCENTIVES IMPLEMENTED TO ADVANCE SSG

The following sections provide overviews of relevant case studies and examples of strategies, actions, policies, and innovative incentives implemented by communities to incorporate SSG Principles into work-cultures and lifestyles. These resources offer suggestions and examples of opportunities for CNMI to proactively embed SSG Principles into present and future development.

A brief synopsis of each initiative is provided and the reader is directed to a website for a full description and further reading.

These case studies represent only a small proportion of the many SSG implementation initiatives currently in place, and are intended to demonstrate how agency leaders can pursue their own data-base of practical SSG actions.

5.1 Policy-based Initiatives

Modernize Building Codes, Improve Climate Resilience, and Reduce Energy Costs

The Biden-Harris Administration announced in June 2022 a National Initiative to Advance Building Codes to help state, local, Tribal, and territorial governments adopt the latest building codes and standards to improve climate resilience and reduce energy costs. Federal agencies, such as FEMA, HUD, and the Department of Energy, are tasked with ensuring programs and policies employ and require the use modern building codes to the greatest extent possible. Communities that adopt modern building codes may be better positioned to secure federal grant funds.

<https://www.whitehouse.gov/briefing-room/statements-releases/2022/06/01/fact-sheet-biden-harris-administration-launches-initiative-to-modernize-building-codes-improve-climate-resilience-and-reduce-energy-costs/>

US EPA Smart Growth Fixes for Climate Adaptation and Resilience

US EPA provides information on how to change land use and building codes and policies to prepare for climate change and how to overcome barriers to climate adaptation. Adaptation to flooding and extreme precipitation, sea level rise, extreme heat, drought, and wildfire are covered along with numerous case studies.

<https://www.epa.gov/smartgrowth/smart-growth-fixes-climate-adaptation-and-resilience>

Sustainability Best Practices Framework

The Institute for Local Governments established the Sustainable Communities Program to assist local governments with establishing BMPs for continued sustainable growth initiatives. The *Sustainability Best Practices Framework* developed for California includes several policy recommendations to improve sustainability in 10 key areas. Many of these recommendations can be applied to other communities to enhance their sustainable development goals and targets.

Institute for Local Government: <https://www.ca-ilg.org/>

Sustainability Best Practices Framework: http://www.ca-ilg.org/sites/main/files/file-attachments/sustainability_best_practices_framework_7.0_version_june_2013_final.pdf

National Wildlife Federation Softening Our Shorelines

The National Wildlife Federation provides policies and practices for living shorelines along the Gulf and Atlantic coasts. Permitting, barriers to living shoreline approaches, opportunities and federal and state level recommendations are provided. State level policies relevant to living shorelines for eighteen (18) states including examples/case studies are also provided.

<https://www.nwf.org/SofteningOurShorelines>

Mandatory Sea Level Rise Disclosure

In 2022, Hawaii became the first state in the nation to enact a law requiring sellers of real property to disclose during the transaction whether the property lies in an area susceptible to impacts from a projected 1-meter (3.2-foot) increase in sea level.

https://www.capitol.hawaii.gov/session2021/bills/SB474_CD1_.HTM

County-Level Plans and Rules to Address Impacts of Projected Sea Level Rise

In 2022, Kauai County, in the State of Hawaii, became one of the first counties nation-wide to require new construction and design standards based on projected impacts of sea level rise on annual high-wave runup and passive flooding. The new building ordinance creates a Sea Level Rise Constraint District in the Comprehensive Zoning Ordinance. New standards include raising residential buildings 2 feet and nonresidential structures 1 foot above the highest projected flood elevation under future sea level rise projections. The Kauai planning department has developed an online atlas and reporting tool – *County of Kauai Sea Level Rise Constraint District Viewer* to allow applicants to select a location and determine if it is within the constraint district and the maximum flood depth a proposed structure will be exposed to.

Maui County was the first in the State of Hawaii to adopted new [shoreline set-back rules](#) to address projected sea level rise. The expanded set-back areas foster greater protection from coastal hazards including floods, storm surge, high-surf and erosion and help maximize protection for property owners and preserve coastal resources and access. Through the permitting process, Maui County encourages soft approaches to shoreline protection such as beach nourishment and living shorelines. A shoreline set-back variance is normally required when hardening the shoreline is proposed. In addition, Maui and Hawaii State Maui County funded the development of an online Shoreline Erosion Atlas to help planning department personnel and property owners project erosion rates for specific properties or locations. Moreover, Maui County and the State of Hawaii encourage investment in nature-based solutions to promote resilience and adaptation to climate change ([A Climate Ready Hawaii](#)).

In 2012, Maui County adopted the [Maui Island Plan](#) to guide future growth through 2030. This long-range plan recommends establishing transfer and purchase of development rights (TDR/PDR) programs as strategies to preserve agricultural lands and to acquire lands for preservation, parks, and greenways/greenbelts and sensitive land (i.e., lands with development constraints). TDR/PDR programs are considered as implementation strategies to achieve growth goals established in the *Directed Growth Plan*, Chapter 8 of the *Maui Island Plan*. In 2009, Maui

County Council considered a preliminary draft ordinance for PDR, but the Council has not promulgated the ordinance to date.

5.2 Strategy-based Initiatives

Guidance for Addressing Sea Level Rise in Community Planning in Hawaii

The guidance document has recommended practices, examples, and resources to assist county government in addressing sea level rise and coastal hazards as part of county planning and implementation framework.

<https://climate.hawaii.gov/wp-content/uploads/2020/10/Item-3-I-a-Guidance-for-Addressing-SLR-in-Community-Planning-in-HI-2.pdf>

Creating Safe Growth Strategies for the San Francisco Bay Area

This case study describes a project that developed strategies to help reduce the vulnerability of development so that all growth is smart and safe. With the help from US EPA's Smart Growth Implementation Assistance Program the project included two major phases, a comprehensive vulnerability assessment and development of 40 resilience strategies.

<https://www.epa.gov/smartgrowth/creating-safe-growth-strategies-san-francisco-bay-area>

US Climate Resilience Toolkit

The Climate Resilience Toolkit provides information and case studies of protection strategies used by Pacific Islands and other regions for climate resilience to drought, water supplies, shoreline erosion, coral reefs, and wetlands.

<https://toolkit.climate.gov/regions/hawai%E2%80%98i-and-pacific-islands>

HUD Community Resilience Toolkit

The Community Resilience Toolkit provides recipients of HUD funds identify opportunities to use their Community Planning and Development dollars to mitigate the impacts of natural hazards. It provides information and case studies of strategies used to mitigate natural hazards including increasing temperatures, sea level rise and coastal storms, inland flooding, wildfires, drought, and erosion. A financing section with other funding opportunities is also provided.

<https://files.hudexchange.info/resources/documents/HUD-Community-Resilient-Toolkit.pdf>

US Dept. of Transportation (DOT) Nature-Based Solutions for Coastal Highway Resilience

US DOT provides an implementation guide for nature-based solutions for coastal highway resilience along with numerous case studies and pilot projects.

<https://highways.dot.gov/public-roads/autumn-2021/02#:~:text=The%20term%20%E2%80%9Cnature%2Dbased%20solutions,shoreline%20stabilization%20and%20protection%20techniques.>

https://www.fhwa.dot.gov/environment/sustainability/resilience/ongoing_and_current_research/green_infrastructure/implementation_guide/

US EPA Planning for Natural Disaster Debris

This planning guide provides a comprehensive planning process for natural disaster debris including conducting pre-planning activities, developing a Pre-incident Debris Management Plan, implementing the plan during a natural disaster. Lessons learned from past disasters are provided with BMPs and numerous case studies.

<https://www.epa.gov/homeland-security-waste/guidance-about-planning-natural-disaster-debris>

5.3 Action-based Initiatives

FEMA Mitigation Planning Success Stories

The FEMA website for Mitigation Planning and Resilient Communities provides a wide range of interactive success stories.

<https://www.fema.gov/flood-maps/tools-resources/risk-map/story-maps>

US Department of Energy Microgrid Portfolio

The US Department of Energy has a comprehensive portfolio of activities that focuses on the development and implementation of microgrids to further improve reliability and resiliency of the grid and help communities better prepare for future weather events.

<https://www.energy.gov/oe/microgrid-portfolio-activities>

Green Mountain Power Pioneering Microgrids

Green Mountain Power (GMP) in Vermont has deployed cutting-edge utility microgrids to make the state cleaner and more resilient. The microgrids are smaller grids that can operate independently, disconnecting from the large grid during outages. GMP is the first utility in the country to island a distribution circuit using inverter-based sources (batteries and solar panels) with no reliance on fossil fuel generation backup. GMP also deploys batteries in customer's homes and businesses that provide power during outages and drive down costs and carbon emissions on peak energy days.

<https://greenmountainpower.com/news/gmp-announces-pioneering-microgrid-in-panton-vt/>

Babcock Ranch, Florida, Community Renewable Energy Resilience

Babcock Ranch, a planned community of 2000 in Florida, with a focus on sustainability and renewable energy, is the first solar-powered town in America. In partnership with Florida Power & Light, Babcock Ranch houses a solar energy center with an 870-acre solar array made up of 650,000 solar panels with a 150 Mega Watt capacity. The ranch houses the largest solar-plus-storage system operating in the United States today. Ten large steel battery storage units can store 1 Mega Watt of power and discharge for 4 hours. The battery storage system ensures a

steady supply of power on partly cloudy days and at night. Babcock Ranch is a Hurricane *Ian* (August 2022) success story. Hurricane *Ian* knocked out power to 4 million customers in Florida and caused up to \$47 billion in damages. Babcock Ranch never lost power and was left largely unscathed by this Category-5 storm.

<https://babcockranch.com/Babcock>

<https://www.cnn.com/2022/10/02/us/solar-babcock-ranch-florida-hurricane-ian-climate>

FEMA Building Codes Save: A National Study

FEMA conducted a national study that provides a strong incentive for communities nationwide to adopt and implement modern hazard resistant I-codes such as the CNMI 2018 IBC. Adoption of the codes brings compelling economic benefits and cost savings and can save billions in annual losses. Accumulated savings in small communities will make the difference between a debilitating disaster and a resilient recovery.

<https://www.fema.gov/emergency-managers/risk-management/building-science/building-codes-save-study>

FEMA conducted a nationwide study on losses avoided as a result of adopting hazard-resistant building codes, which was informed by national study above.

https://www.fema.gov/sites/default/files/2020-11/fema_building-codes-save_study.pdf

National Institute of Building Sciences Report on the Value of Mitigation

A detailed analysis of the costs and benefits of specific public-sector mitigation strategies the project team studied including For flood resistance, acquiring or demolishing flood-prone buildings and for wind resistance, adding hurricane shutters, tornado safe rooms and other common measures.

<https://www.nibs.org/news/national-institute-building-sciences-issues-new-report-value-mitigation>

Staten Island Living Breakwaters Project

New York used HUD Rebuild by Design funding to provide a layered resiliency approach for shorelines to promote risk reduction through erosion prevention, wave energy attenuation, and enhancement of ecosystems and social resiliency.

<https://stormrecovery.ny.gov/living-breakwaters-project-background-and-design>

Shoreline Management

NOAA is leading innovative approaches to managing shorelines using nature-based techniques such as living shorelines. NOAA has developed guiding principles and a framework for considering using living shorelines. A living shore is a protected, stabilized coastal edge made of natural materials such as plants, sand, or rock. Compared to engineered approaches, nature-based solutions offer several environmental benefits including water purification, a buffer for

floods, erosion reduction, carbon storage, and enhancing or creating wildlife habitat. NOAA maintains a nation-wide database of implemented living shore projects.

<https://www.habitatblueprint.noaa.gov/living-shorelines/leading/>

However, it is important to consider local conditions when planning shoreline management. The State of Hawaii and Maui County have developed a permitting process to manage beach nourishment projects and to control coastal erosion control. The permitting process allows the State and County to better control activities and ensure solutions are designed and appropriate for local conditions and environments.

Hawaii Department of Land and Natural Resources: <https://dlnr.hawaii.gov/occl/beach-restoration/>

Maui County: <https://www.mauicounty.gov/696/Shoreline-Setback-Area-Permits>

5.4 Innovative Incentives-based Initiatives

Communities have found that an effective strategy to promote SSG is to incentivize the market by providing advantages for selection of SSG Principles in present and proposed developments. Incentive examples are provided below along with links to additional information.

Natural Resource Conservation Service (NRCS) Agricultural Conservation Easement Program

NRCS provides assistance for purchasing Agricultural Land Easements. Examples provided include preserving family farms and protecting wildlife habitat to protect agriculture uses and conservation values of land, and restoration of wetlands to protect fish, improve water quality, and provide critical habitat for birds.

<https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/acep/>

NRCS Environmental Quality Incentives Program

NRCS now provides incentive contracts for financial assistance for climate smart agriculture.

<https://www.usda.gov/media/press-releases/2022/01/10/usda-offers-expanded-conservation-program-opportunities-support>

https://www.nrcs.usda.gov/Internet/FSE_MEDIA/nrcseprd1801047.pdf

Wildfire Victims Green Rebuild Incentives

Marshall Colorado had just adopted new green building codes in 2021 when a fire hit and incinerated more than 1000 homes. Citizens were concerned the new codes would make rebuilding more expensive. The community ended up making the new code optional for fire victims. The State stepped in and together with Colorado's largest power company now offers cash rebates for climate-friendly rebuilds. A team of architects and builders crafted a plan for passive homes (RESTORE Passive House) to take advantage of those incentives. Approximately

one half of the fire victims plan to use the green building incentives. Incentives include a \$10,000 state incentive for all-electric appliances and the power company offers a \$37,500 discount. Smaller rebates are available for homes built with less-stringent green building standards.

<https://www.treehugger.com/restore-passive-house-marshall-fire-victims-colorado-6747400>

<https://www.passivhaus.city/>

<https://www.cpr.org/2022/09/30/marshall-fire-climate-friendly-homes/>

Study of Incentives Driving Improvement of Environmental Performance of Companies

This study provides information and case examples of administrative, economic, and reputational incentives. Principle findings are that incentives are increasingly being used, regulation is an important incentive, and economic and reputational incentives appear to be the most effective elements.

https://ec.europa.eu/environment/pubs/pdf/Incentives_Ecorys.pdf

6.0 CONCLUDING REMARKS

Smart, Safe Growth is achievable for the CNMI over the long term and will result in progress towards sustainable development goals. Persistent application of SSG Principles for planning documents and development projects, whether these be for government, utility, or private-sector, will continue to 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 in the CNMI. Daunting as the prospect of broad-scope change may seem, it is important to begin the groundwork.

Government has a critical role in achieving SSG. Leadership support, legislative action, regulatory consistency and cohesion in government actions are key. Leadership and continued coordination 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 economic 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 the 2018 *Guidance Manual*, and the use of the various tools, to the extent practicable within budgets and staffing, will continue to propel the CNMI on its trajectory towards *Smart, Safe Growth*.