NOAA Technical Memorandum CRCP 34

National Coral Reef Monitoring Program Socioeconomic Monitoring Component

Summary Findings for CNMI, 2016

NOAA Coral Reef Conservation Program

Silver Spring, MD

April 2019

United States Department of Commerce	National Oceanic and Atmospheric Administration	National Ocean Service
Wilbur R. Ross Secretary	Neil Jacobs Acting NOAA Administrator	Nicole LeBoeuf Acting Assistant Administrator

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About this document

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For further information direct inquiries to:

NOAA Coral Reef Conservation Program
Office for Coastal Management, National Ocean Service
National Oceanic and Atmospheric Administration,
1305 East-West Highway, Silver Spring, Maryland 20910
http://coralreef.noaa.gov/
http://www.coris.noaa.gov/monitoring/socioeconomic.html

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Executive Summary

The Socioeconomic Component of the National Coral Reef Monitoring Program (NCRMP) is currently in the process of monitoring socioeconomic indicators across all United States (US) coral reef territories and jurisdictions. These indicators fall under the following broader categories: the demographics of these areas, human use of coral reef resources, and knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal of this endeavor is to track relevant information regarding each jurisdiction's population, social and economic structure, society's interactions with coral reef resources, and the responses of local communities to coral management. From there, these baseline data are used to develop indicators that describe the state of each jurisdiction and provide researchers with the ability to compare jurisdictions to one another. The National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) will use the information for future research, to assess the socioeconomic outcomes of management activities, and to improve the results of programs designed to protect coral reef resources.

This report outlines human dimensions information relevant to coral reef resources in the Commonwealth of Northern Mariana Islands (CNMI). The findings were derived from a combination of data gathered through household surveys conducted from August 2016 to April 2017 and additional secondary sources of socioeconomic information for the region.

With respect to human participation in recreational coral reef-related activities, the surveys demonstrated that CNMI residents participate in swimming and beach recreation most frequently. Additionally, 38% of residents indicated that they participate in fishing or gathering of marine resources. Perceptions concerning the current condition of marine resources were mostly neutral to good; however, survey results indicate that perceptions concerning the change in condition of marine resources over the last 10 years were mostly negative. Surveys also revealed that CNMI residents generally support a range of potential marine management policies and regulations, and are moderately familiar with the various threats facing coral reefs (such as typhoons, pollution, and coastal development).

The population of CNMI decreased between 2000 and 2010, and increased slightly from 2010-2016, but is still down over 20% since 2000. In addition to a declining population, the jurisdiction faces a number of other social challenges including a declining real median household income, an increasing poverty rate, and increasing dependence upon public assistance income in the territory.

Coral bleaching, coral diseases, invasive species, and physical damage have contributed to the declining health of the reefs. This fact, coupled with the increased frequency of natural disturbances and pressures from coastal development (Puglise and Kelty, 2007), exemplifies the influence humans can have on the environment in this region. Conversely, it is also important to note that island and coastal communities are positively connected to coral reef resources through

continued subsistence and cultural-based fishing, the tourism industry, commercial fishing, and a range of recreational activities enjoyed by residents.

There were key lessons learned from this first NCRMP socioeconomic data collection in CNMI. This was the second iteration of the NCRMP socioeconomic survey that distinguished between fish/seafood consumption and reef fish/seafood consumption. However, a need still exists to distinguish between locally caught and imported fish. Further, there is still a desire to address residents' willingness to pay for coral reef protection to lend context to the value people place on coral reef ecosystems. As similar surveys are implemented across other US coral reef jurisdictions, the NCRMP team will be making adjustments to the data collection effort to improve on the type of information being generated. Thus, the findings contained within this report should be considered a starting point to the development of more detailed research questions for future work. Surveys are planned to be repeated in each US coral reef jurisdiction after the completion of a full monitoring cycle, approximately once every five to seven years.

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List of Acronyms

ACS	American Community Survey
BEA	Bureau of Economic Analysis
BECQ	Bureau of Environmental and Coastal Quality
BLS	Bureau of Labor Statistics
CATI	Computer Assisted Telephone Interviewing
C-CAP	Coastal Change Analysis Program
CNMI	Commonwealth of Northern Mariana Islands
CRCP	Coral Reef Conservation Program
ENOW	Economics – National Ocean Watch
ENSO	El Niño-Southern Oscillation
EPA	Environmental Protection Agency
GDP	Gross Domestic Product
GIS	Geographic Information System
HHS	Department of Health and Human Services
HIES	Hawaii International Environmental Services
MPA	Marine Protected Area
MVA	Marianas Visitors Authority
NCCOS	National Centers for Coastal Ocean Science
NCRMP	National Coral Reef Monitoring Program
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NWS	National Weather Service
OCM	Office for Coastal Management
OMB	Office of Management and Budget
OR&R	Office of Response and Restoration
PIFSC	Pacific Islands Fisheries Science Center
RDD	Random Digit Dialing
SCUBA	Self Contained Underwater Breathing Apparatus
UNEP	United Nations Environment Programme
US	United States
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
WTP	Willingness to pay

Introduction

In 2007, the National Oceanic and Atmospheric Administration's (NOAA) Coral Reef Conservation Program (CRCP) underwent an external review by an expert panel to provide an independent assessment of the CRCP's effectiveness in meeting its mandates and to suggest recommendations for future improvement. Some major recommendations from the external review included increasing the CRCP's social science portfolio, strategically using social science to improve coral reef management by engaging local communities, and better assessing the social and economic consequences of management policies, interventions, and activities on local communities. In response, the *CRCP Social Science Strategy* (Loper *et al*., 2010) recommended three priority activities:

1. Development of a set of national-level social science indicators
2. Collecting these indicators via regular and repeated jurisdictional surveys
3. Increasing social science capacity within the coral reef conservation program.

In 2010, the CRCP created the National Coral Reef Monitoring Program (NCRMP), which for the first time, included a socioeconomic monitoring component that would improve the CRCP's ability to track social science information in coral reef jurisdictions. The socioeconomic component of the NCRMP addresses the first two priorities. Since the socioeconomic component of NCRMP is situated within a larger social science program dedicated to a range of social science activities in United States (US) and international coral reef jurisdictions, the results of this monitoring have a wide range of applications.

The inclusion of socioeconomic indicators in the NCRMP represents a strong step forward for the CRCP, which has recognized the need to integrate socioeconomic information with biophysical indictors relevant to the conservation of coral reef resources. The main purpose of the Socioeconomic Component of the NCRMP is to answer the following questions: What is the status of human knowledge, attitudes, and perceptions regarding coral reefs? And, how are human uses of, interactions with, and dependence on coral reefs changing over time? Integration of socioeconomic information will strengthen national coral reef monitoring and improve the Program's ability to explain how people interact with coral reef resources, as well as how coral reef ecosystems and coral reef management strategies (both federal and local) are perceived by the public -- issues of utmost interest to the Program's partners, resource managers, and policy makers.

The NCRMP is an integrated long-term program designed to monitor the condition of coral reefs and coral reef ecosystems. Since 2014, the Program has been conducting sustained observations of biological, climatic, and socioeconomic indicators in US states and territories where coral reefs are present. More information about all components of the monitoring program can be explored in "NOAA Coral Reef Conservation Program: National Coral Reef Monitoring Plan" (NOAA CRCP, 2014) available at:

ftp://ftp.library.noaa.gov/noaa_documents.lib/CoRIS/CRCP/noaa_crcp_national_coral_reef_monitoring_plan_2014.pdf.

Purpose of this Report

This technical memorandum presents the findings from the initial Commonwealth of Northern Mariana Islands (CNMI) NCRMP socioeconomic data collection. The report presents preliminary social indicators and provides examples of how indicators can be used to analyze changes over time in a long-term setting. The main objective is to lay the groundwork for combining and comparing socioeconomic variables with the goal of developing meaningful indicators that can be used to examine trends in human dimensions of coral reef resources and better understand human influences on effective coral reef conservation. It should be noted that this report presents information that, in many instances, has been collected for the first time. In all instances, the information represents baseline socioeconomic data for the NCRMP. Some of the variables presented in this report identify gaps in information, and we provide suggestions on how these gaps can be addressed in the future.

Overall Approach of the Socioeconomic Component of NCRMP

The socioeconomic component of NCRMP gathers and monitors a collection of socioeconomic variables, including demographics in coral reef areas, human use of and their interactions (over time) with coral reef resources, as well as knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal is to track relevant information regarding each jurisdiction's population, social and economic structure, society's interactions with coral reef resources, and the responses of local communities to coral management actions. The CRCP will use the information in future research, to assess and monitor socioeconomic status and change over time, to assess the socioeconomic outcomes of federal and/or local management activities, and to improve programs designed to protect coral reefs within each jurisdiction. Ultimately, in consultation with stakeholders, partners, and other scientists, the information collected will inform the development of socioeconomic indicators. Socioeconomic indicators are numerical measures that describe the status of individuals or communities, comprised of one variable or several components combined into an index (Jepson and Colburn, 2013). For example, data on income, poverty rates, GDP, and employment can be combined to generate an indicator of economic security. The development of indicators is a method that allows researchers to measure the complex two-way relationship between the environment and humans and track the various facets of this relationship over time by breaking down an intellectually complex and immeasurable concept into its various smaller and more measureable parts to improve communication and policy (Schirnding, 2002).

Each indicator will be created using primary data from resident surveys in US coral reef jurisdictions and from existing socioeconomic data collected from secondary sources such as the

US Census Bureau and local government agencies. These indicators will include information about the population, the social and economic structure, the impacts of society on coral reefs, and the contributions of healthy corals to nearby residents. The indicators can also be used to track and assess the status of human knowledge, attitudes, and perceptions regarding coral reefs and management activities related to coral reef resources. The indicators and the rationale for their selection are provided below in Table 1. The process of selecting and prioritizing these indicators can be explored further in the workshop report "Developing Social and Economic Indicators for Monitoring the US Coral Reef Jurisdictions" (Lovelace and Dillard, 2012) available at: https://data.nodc.noaa.gov/coris/library/NOAA/CRCP/project/626_Loper/Social_and_Economic_Indicators_for_Monitoring_the_U.S._Coral_Reef_Jurisdictions_Workshop_Report_2012.pdf.

Indicator Development

The indicators identified in Table 1 will be developed and calculated at the conclusion of the first full monitoring cycle by combining data from **primary** and **secondary** sources (both defined below). The assessment of all US coral reef jurisdictions will draw on indicators that may be composites of multiple distinct measures that address the same higher level concepts such as 'Attitudes towards coral reef management strategies.' For example, Dillard *et al.* (2013) established a methodology for creating composite indicators of well-being in coastal communities; and this work will be used as a guide for developing indicators for the well-being of populations living in US coral reef jurisdictions. Box 1 provides a description of the conceptual framework for developing the community well-being composite indicators, as an example of the way in which multiple measures can be used to assess a single composite indicator, such as Basic Needs or Economic Security, that ultimately captures aspects of a larger concept like well-being. It should be noted that the data presented in this report represent the current status of the collection, ultimately intended to contribute to the development of indicators. Once developed, these indicators will be used to assess all US coral reef jurisdictions at the conclusion of the first full monitoring cycle. Both the primary and secondary data presented in this report serve as a snapshot of the collection and analysis of the NCRMP socioeconomic monitoring component for CNMI in 2016.

Primary Data

Primary data for the socioeconomic component of NCRMP are collected via a survey administered to individuals reporting on behalf of their households. The survey instrument is composed of one set of questions that is the same for all US coral reef jurisdictions, as well as a sub-set of jurisdiction-specific questions relevant to local management needs. NCRMP socioeconomic data are collected using a variety of modes as appropriate to the context in each jurisdiction. For example, in CNMI, a random digit dial (RDD) telephone survey method that utilized both landlines and cell phones was employed in addition to utilizing a face-to-face interview method. For all jurisdictions, the aim is a representative sample of the population that meets a 95% confidence level with a minimum of a +/-5% margin of error. The survey

methodology generally follows Dillman's Tailored Design Method (Dillman *et al.,* 2009). It should be noted that the survey was developed by utilizing questions from a "bank" of over 120 questions. These questions were approved for use by the Office of Management and Budget (OMB), which is responsible for administering the Paper Work Reduction Act (1995), the main purpose being to ensure that the public is not unduly burdened (in terms of time) and that confidentiality is assured. Surveys are planned to be repeated in each US coral reef jurisdiction after the completion of a full monitoring cycle, approximately once every five to seven years.

Secondary Data

Not only is the use of secondary data ideal for the development of a sustainable, cost effective, and long term socioeconomic monitoring plan, but secondary data is also well suited for the development of indicators used to track population and environmental trends over time. Secondary data collection involves compiling data that were gathered by other organizations from multiple sources and across US coral reef jurisdictional geographies into a centralized database. The use of data sources that are collected in a standardized way over time (such as US Census Bureau data) can help facilitate the integration of social, economic, and biophysical data collected under NCRMP because integration is aided by broad spatial and temporal coverage of social, economic, and biophysical data. Many of the secondary datasets that provide social and economic data have this quality and allow for more robust analyses with biophysical data.

Original sources for much of the secondary data presented in the report can be found in the secondary data sources table (Appendix 4). Secondary data items included in this report, but not listed in Appendix 4, are not considered part of the formal NCRMP secondary data collection because they are unique to the jurisdiction or are not available in a standardized format over time. These items may be included in the formal NCRMP secondary data collection at a later time if availability across geographies increases.

Box 1: Composite Indicator – Community Well Being

Well-being is a concept used to assess the status of people, either individually or collectively, at different scales (e.g., individual, community and national; Costanza *et al*. 2007). Well-being assessments can be used to determine how people are doing in relation to an optimum standard of life experience (Doyal and Gough 1991) and are generally used by decision-makers to inform policies and programs focused on improving the societal conditions. It provides a means of tracking the relationship between communities and the environment, and a better means of understanding the ecosystem as a whole. When the environment is providing ecosystem services that communities need and desire, well-being has positive gains. Conversely, if there is decline or disruption in ecosystem services, we may expect a decline in well-being, particularly with increased dependence on these services (Butler and Oluoch-Kosura 2006; Costanza *et al*. 1997; MEA 2005). Being able to predict the consequence to humans, both positive and negative, associated with changes in ecosystem states is critical to informed management.

Composite indicators that can ultimately be tracked alongside coral reef ecosystem condition will be employed. The composite indicators are shown in the figure below and each composite indicator is conceptually complex. At the conclusion of the first monitoring cycle, the coral reef jurisdictions like CNMI will be scored on select indicators of well-being. These scores will be compared across US coral reef jurisdictions and will then be used in statistical analyses with indicators of environmental condition to analyze the dynamic relationship between the ecosystem services that people regularly enjoy and community well-being.

Figure 1: Framework of composite indicators for well-being and ecosystem condition, adapted from Dillard *et al.* 2013

Table 1: NCRMP Socioeconomic Indicators

	Indicators	Rationale
1	Participation in coral reef activities (including snorkeling, diving, fishing, harvesting)	Measuring participation in coral reef activities enhances understanding of the economic and recreational importance of coral reefs to local residents as well as the level of extractive and non-extractive pressures on reefs
2	Perceived resource condition	Assessment of perceived conditions is a complement to biophysical information and is key to evaluating differences in levels of support for various management strategies
3	Attitudes towards coral reef management strategies	Monitoring this information over time will be valuable to decision makers, as it will provide insight into possible changes in public perception concerning coral reef management strategies
4	Awareness and knowledge of coral reefs	Monitoring this information over time is key to tracking whether the CRCP constituents understand threats to coral reefs and will help inform management strategies (and education/outreach efforts)
5	Human population trends (change) near coral reefs	Monitoring human population trends is important for understanding increasing pressure on coral reefs, as well as reef-adjacent populations
6	Economic impact of coral reef fishing to jurisdiction	Tracking the economic contributions of coral reefs can help justify funds allocated for coral reef protection
7	Economic impact of dive/snorkel tourism to jurisdiction	Tracking the economic contributions of coral reefs can help justify funds allocated for coral reef protection
8	Community well-being	Tracking changes in health, basic needs, and economic security enhances understanding of linkages between social conditions and coral reefs
9	Cultural importance of coral reefs	Measuring cultural importance improves understanding of traditional and cultural significance of coral reefs to jurisdictional residents, and whether this is changing over time
10	Participation in behaviors that may improve coral reef health (*e.g.*, beach cleanups, sustainable seafood choices)	Measuring participation improves understanding of positive impacts to coral reefs as well as negative impacts
11	Physical Infrastructure	Assessment of coastal development footprint, physical access to coastal resources, and waste management/water supply infrastructure provides general understanding of human impact on the coast
12	Knowledge of coral reef rules and regulations	Tracking this information over time at the jurisdictional/national level will inform investment in education and outreach
13	Governance	Measurement of governance provides information on the current status of local institutions involved in coral reef conservation, number of functioning management strategies, and percent area of coral reefs under protection

Geographic Scope

Overall, the NCRMP focuses on the CRCP's geographic priority areas; however, as some of those areas are uninhabited, the socioeconomic variables are being collected from only the inhabited areas. When feasible, indicators formulated at the sub-jurisdictional scale will be reported alongside biological indicators collected at the same scale. Efforts will be made to ensure sufficiently robust sample size to allow for reporting of socioeconomic indicators at

appropriate sub-jurisdictional scales. Table 2 displays the seven US coral reef jurisdictions that are encompassed by the socioeconomic monitoring effort.

Table 2: Geographic scope of current NCRMP Socioeconomic Monitoring

Location	Sampling Units
American Samoa	Island of Tutuila
Florida	Martin, Palm Beach, Broward, Miami-Dade, and Monroe Counties
Hawai'i	Islands of Hawaii, Maui, Oahu, Kauai, Molokai, and Lanai
Puerto Rico	Islands of Puerto Rico, Vieques, and Culebra
Commonwealth of the Northern Mariana Islands	Islands of Saipan, Tinian and Rota
Guam	Entire island of Guam
US Virgin Islands	Islands of St. Croix, St. Thomas, and St. John

Jurisdiction Description

CNMI is a commonwealth of the United States, and has been under territorial control by the US since the end of World War II. It consists of 14 islands (three of which are heavily populated: Saipan, Tinian, and Rota; and two of which are sparsely populated: Pagan and Alamagan) in the northwestern Pacific Ocean, with a total land area of 183.5 square miles (NOAA CRCP, 2016). The administrative center is Capitol Hill, a village in northwestern Saipan; however, most publications consider Saipan to be the capital because the island is governed as a single municipality. The Northern Mariana Islands (Figure 2), together with Guam to the south, compose the Mariana Islands archipelago. The southern islands in CNMI are made of limestone and have the oldest and most developed reefs in CNMI, which are predominantly located along the western (leeward) side. The northern islands are volcanic, with active volcanoes on several islands, including Anatahan, Pagan, and Agrihan (NOAA CRCP, 2016). Within the Mariana Archipelago, the most notable broad-scale reef-community zonation pattern exists between the northern volcanically active islands and the southern raised limestone islands (Starmer *et al.*, 2008). CNMI lies relatively close to the Indo-Pacific center of coral reef biodiversity (Veron, 2000), and possesses one of the most species-rich marine ecosystems among U.S. jurisdictions.

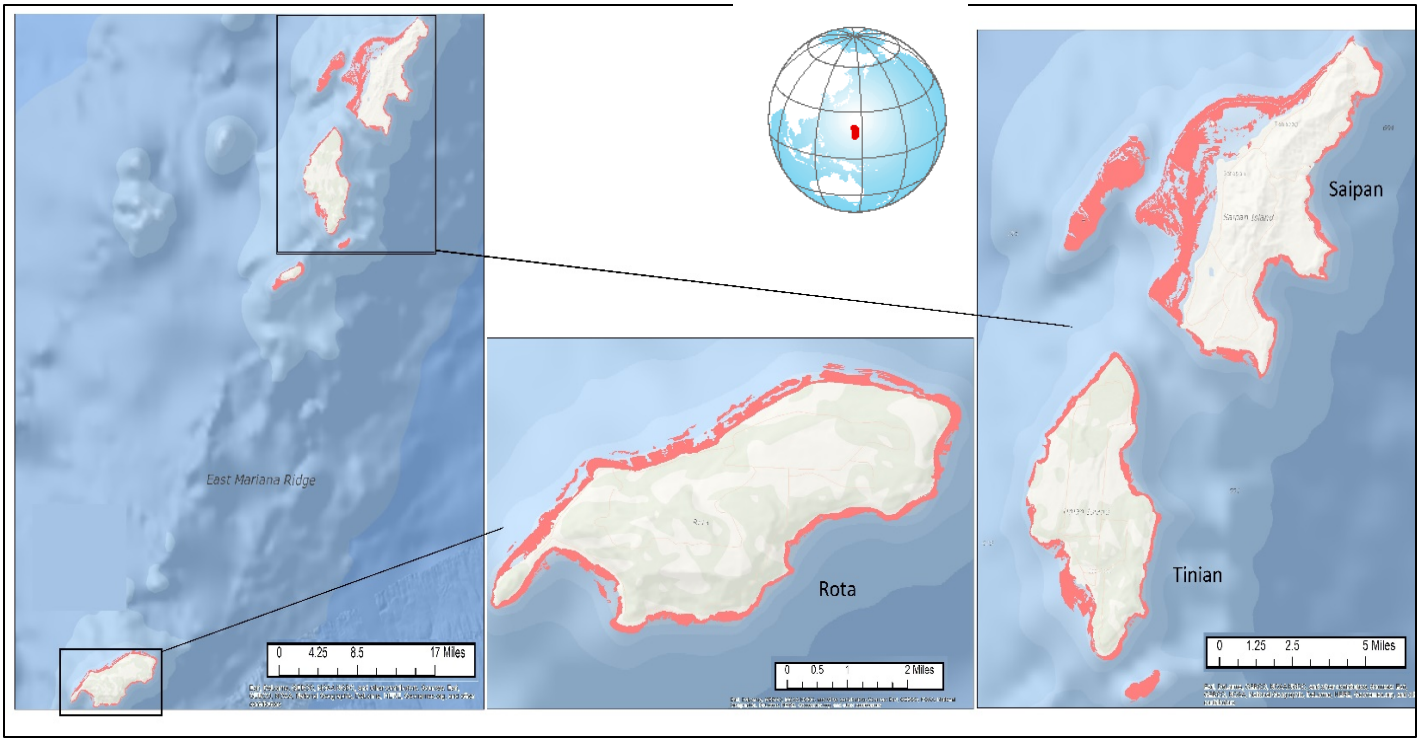

Figure 2: Location of islands in CNMI in relation to coral cover

CNMI's climate is classified as *equatorial* (Kottek *et al.*, 2006). The climate is moderated by seasonal northeast trade winds, with little seasonal temperature variation. The dry season runs from December to June; the rainy season runs from July to November, and can include typhoons. Although typhoons are more frequent during these rainy months, the threat of typhoons is a year-round reality for residents of CNMI since the Commonwealth is located in "Typhoon Alley," and it is common for the island to be threatened by tropical storms and possible typhoons. The primary ocean current that influences this region is the North Equatorial Current, flowing east to west in the tropical Pacific Ocean. CNMI is hot and humid, with a mean annual temperature of 28°C (83°F), and a mean annual rainfall of approximately 213 cm (84 inches) (Starmer *et al.*, 2008). CNMI lies within an El Niño-Southern Oscillation (ENSO) core region, which experiences interannual variations of rainfall and drought-like conditions in years following El Niño events.

CNMI has a rich cultural history and a traditionally strong association with maritime activities including fishing and navigation. Humans arrived in the Northern Marianas around 1500 BC and came to be known as the Chamorro people. The Chamorro fished for both reef and pelagic species in addition to collecting mollusks and other invertebrates. Evidence from fishbone analysis suggests that early inhabitants of the Northern Marianas used a variety of methods to harvest seafood including nets, fishing lines, baited hooks, and baskets. After 1500 AD, the Chamorro natives interacted with Spanish Europeans, leading to the Spanish-Chamorro Wars in the 1600s. After the wars, the Spanish required the natives of the Northern Marianas to move to

Guam. From the period of around 1700 until 1815, there were no permanent Saipan residents. The other indigenous culture to the Northern Marianas, the Refaluwasch (or Carolinian) people from the Caroline Islands to the south, are known to have traveled to the Marianas during the Prehistoric Period, but their visits declined during the Spanish occupation. In around 1815, a typhoon decimated the islands of Satawal and Elato in the Caroline Islands, forcing residents to move to Saipan, where they established the village of Arabwal, later known as Garapan. After that, more Carolinians arrived and settled in Arabwal. Around 1865, Chamorro began to migrate back to Saipan from Guam, moving back to their ancestral homeland and creating the unique dual-indigenous culture that CNMI has today. Fishing and harvesting persisted as main sources of livelihood throughout the colonial period and continues to this day. A key difference in modern times, however, is that revenue for fishermen is now more closely tied to tourism in CNMI, as tourists provide a significant source of demand for seafood (Allen and Amesbury 2012).

Owing to its island status and its favorable equatorial climate, CNMI is a frequently visited tourist destination for Japanese, Korean, Chinese, and US travelers alike (MVA, 2017). Tourism is an integral aspect of CNMI's economy, and on average, approximately 29.6% of tourists travel to Saipan for marine-related tourism, and this form of tourism provides millions of dollars per year in associated economic value (van Beukering *et al.*, 2006). High rates of tourism, coupled with relatively higher population density near the coast, bring even more humans in contact with coral reef ecosystems in the region; thereby creating more opportunities for humans to derive ecosystem services from reefs, but also more opportunities for human-induced stressors to impact reefs.

CNMI experienced direct impacts from two severe typhoons during 2018. In August, Typhoon Mangkhut passed over Rota, leaving significant damage in its wake. And in October, Typhoon Yutu made direct landfall on Tinian and southern Saipan, bringing devastation to people and property in CNMI, including major population centers on Saipan. With maximum sustained winds of approximately 180 miles per hour at landfall, the typhoon was one of the strongest tropical cyclones ever recorded, and recovery from the storm will likely be a prolonged effort.

Methodology

2016 NCRMP Survey

Resident surveys took place on the islands of CNMI in 2016 and 2017. Although five islands in CNMI are technically inhabited, accessibility and very small populations on Pagan and Alamagan render those islands difficult to survey; therefore, Saipan, Tinian, and Rota were the sampling strata for NCRMP in CNMI. The potential respondent universe for this study was adults, eighteen years or older, who live on Saipan, Tinian, or Rota.
The CNMI survey data collection focused on the following indicators:

- Participation in coral reef activities[1] (including snorkeling, diving, fishing, harvesting)
- Perceived resource condition
- Attitudes towards coral reef management strategies and enforcement
- Awareness and knowledge of coral reefs
- Cultural importance of reefs
- Participation in behaviors that may improve coral reef health
- Awareness/knowledge of coral reef rules and regulations

More information on the general survey methods applied can be found here: http://www.coris.noaa.gov/monitoring/resources/FAQs_NCRMP_Social_Survey.pdf, while details for the CNMI effort are provided below.

Residents of CNMI over the age of 18 were surveyed via telephone and via face-to-face interviews from August 2016 to April 2017. To achieve statistical representativeness of this target sample, the target sample size was set at 700 residents across Saipan, Tinian, and Rota. A total of 722 interviews were completed (702 by phone and 20 by face-to-face interview), yielding a response rate[2] of approximately 20% (20% for telephone and 29% for face to face interviews).[3] To obtain a sample that did not over or under-sample regions of Saipan based on population density, the 2010 US Census population density data was initially used to develop a density dependent sampling strategy. It was quickly determined from field efforts that the 2010 population data for Saipan does not accurately represent present day population distribution. This is in part due to Typhoon Soudelor, which hit Saipan directly in August of 2015 and severely impacted infrastructure and housing. Face-to-face surveyors found that many of the areas in which the 2010 census data indicated high population density were still largely abandoned as of early 2017. Without accurate density information, the survey method was changed to a random approach in which the surveyors arbitrarily chose a section of the island from digital maps and drove in this area until an inhabited neighborhood was found. If more than one residence was present, the surveyor would approach every third door. If the approached residence was abandoned, the surveyor noted this and continued to the next residence in the sequence. Face-to-face interviewers used electronic tablets or laptops with the survey instrument programmed into an application that recorded time and duration of survey, the results of each house visited (i.e. no

[1] The most direct linkage between beaches and coral reefs is through the protection afforded to beaches by coral reefs which help protect beaches from erosion due to storm events. Additionally, reefs provide material for "natural beach replenishment" (NOAA CRCP 2015). As a result of these linkages, coral reefs are important to coastal residents' and visitors' use of the beach (Shivlani 2014).

[2] A survey's response rate is the result of dividing the number of people who were interviewed by the total number of people in the sample who were eligible to participate.

[3] Final counts were for 644 Saipan, 42 for Tinian, and 36 for Rota, matching the spread of population across the three islands according to the 2010 US Census (See Appendix 3).

answer, refused survey, or successful survey), and automatically skipped questions as necessary based upon answers to previous questions.

Phone numbers were obtained from online phone books for Saipan, Tinian, and Rota and compiled into a project database. Both landline and cell phone numbers were available.[4] The database was then filtered by phone number prefix to remove the majority of non-residential numbers and categorize by island. Surveyors worked within a specific island until its quota had been met. The database was used to randomly select phone numbers, as well as track which numbers had been used and the results of each call (i.e. no answer, disconnected, refused survey, successful survey, or non-residential number). In the case of Saipan, numbers that were initially recorded as "no answer" were called again after all available numbers had been contacted once, because more surveys were needed. Numbers which were still "no answer" were re-entered into the re-call pool and used again as necessary. The CNMI online phone book was updated during the survey process, which increased the availability of working numbers and enabled the completion of the surveys. Contracted surveyors used Computer Assisted Telephone Interviewing (CATI) software for telephone surveys and offered the survey in four languages: English, Chamorro, Carolinian, and Tagalog. No names or personally identifiable information were collected during surveying. A full breakdown of the representativeness of the CNMI NCRMP sample compared to the 2010 US Census is available in Appendix 3.

This report presents a summary of select measures collected via the survey instrument and secondary data sources. A presentation on all survey data results for CNMI is available at: http://www.coris.noaa.gov/monitoring/socioeconomic.html.

Secondary Data Collection

Socioeconomic data were compiled for CNMI from secondary data sources including the US Census Bureau, the US Bureau of Economic Analysis (BEA), the US Bureau of Labor Statistics (BLS), the Environmental Protection Agency (EPA), the US Department of Health and Human Services (HHS), the National Weather Service (NWS), and local government agencies. These data were collected and analyzed at the jurisdiction level, though smaller geographies may be included in future analyses. Secondary data collection included cleaning and transforming data prior to analyses, maintaining documentation from original sources, evaluating data for errors, and other data proofing procedures.

The secondary data collection for CNMI was focused on the following indicators:

- Human population change near coral reefs
- Community well-being

[4] It is recognized that it is impossible for online phone books to have 100% of cell phone numbers in use at a given time, but it is the best and most complete database available to researchers conducting telephone-based surveys in CNMI.

- Physical infrastructure
- Economic impact of coral reef fishing to jurisdiction
- Economic impact of dive/snorkel tourism to jurisdiction

Many of the secondary data presented in this report were taken from the NCRMP socioeconomic project collection as described above. More information about original sources for these data can be found in the data sources table (Appendix 4). Secondary data items included in this report, but not in Appendix 4, are not considered part of the formal NCRMP secondary data collection because they are unique to the jurisdiction or are not available in a standardized format over time.

As the secondary data collection and final indicator development for CNMI is in progress, there are several indicators that will be more comprehensively addressed by combining the survey (primary) and secondary data. These include indicators which benefit from both existing data from management plans, as well as survey data on the involvement of local residents in resource management decisions (e.g., Governance). At the conclusion of the first full cycle of monitoring, the following indicators will be developed using a combination of primary and secondary data:

- Governance
- Community well-being
- Cultural importance of coral reefs
- Participation in behaviors that may improve coral health

Data analysis

Data analysis of both survey and secondary data included descriptive analyses (e.g., measures of central tendency, examination of distribution), as well as examinations of statistical relationships between variables (e.g., cross tabulations, correlation, regression analyses). Additionally, geospatial analyses were used to examine the extent of governance and specifically, the amount of coral reef area under protected status. Some of the key findings will be discussed in the following sections of this report.

Coral reefs in Rota, CNMI (Photo Credit and copyright: Douglas Fenner)

Results: Primary Data Indicators

Results are reported by indicator in order to demonstrate which individual measures will be used to assess the indicators presented in Table 1. The first section of indicators presented includes those measured through the use of primary survey data; the first of which is the frequency of participation in marine activities related to coral reefs, as displayed in Figure 3.

Frequency of participation in recreational and extractive activities

Figure 3 outlines residents' self-reported frequency of participation in coral reef related activities. It must be noted that these results reflect only residents of CNMI, and do not take tourist activity participation into account. Participation in non-extractive recreational reef activities varies in CNMI, with the two activities that residents participate in most frequently being beach recreation (76% participate) and swimming (70% participate). Participation in fishing and gathering (extractive activities) of marine resources is less common, with 27% of residents indicating that they fish from the shore, 21% of residents indicating that they fish from a boat, canoe, or paddle board, and 15% of residents indicating that they gather marine resources. When combining extractive activities, 38% of residents stated that they fish or gather; 13% fish from shore and from a boat; and 7% indicated that they fish from shore, fish from a boat, and gather.

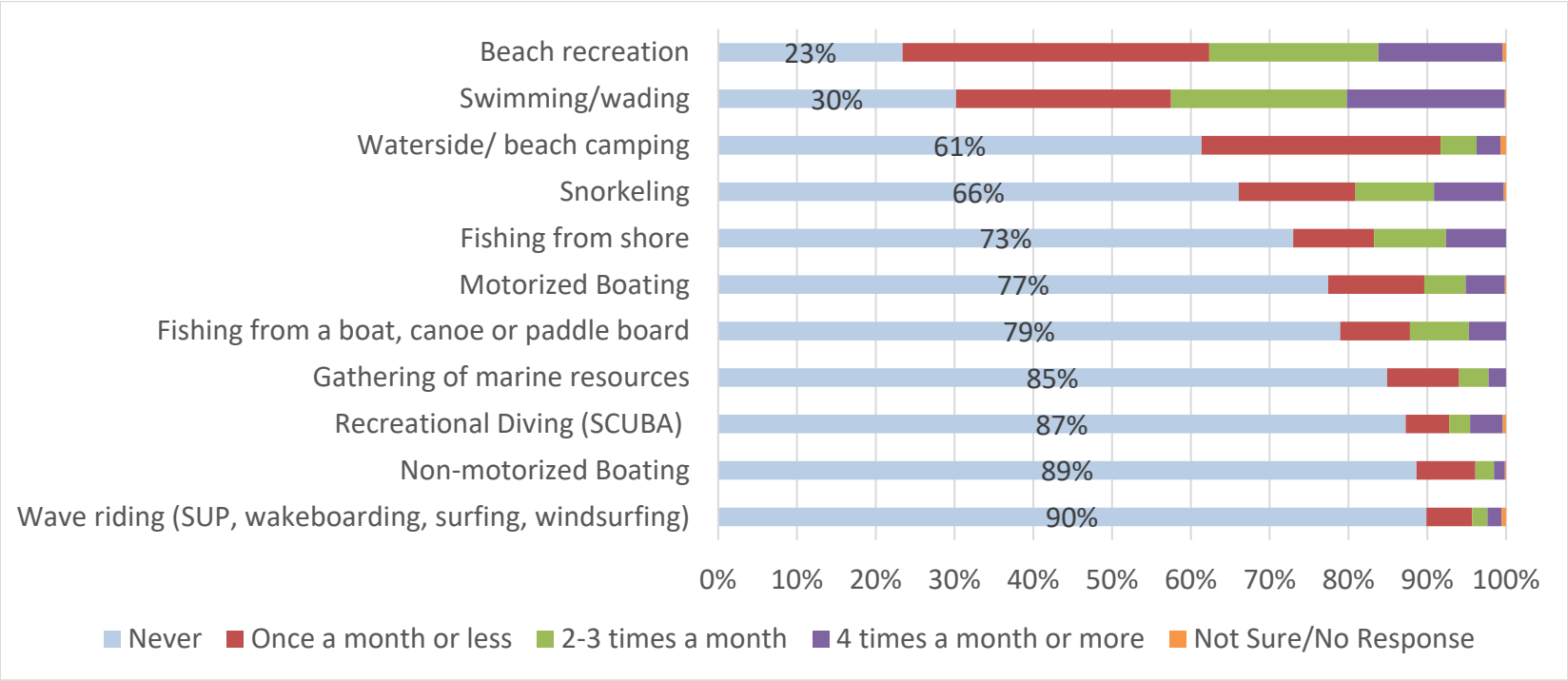

Figure 3: Frequency of activity participation (n = 722)

Figure 4 displays residents' self-reported reasons for fishing or gathering marine resources. These questions were only answered by the 277 respondents that indicated that they fish and/or gather in the "activity" question (Figure 3). Therefore, the sample size for this question is relatively small when compared to other questions in the survey. The most common reason for fishing among CNMI residents who fish is "To feed myself and my family/household;" with 95% of residents who fish indicating that they fish "To feed myself and my family/household" and 34% indicating that they do so "frequently." Of residents who fish, fishing "to sell" was the least chosen response, with 76% of residents who fish indicating that they never sell their catch.

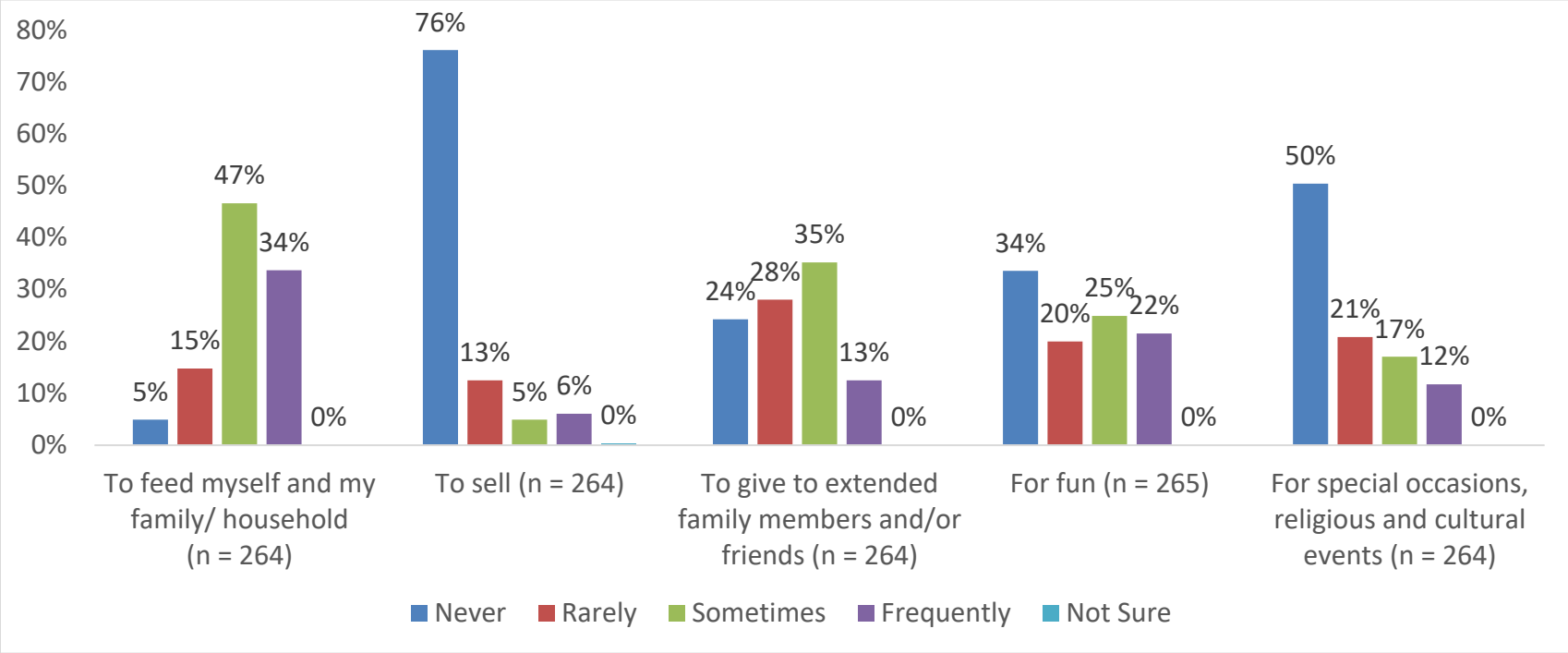

Figure 4: Frequency of fishing for various purposes in CNMI

Frequency of seafood consumption

Of the 722 people that responded to the question "How often do you or your family eat fish/seafood?" 99% indicated that they consume seafood, with 85% indicating that they consume seafood at least once a week. Of the 722 people that answered the question "How often does your family eat fish/seafood that is harvested from coral reefs?" 76% indicated that they consume seafood from coral reefs, with 33% indicating that they consume seafood from coral reefs at least once a week. When considering from where residents obtained their seafood, "purchased by myself or someone in my household at a market or roadside vendor" was the most frequently encountered response, with 73% of residents indicating that they use this source as one of their sources for seafood. This choice was followed by "purchased by myself or someone in my household at a store or restaurant" (66%). Thirty percent of residents indicated that they catch the seafood that they consume themselves.

Participation in behaviors that improve coral reef health

Residents were also asked about their environmental behavior practices (for example, participating in beach clean-ups and volunteering for an environmental group, among other practices), with the assumption being that these types of behaviors would help sustain and/or improve coral reef health in the region. Of the 721 that responded, almost three-fourths (73%) indicated that they participate in environmental behavior at any frequency, and 52% of residents indicated that they participate in environmental behavior at least "several times a year" (Figure 5). Initiatives such as the *Beautify My Marianas* program encourage pro-environmental behavior by inviting groups to apply for designated clean-ups, offering $100 for each. In 2017, 427 groups in the program collected 30,450 pounds of trash (MVA 2017).

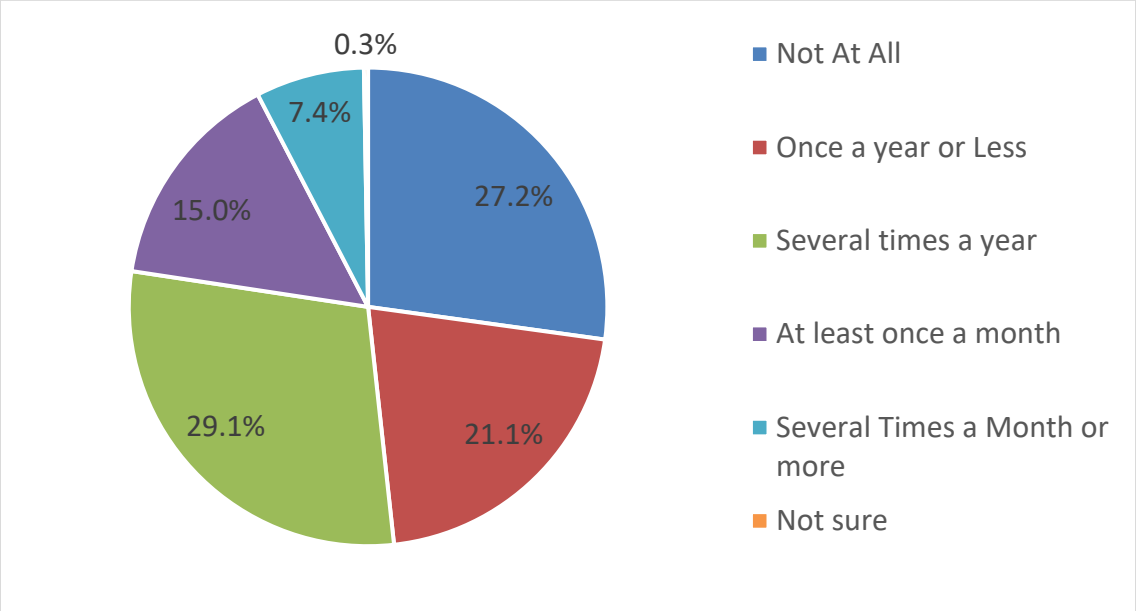

Figure 5: Frequency of participation in pro-environmental behavior (n=721)

Logo for the 2018 CNMI International Coastal Cleanup (credit: CNMI Division of Coastal Resources Management)

Perceived resource condition

Figure 6 illustrates residents' perceptions of the current condition of marine resources in CNMI. Residents responded most favorably when asked about their perceived condition of ocean water quality, with 61% of residents indicating that ocean water quality condition is "good." Residents responded most negatively when asked about their perceived condition of the number of fish, with 26% of residents indicating that the current condition of the number of turtles is "bad." The resource that residents were the most unsure about was number of trochus (35%). The positive perception of ocean water quality is an interesting result, as water quality data from the CNMI Bureau of Environmental and Coastal Quality indicate that it is routinely unadvisable for humans to be in the water or consume anything caught within 300 feet of the shoreline at most public access points and beaches on Saipan (Robbie Greene, pers. comm., 2019). This could suggest a gap between actual and perceived condition of water quality.

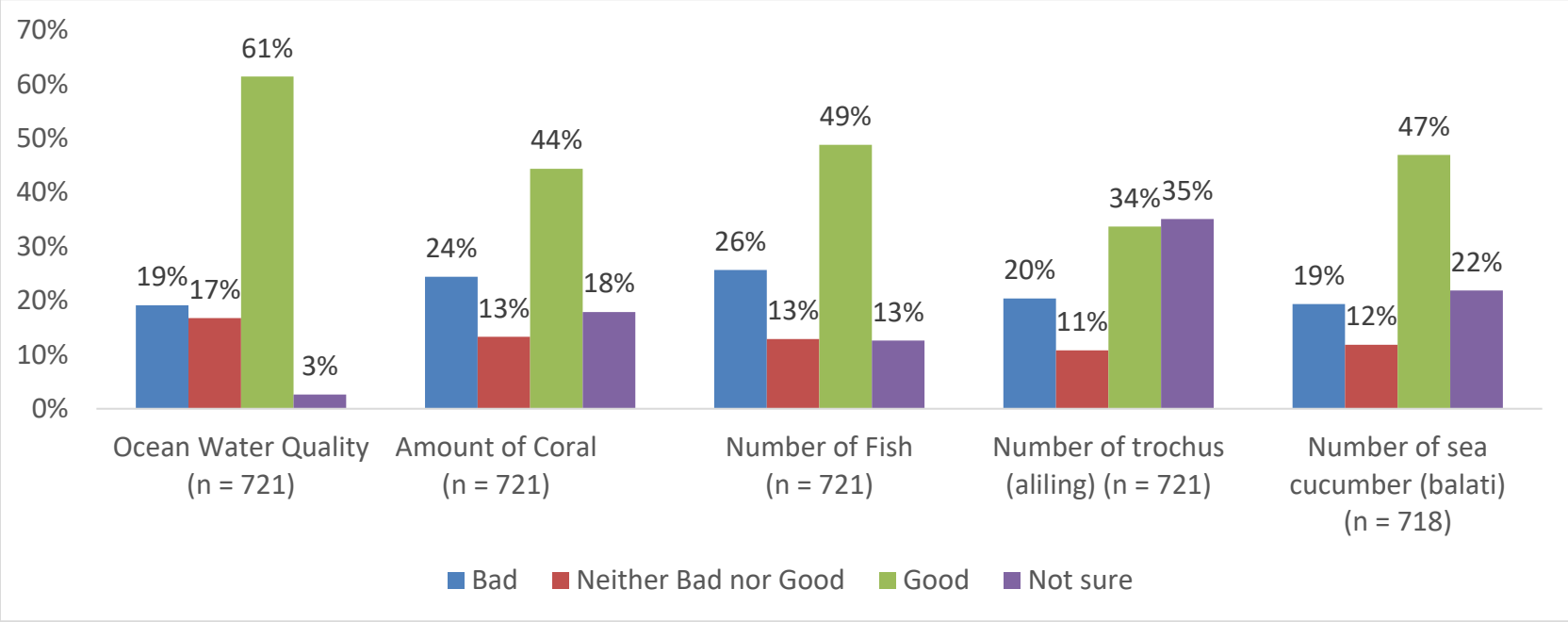

Figure 6: Resident opinions regarding current conditions of marine resources

Figure 7 illustrates residents' perceptions concerning the change in the condition of marine resource over the last 10 years in CNMI. For each of the marine resources in the survey, "gotten worse" was the most frequently chosen response. Less than a quarter of residents believe that the condition of these marine resources has gotten better over the last decade. "Ocean water quality" is the marine resource that the highest proportion of residents feel has gotten worse over the last decade (43%), which is interesting considering that ocean water quality is considered to be in "good" condition currently by the majority of residents (Figure 5), suggesting a very positive perceived baseline of ocean water quality from 10 years prior. When asked about the change in condition over the last decade, the marine resource that residents are most unsure about is again "number of trochus" (27%). Although there has been a moratorium on trochus harvest since 1998 (CNMI Division of Fish and Wildlife 2015), one third of residents still feel that the conditioned has worsened over the last 10 years, perhaps suggesting a gap in knowledge concerning trochus condition.

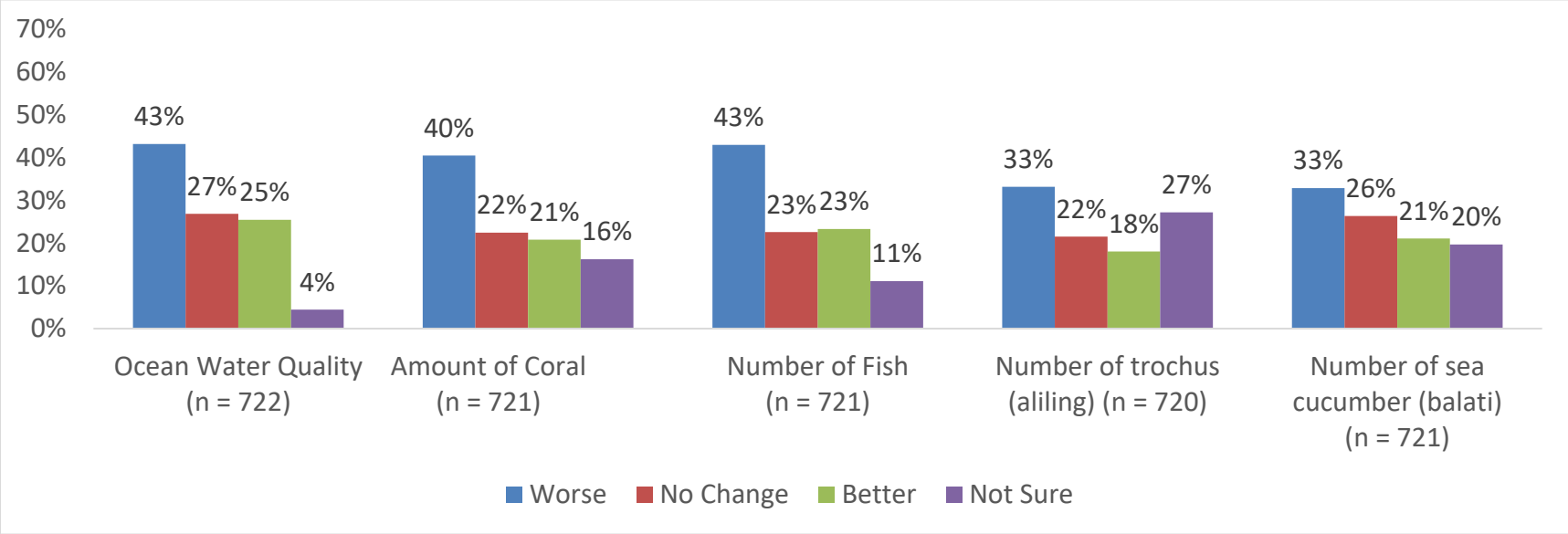

Figure 7: Resident opinions on change in condition of marine resources over past 10 years

Residents were also asked how they felt the condition of marine resources will change over the next 10 years. Of the 721 that responded, 42% indicated that they think the condition of marine resources will "get better" over the next decade, while 18% feel that the condition will "stay the same," and 34% believe that the condition will "get worse." Seven percent are unsure.

Knowledge of coral reef rules and regulations

In order to contribute to the indicator of "knowledge of coral reef rules and regulations," Figure 8 displays residents' self-reported relative familiarity with MPAs in CNMI. It was found that 62% of residents indicated that they are familiar with MPAs, and 34% are either unfamiliar with MPAs or unsure of their level of familiarity

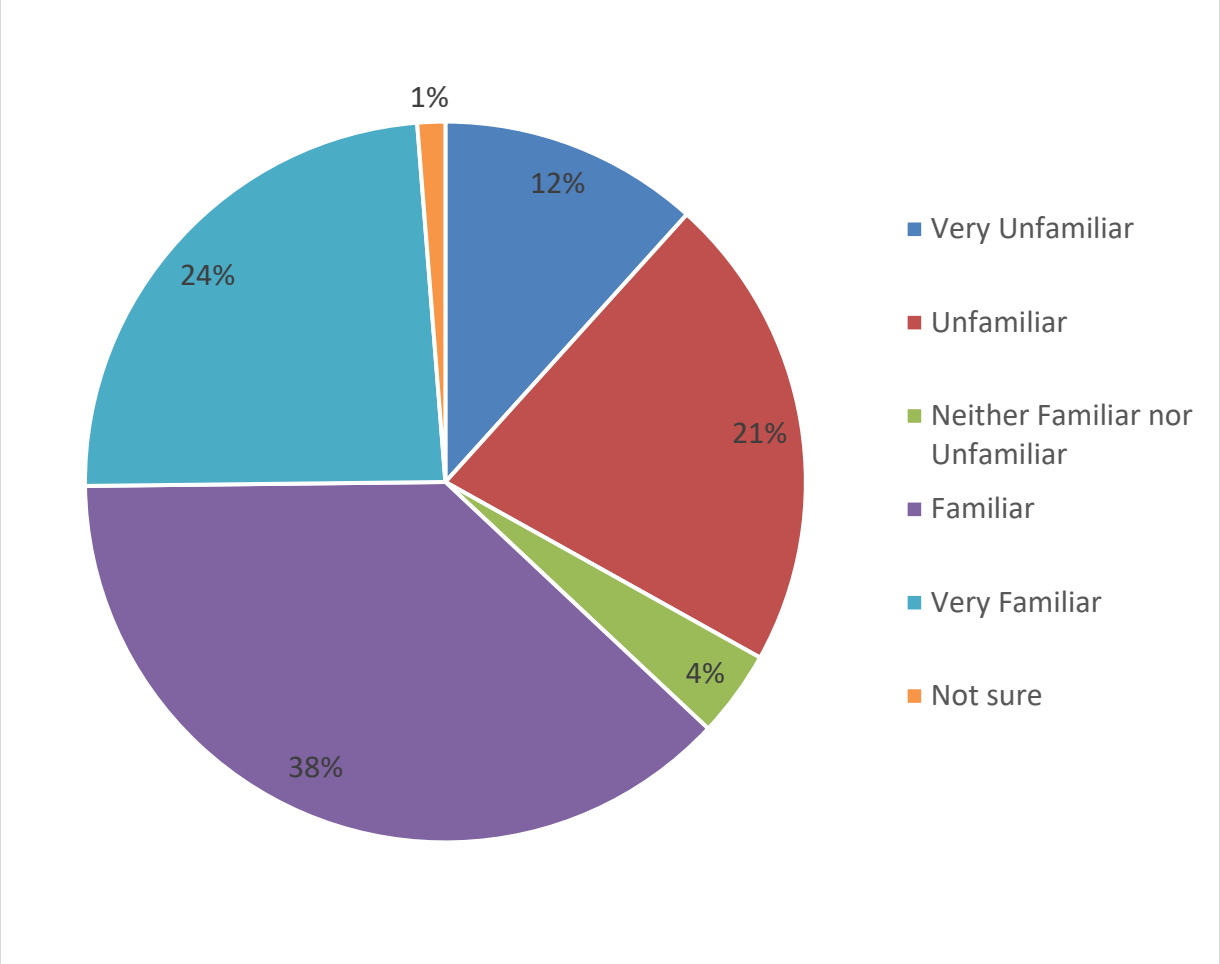

Figure 8: Residents' familiarity with MPAs in CNMI (n = 719)

Attitudes towards coral reef management strategies

Table 3 depicts resident opinions regarding the various purposes and functions of marine protected areas (MPAs). Survey results indicated that 62% of residents are familiar with MPAs. When examining resident attitudes toward the survey statements concerning MPAs, residents agree the most with "MPAs protect coral reefs" (96%) and agree the least with "There should be fewer locally managed MPAs in CNMI" (68% disagree). Residents are the most unsure about "Fishermen's livelihoods have been negatively impacted from the establishment of locally managed MPAs in CNMI" (12%). It also must be noted this series of questions was only answered by residents who indicated that they are "neither unfamiliar nor familiar," "familiar," or "very familiar" with MPAs (See Appendix 2)

Table 3: Resident opinions regarding marine protected areas in CNMI

MPA Statement	Disagree	Neither Agree nor Disagree	Agree	Not Sure	Sample Size
MPAs protect coral reefs	1%	1%	96%	2%	477
MPAs increase the number of fish	4%	2%	90%	4%	477
There should be fewer locally-managed MPAs in CNMI	68%	11%	15%	6%	477
There should be more locally-managed MPAs in CNMI	12%	12%	71%	6%	478
There has been economic benefit to CNMI from the establishment of locally-managed MPAs	10%	5%	74%	11%	479
Fishermen's livelihoods have been negatively impacted from the establishment of locally-managed MPAs in CNMI	44%	10%	34%	12%	479
Locally managed MPAs help increase tourism in CNMI	9%	4%	81%	6%	477
The establishment of locally-managed MPAs increases the likelihood that people will vacation in CNMI	7%	5%	82%	6%	476
I would support adding new locally managed MPAs in CNMI if there is evidence that the ones we have are improving CNMI's marine resources	5%	5%	86%	4%	479
I generally support the establishment of locally-managed MPAs	4%	4%	90%	3%	477
I generally support the establishment of the federally managed Marina Trench Marine National Monument	6%	5%	81%	8%	476

Figure 9 depicts residents' attitudes toward various management options that were presented in the survey as common strategies used in the management of coral reef ecosystems. Overall, residents are generally very supportive of all potential management strategies that could be used to improve the protection of coral reefs. The management option with the most support is "Increased enforcement of wastewater and stormwater regulations to preserve water quality," with 93% of residents agreeing with this strategy. While the majority of residents agree with all of the presented management options, the option with the least support was "Impose a small fee ($1 to $5) for non-residents visiting a locally managed MPA to fund conservation," with 17% of residents disagreeing with this strategy. "Limits on the number of tourism boat operators able to conduct business within locally managed MPAs" is the management option that residents are the most unsure about (6%).

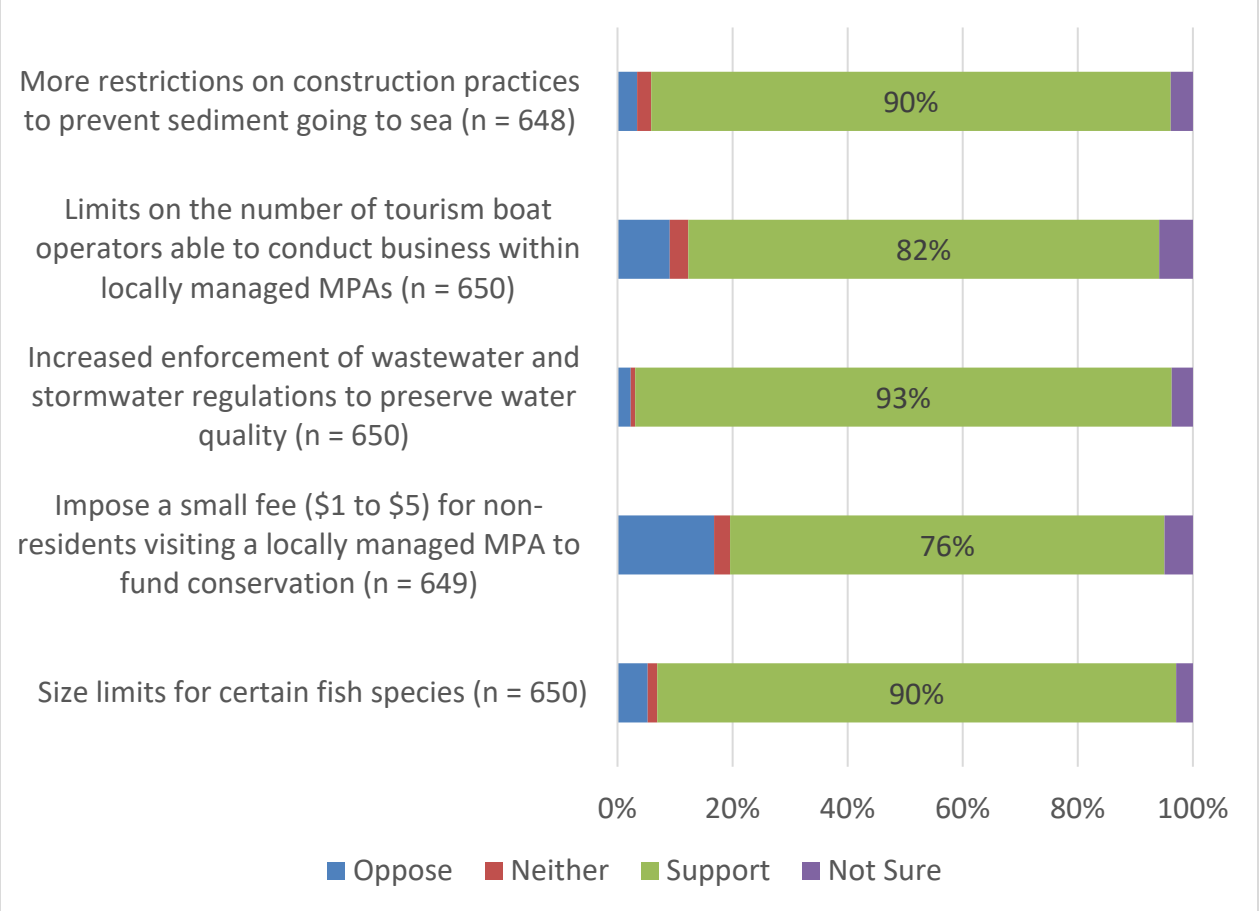

Figure 9: Resident opinions regarding potential management strategies for CNMI

Awareness and knowledge of coral reef functions and threats

Figure 10 displays resident attitudes pertaining to the services and byproducts of healthy coral reef ecosystems. The majority of residents agree with the statements in the graph, except for one item: 80% of residents disagree with the statement "coral reefs are only important to fishermen, divers and snorkelers." The statement that residents are most unsure about is "Coral reefs protect the CNMI from coastal erosion and natural disasters" (2%). It is noted that CNMI has a unique cultural situation where the indigenous groups (Chamorro and Carolinian) are not specifically tied to a single island (i.e. there is not a defined "Saipanese" culture, etc.); however, the statement about island culture is meant to be place-based in nature (i.e. *coral reefs are important to the culture in the place that I live*).

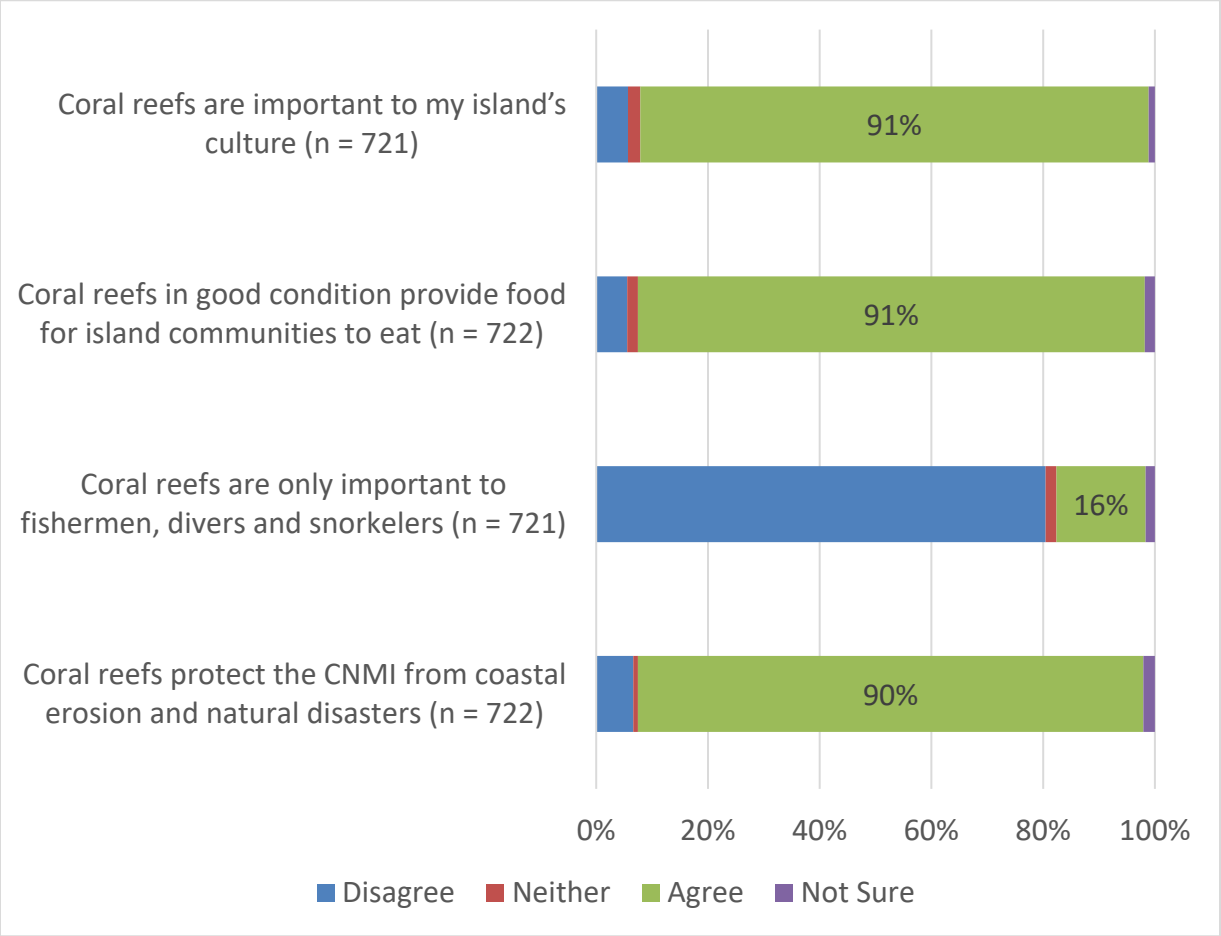

Figure 10: Resident perceptions regarding coral reef services

Familiarity with threats

Residents were also asked about their relative familiarity with various issues that pose a threat to coral reef ecosystems. Residents are, overall, mostly familiar with the various threats faced by coral reefs. The majority of residents are familiar with eight of the ten threats listed in the survey; however, 51% are mostly unfamiliar with two issues (coral bleaching and invasive species). Figure 11 shows that residents are most familiar with the threat of typhoons and other natural disasters and pollution (91%)

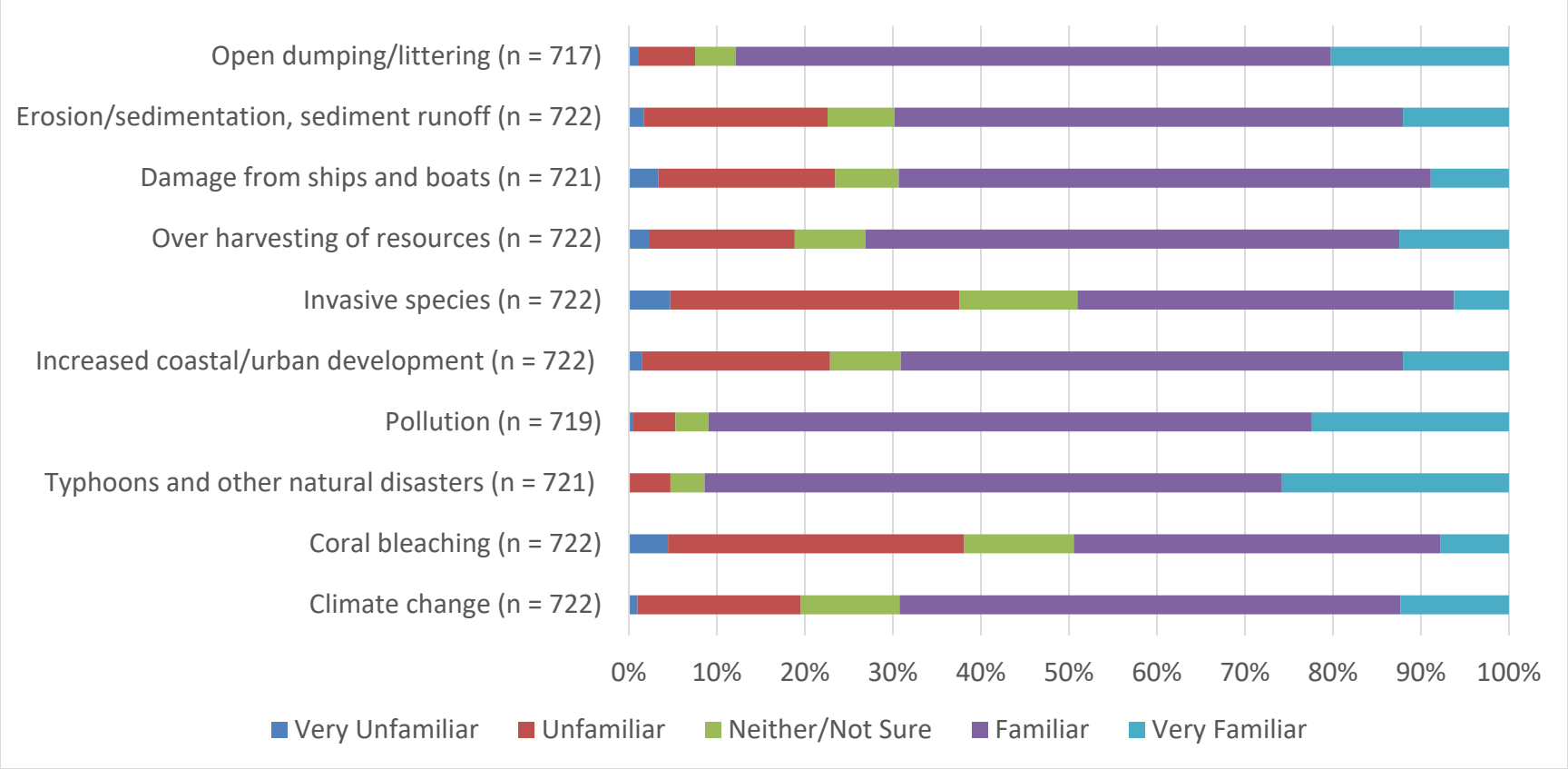

Figure 11: Residents' familiarity with threats to coral reefs

Level of threats to coral reefs

Figure 12 illustrates resident perceptions concerning the level of threat severity facing coral reef ecosystems in CNMI. Perception is fairly evenly split as almost half of residents (45%) believe that the threat severity to coral reefs in CNMI is at least "large," and almost half (48%) think the threat severity to coral reefs is "minimal" or "moderate." Just under 1% of residents indicated that they believe coral reefs are facing no threats at all. Additionally, 6% of residents indicated that they are not sure about overall coral reef threat severity.

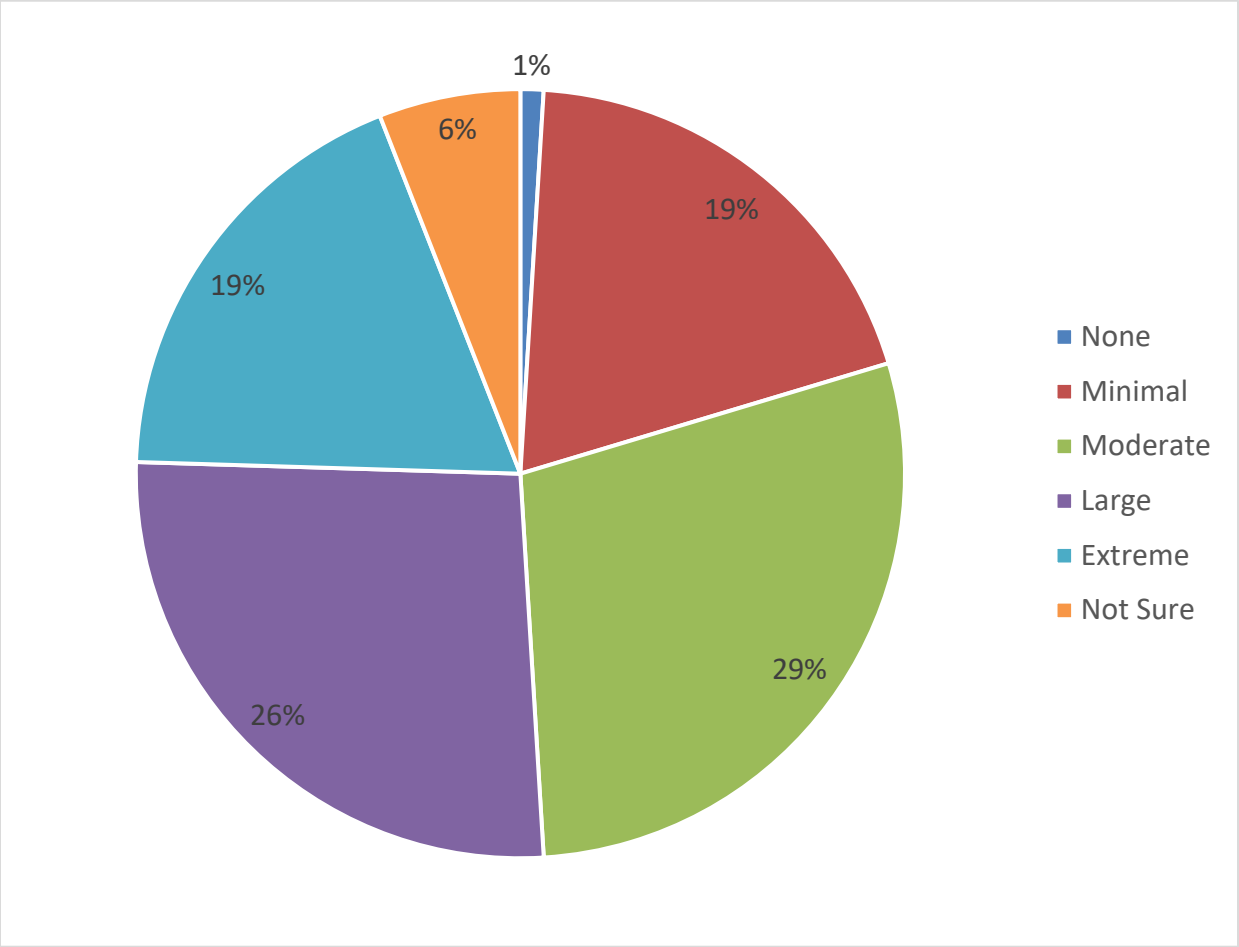

Figure 12: Residents' perceptions of the severity of threats to coral reefs (n = 722)

Results: Secondary Data Indicators

In the following section, the measures presented for each indicator originate from various secondary data sources. These indicators may be ultimately measured through secondary data alone or through a combination of primary and secondary data.

Human population composition and trends near coral reefs

Figure 13 illustrates the recent trend in population numbers for CNMI (World Bank). The population of CNMI decreased by 22% from 2000-2011; however, since 2011, the population of CNMI has increased by 4% as of 2017.

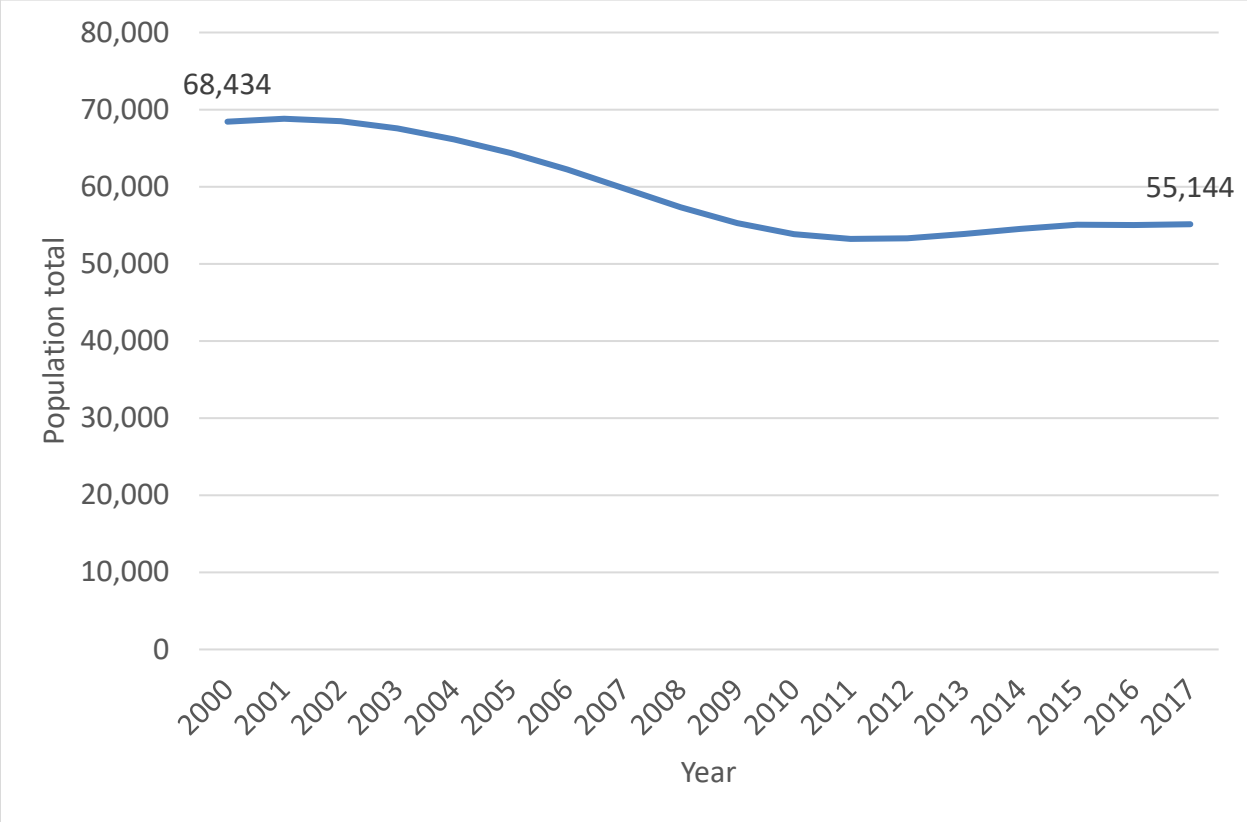

Figure 13: CNMI's population trend, 2000-2017
Source: World Bank World Development Indicators: Population; Total

Table 4 shows that each of the Mariana Islands experienced a population decrease from 2000-2010. The island of Rota exhibited the largest population decrease from 2000-2010 in percentage terms (23%), while the island of Saipan (the most populous island overall) exhibited the largest population decrease in absolute terms (-14,172). Since 2010, the population of Rota has increased slightly, while Tinian has decreased further and Saipan remained relatively steady (CNMI Department of Commerce, 2017). However, the longer term overall trend has still been downward since 2000.

Table 4: Population change for each Mariana Island, 2000-2016

	Population, 2000	Population, 2010	Population, 2016	Percent change, 2000-2010	Percent change, 2010-2016	Percent change, 2000-2016
Rota	3,283	2,527	2,635	-23%	4%	-20%
Saipan	62,392	48,220	48,200	-23%	<1%	-23%
Tinian	3,540	3,136	3,056	-11%	-3%	-14%

Source: US Census Bureau, Decennial Census of Population and Housing and CNMI Department of Commerce

Table 5 shows that the trend for population density follows that of population. An overall decrease is observed from 2000-2016. However, as of 2016, the overall population density for CNMI has remained relatively steady at around 288 people per square mile since 2010 (US Census Bureau 2010, CNMI Department of Commerce, 2017). Saipan is by far the most densely populated island in CNMI.

Table 5: Population density (persons per square mile) in Mariana Islands, 2000-2010

	Population Density, 2000	Population Density, 2010	Population Density, 2016
Rota	63.20	48.65	50.73
Saipan	854.56	660.45	660.17
Tinian	57.14	50.62	49.33
CNMI TOTAL	370.32	288.29	288.33

Source: US Census Bureau, Decennial Census of Population and Housing and CNMI Department of Commerce

Figure 14 depicts CNMI's population density at the Census block group level. It is widely understood that increased population density in proximity to coral reefs can lead to stress in the coral reef ecosystem (Brewer, 2013). The inset map illustrates an area of high population density (District 3 in Saipan) in relation to coral cover, and shows how CNMI contains areas of differing population density that may impact its coral reef ecosystem through stressors from development, recreation, and other types of anthropogenic effects.

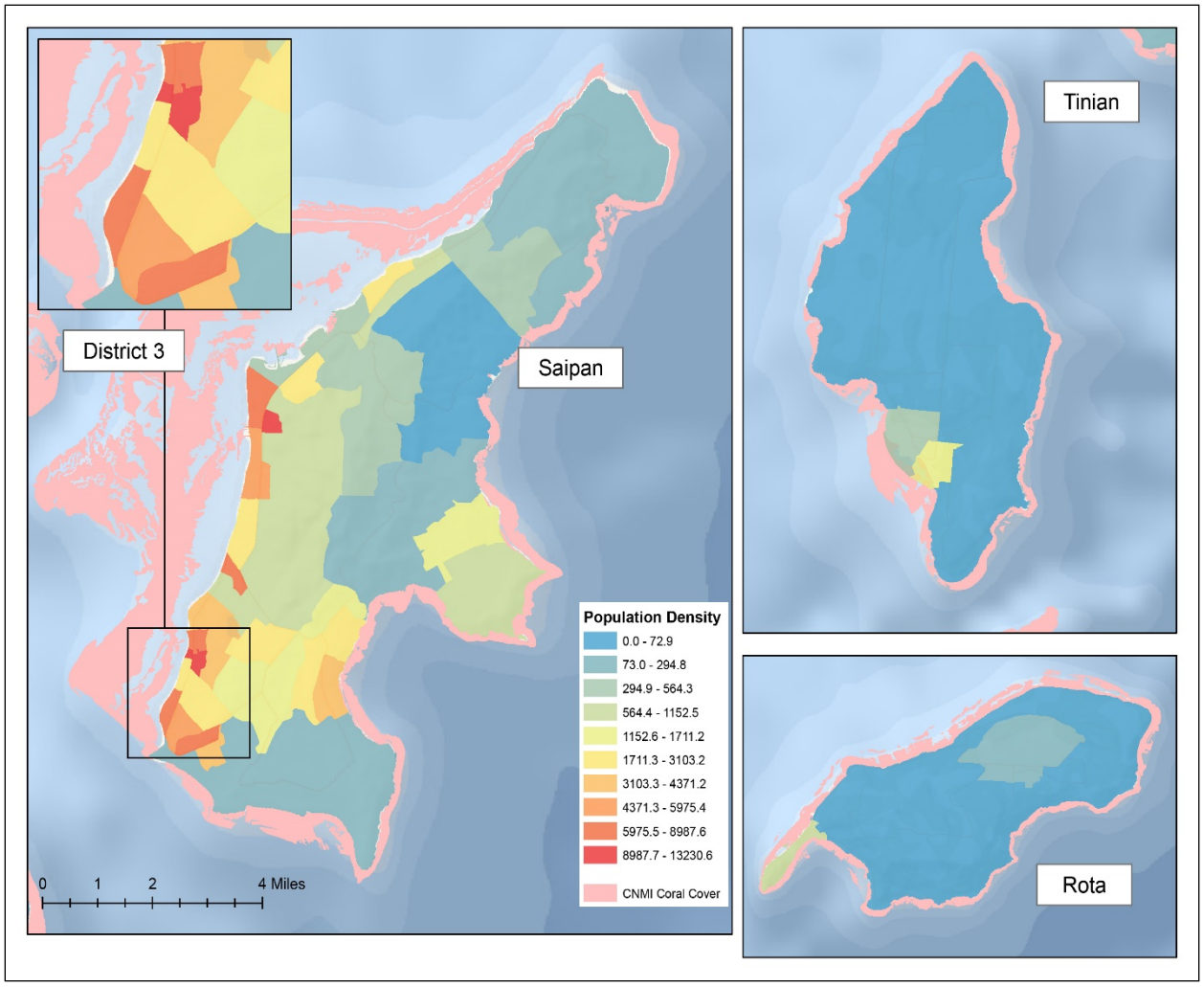

Figure 14: CNMI Population density (2010) by US Census Block Group and proximity to coral cover

Racial Composition and Age Structure of CNMI

As evidenced by Figure 15, the ethnic composition of CNMI is almost half Filipino, followed by Chamorro (27%) and Carolinian (7%) (CNMI Department of Commerce, 2017).

As for the age structure of the population of CNMI, the CNMI Department of Commerce (2017) reports an overall median age of 33.4 years old for CNMI's population in 2016. Five percent are 65 years old or older, and 36% of the population are 19 years old or younger.

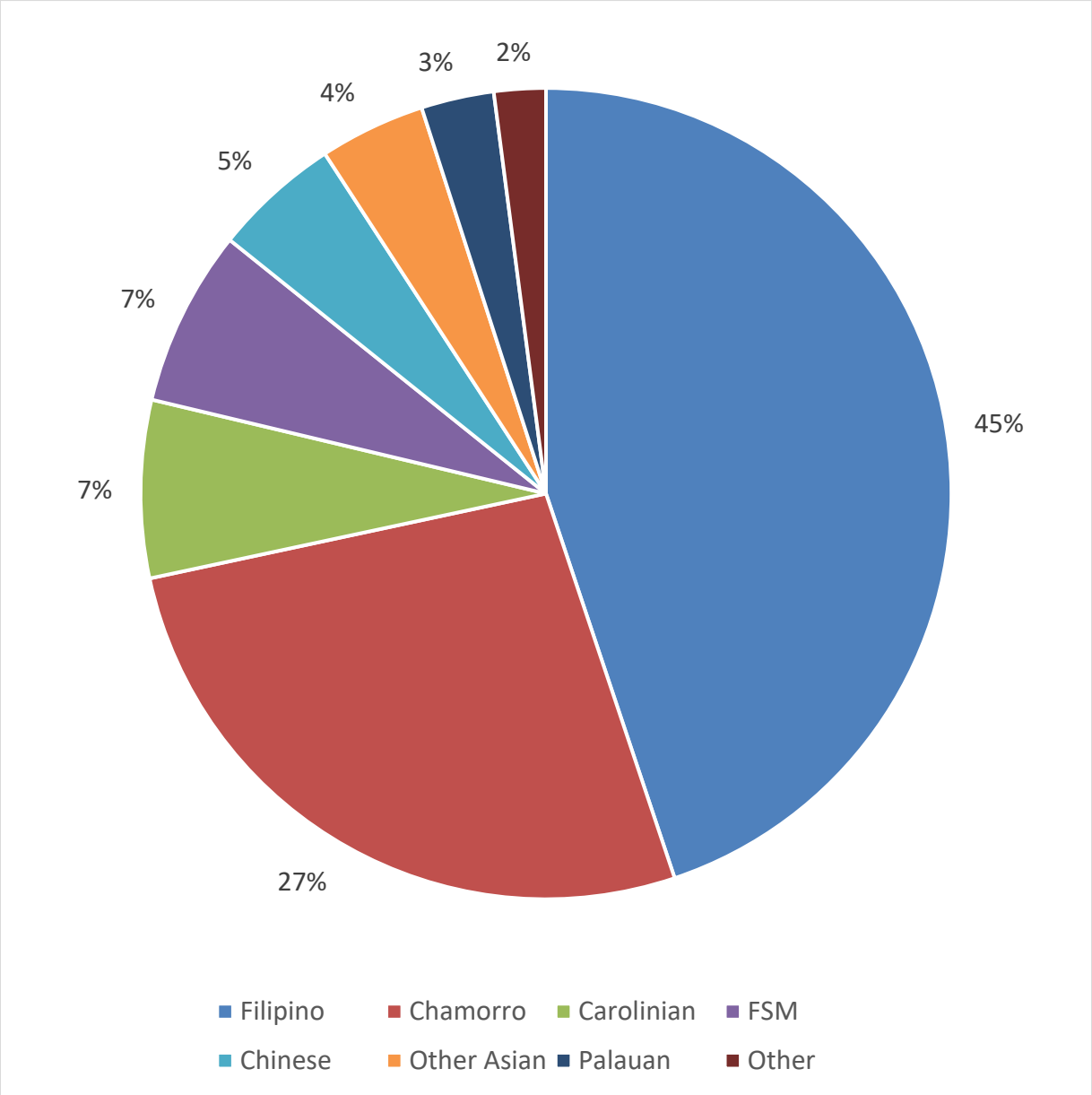

Figure 15: Ethnic composition of CNMI, 2016
Source: CNMI Department of Commerce

Community well-being

In addition to the basic demographics described above, composite indicators can be utilized to further explain social variance (see Box 1). Five composite indicators related to human well-being are being tracked as part of the NCRMP socioeconomic component: Economic Security, Health, Basic Needs, Access to Social Services, and Education.

Each composite indicator is conceptually complex. The indicators, demonstrated in Figure 16 with *Economic Security*, are composed of multiple of measures that, in turn, operationalize multiple dimensions of the composite indicator.

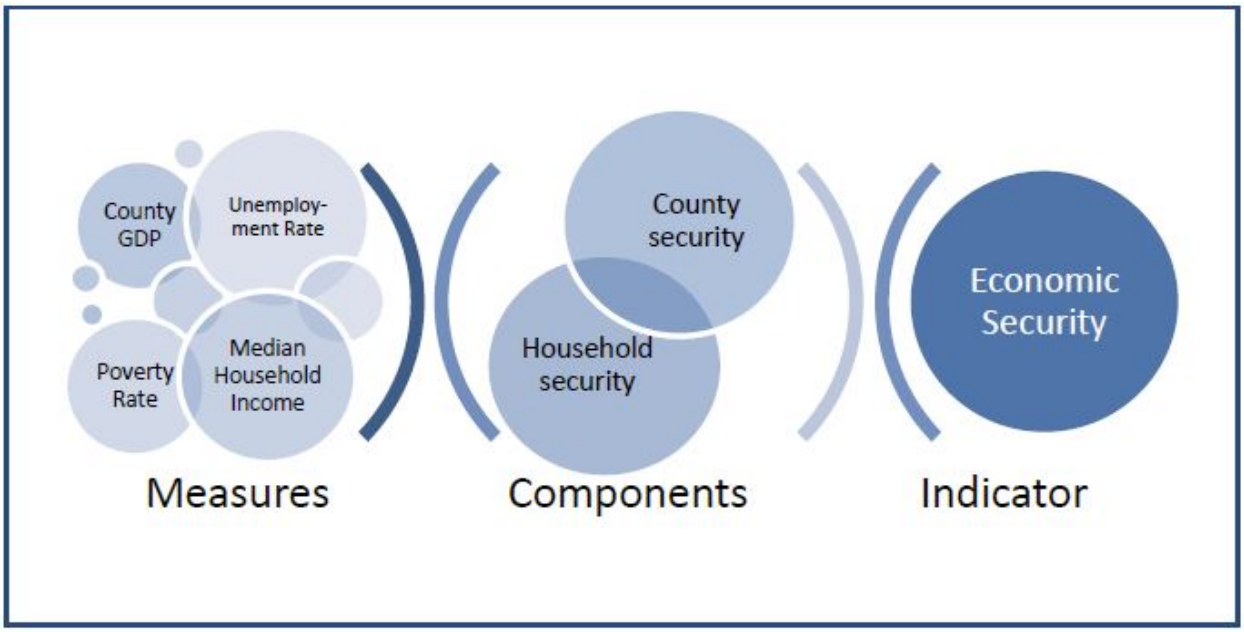

Figure 16: Economic Security presented as an example of operationalizing a composite indicator

At the conclusion of the first monitoring cycle, the coral reef jurisdictions will be scored on select indicators of well-being. These scores will allow for comparisons across jurisdictions, and will be used in statistical analyses with indicators of environmental condition to analyze the dynamic relationship between the ecosystem services that people regularly enjoy and community well-being. A selection of measures that will be used to operationalize the well-being indicators of Economic Security, Health, Basic Needs, Access to Social Services, and Education are presented and discussed below.

Economic Security

The measures used to operationalize economic security will include gross domestic product, median household income, the percent of the population in poverty, unemployment rate, and the amount of households receiving public assistance.

One of the most telling measures of economic well-being is real gross domestic product (GDP), depicted in Figure 17. From 2007 to 2015, real GDP decreased by 25% in CNMI. Real GDP dipped from 2007 to 2011, but has increased over 9% from 2011-2015. The garment industry leaving Saipan throughout the 2000s, culminating in the final garment factory closing its doors in 2009, initiated economic downturn in the jurisdiction (Allen and Amesbury 2012), and has led to tourism being the primary economic driver in CNMI (Ayers 2018).

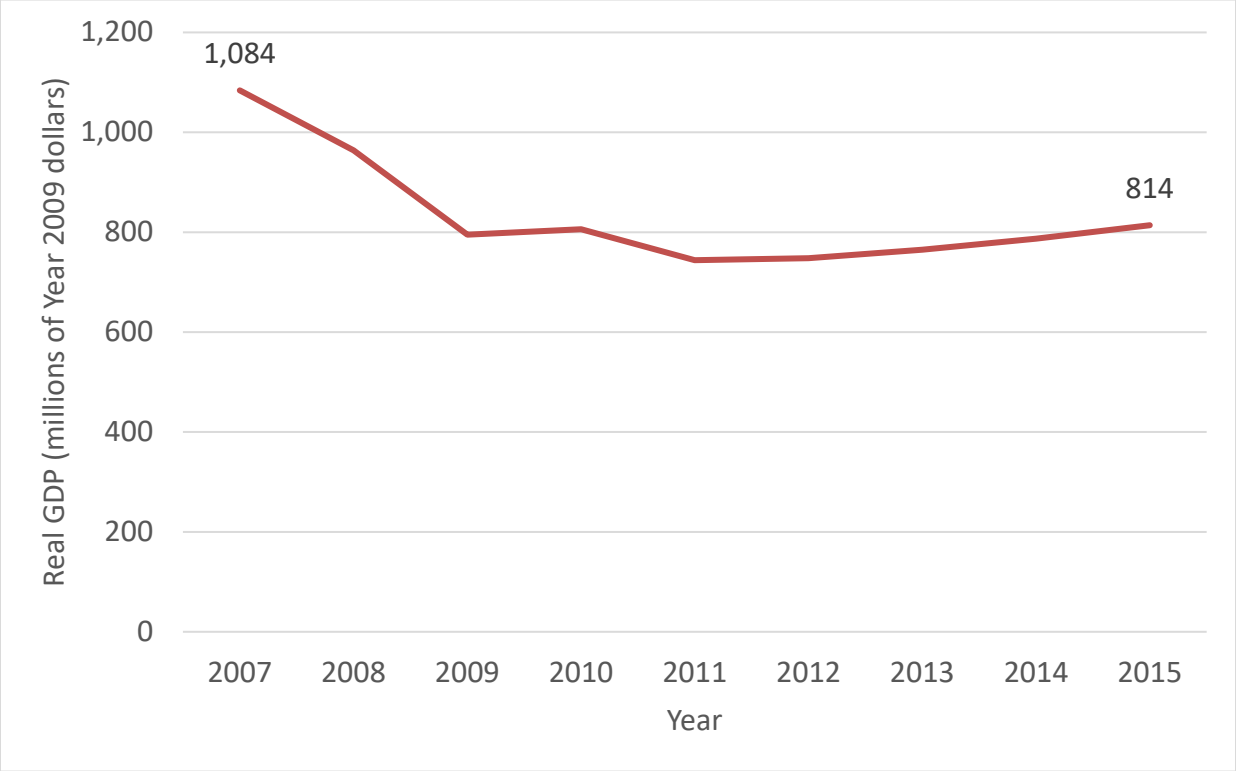

Figure 17: Real GDP trend in CNMI
Source: US Bureau of Economic Analysis

According to the CNMI Department of Commerce (2017), 12.8% of the civilian population labor force is unemployed as of 2016. This is an increase of 4.7% from the figure of 8.1% reported in the 2012 US Census American Community Survey (ACS) 5-year estimates.

Figure 18 shows that real median household income, measured in 2009 dollars using the consumer price index, decreased on all three Mariana Islands from 2000 to 2010 (US Census), and decreased even further from 2010-2016 (CNMI Department of Commerce, 2017). The largest decrease was observed on Rota, where real median household income decreased by 54% from 2000-2016. For CNMI as a whole, real median household income decreased by 42% from $29,487 in 2000, to $17,163 in 2016.

Figure 18: Median household income in CNMI (inflation adjusted to 2009 dollars)
Source: US Census Bureau, Decennial Census of Population and Housing and CNMI Department of Commerce

Additionally, the percent of the population below the poverty line increased on all three Mariana Islands from 2000 to 2016, with the largest increase observed on Rota (Figure 19). In Rota, the poverty rate increased from 34% in 2000, to 44% in 2010, to 48% in 2016 (CNMI Department of Commerce, 2017). For CNMI as a whole, the poverty rate increased by 10% from 2000-2016.

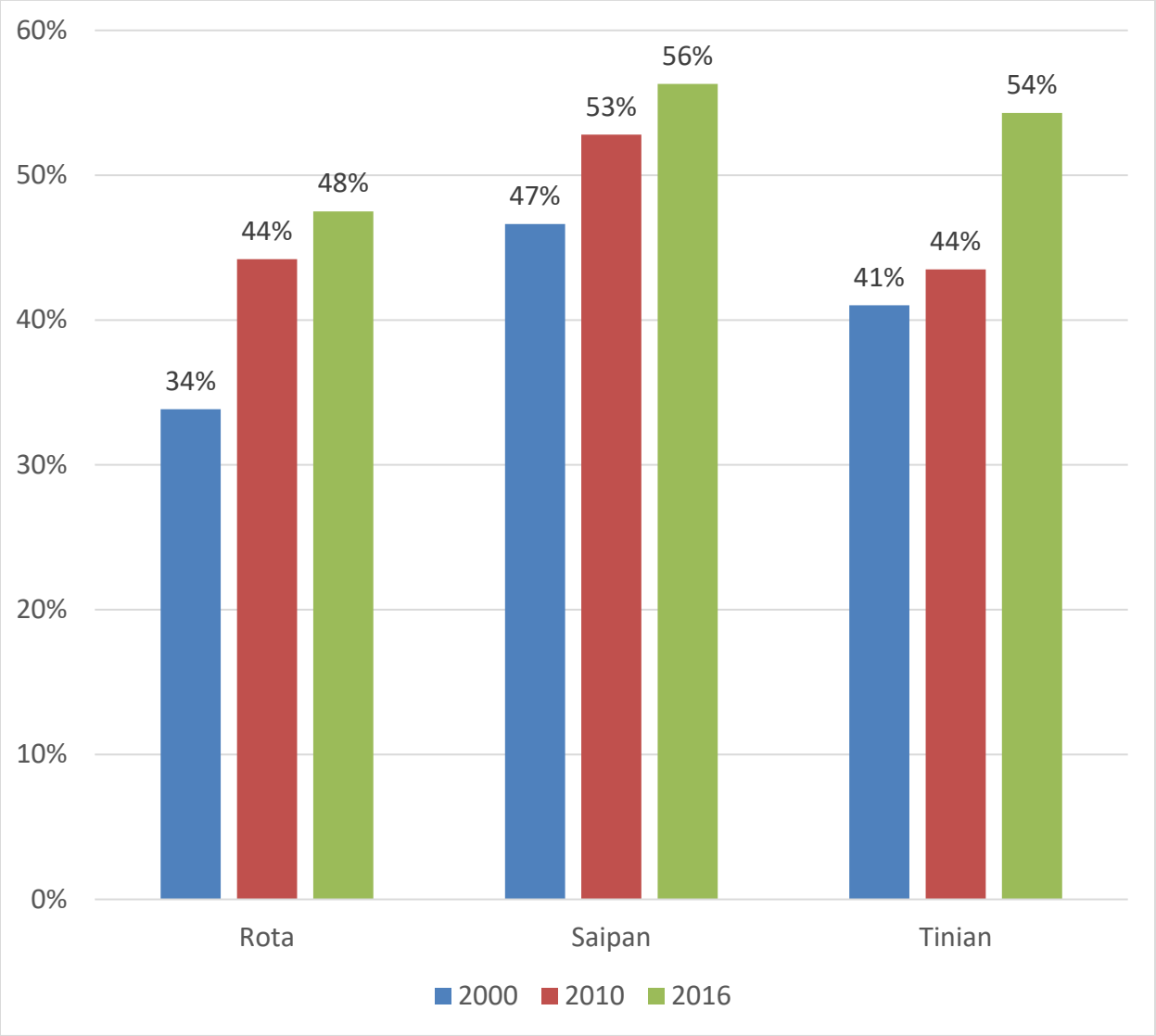

Figure 19: Level of poverty in CNMI
Source: US Census Bureau, Decennial Census of Population and Housing and CNMI Department of Commerce

Figure 20 shows that the percentage of households receiving public assistance income increased in all three Mariana Islands from 2000 to 2010 (US Census). The largest increase was observed on Saipan; 12% of households on Saipan were receiving public assistance income in 2010, compared to just 5% of households receiving public assistance income in Saipan in 2000. For CNMI as a whole, the percentage of households receiving public assistance income increased from 5% in 2000, to 12% in 2010.

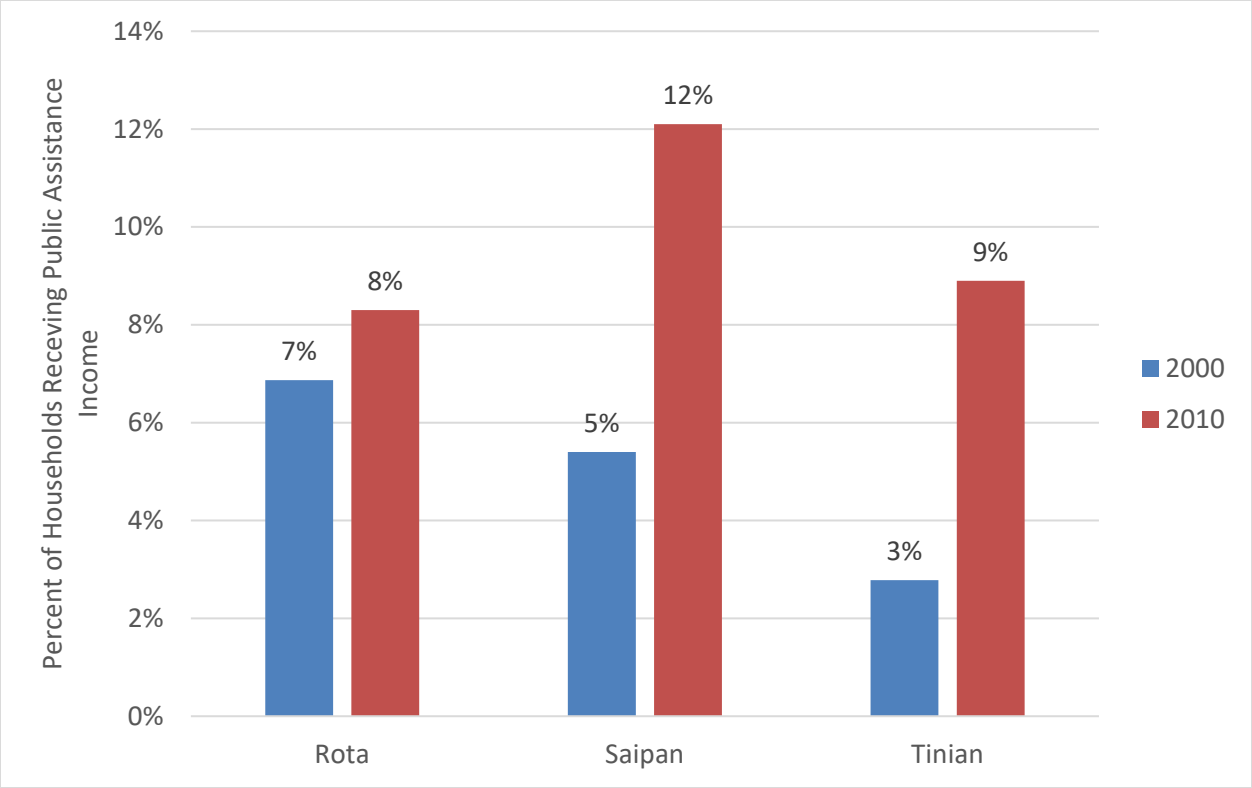

Figure 20: Public assistance in CNMI
Source: US Census Bureau, Decennial Census of Population and Housing

Health

Health, both physical and mental, contributes tremendously to individual and population well-being. Measures of life expectancy, mortality, and opportunity for a healthful lifestyle can be used to assess a population's health. Some of the measures that will be used as part of the indicator for health across all jurisdictions include leading cause of death, life expectancy, and three categories of age-adjusted death rates (from all cancers, from heart disease, and overall). The leading cause of death in CNMI (2010-2012) was diseases of the heart. The average life expectancy (2015) was 60.3 years old for males and 63.6 years old for females (CNMI Department of Commerce 2015). In 2010, the age-adjusted death rate from all cancers was 123 per 100,000 people, the age-adjusted death rate from heart disease was 167 per 100,000 people, and the overall age-adjusted death rate was 863.3 per 100,000 people.[5] It is important to track the overall health of the population in relation to the state of the environment, as the impact of environmental stressors on human health has been shown to have severe consequences. For example, a recent report finds that "the air we breathe, the food we eat, the water we drink, and the ecosystems which sustain us are estimated to be responsible for 23% of all deaths worldwide" (UNEP, 2016). CNMI has currently been undergoing a paradigm shift in terms of

[5] References and data sources found in Appendix 4.

food and diet, with a shift from traditional Chamorro and Carolinian cultural ties to farming/land-based sources of fresh food and seafood/reef fish toward relatively less healthy diets that federal assistance enables.

Basic Needs, Access to Social Services, and Education

Basic needs, access to social services, and education are important social dimensions of well-being. The measures for basic needs include those related to the adequacy of housing, access to healthy food, and clean water. Basic needs are linked to the environment and its ability to provide the regulating and provisioning services that are necessary for water, food, and shelter. Of the 2010 US Census Bureau reported figure of 20,850 housing units in CNMI, 16,035 (77%) were occupied. Of the occupied housing units, 4,537 (28%) were owner-occupied and 11,498 (72%) were renter-occupied. Although, it is likely that the above figures have been significantly altered due to impacts from Typhoon Soudelor in 2015 and Typhoon Yutu in 2018. In 2010, the median value of owner occupied housing units in CNMI was $123,777 and the median age of housing units was 16 years. The average household size in 2010 was 3.26 persons per household. This is a decrease of 11% from the figure of 3.66 persons per household reported in 2000. Similarly, the average family size in CNMI also decreased by 9% from 4.16 persons per family in 2000 to 3.80 persons per family in 2010.

In 2010, 66% of the civilian non-institutionalized population in CNMI had health insurance coverage. Also, as of 2010, 23% of occupied households in CNMI lacked access to a vehicle and 10% of occupied households lacked access to telephone service. Additionally, 14% of occupied households in CNMI lacked access to complete plumbing (US Census), and similarly, 27% of occupied households in CNMI lacked access to a complete kitchen (US Census). Further, the 2010 US Census reports that 56% of occupied households in CNMI had access to a computer or laptop at home; and of those, 78% had access to internet service.

One of the key components of community well-being is education. K-12 enrollment, along with high school and college educational attainment will be combined to examine education. In 2016, 82% of CNMI residents aged 25 and older had completed high school or higher, and 17% of CNMI residents aged 25 and older had completed a bachelor's degree or higher (Figure 21). Both of these figures represented an increase in educational attainment since 2000, in which 69% of CNMI residents aged 25 and older had completed high school or higher, and 16% of CNMI residents aged 25 and older had completed a bachelor's degree or higher (US Census Bureau 2010 and CNMI Department of Commerce, 2017).

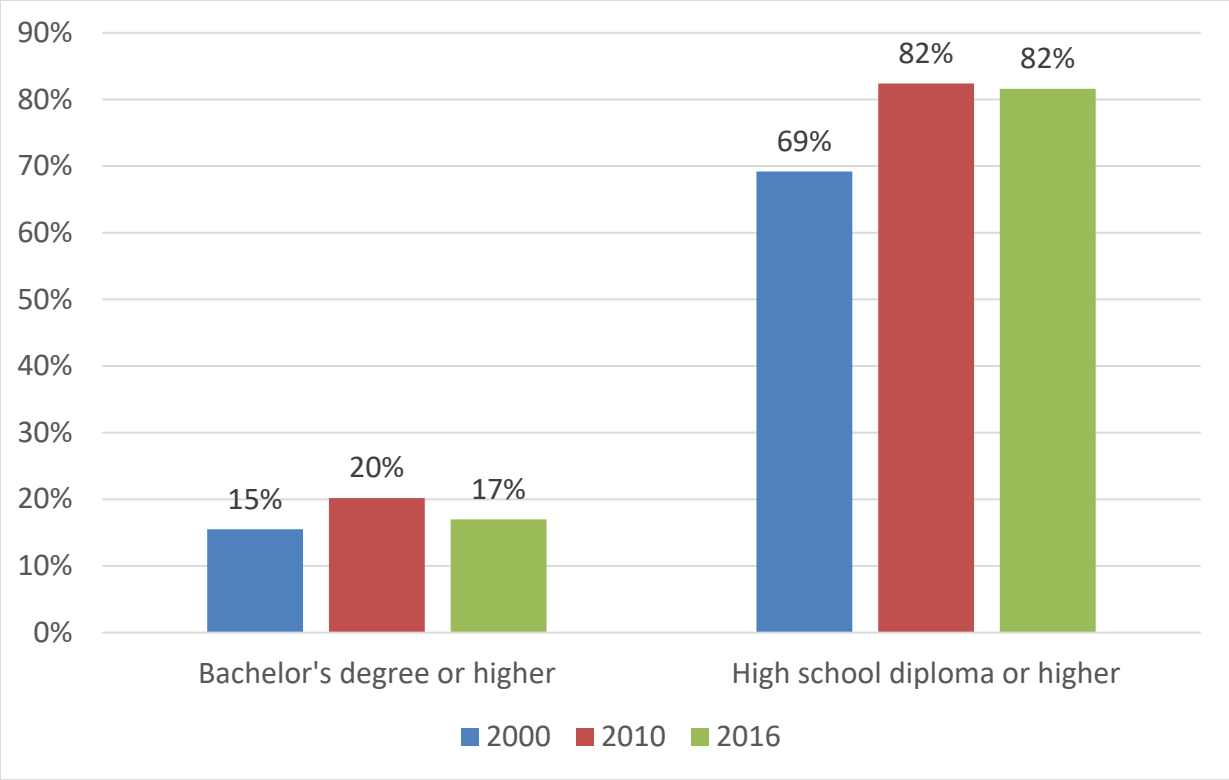

Figure 21: Levels of educational attainment in CNMI
Source: US Census Bureau, Decennial Census of Population and Housing and CNMI Department of Commerce

Physical Infrastructure

In addition to the five community well-being indicators, an indicator of physical infrastructure will be monitored in order to track coastal development, access to coastal resources, and waste management/water supply infrastructure. Indicators for physical infrastructure relate to both the human development footprint, as well as measures in place to mitigate human impacts to the marine environment (e.g., point and non-point sources of land-based pollution, sewage treatment and abatement). Some key aspects of physical infrastructure in CNMI are outlined below.

Pollution

Water

One hundred percent of all beaches in CNMI were monitored in 2012; and 91% of these beaches were impacted by a beach advisory action (98% on Saipan, 92% on Rota, and 50% on Tinian), resulting in 3% of beach days being impacted (4% on Saipan, 1% on Rota, <1% on Tinian) (EPA). As evidenced by Table 6, of the coastal shoreline water bodies in CNMI that were assessed, 36% were deemed to be “impaired” in 2014 (EPA). A waterbody is considered "impaired" if any one of its uses is not met (“uses” include aquatic life, recreation, fish/wildlife propagation water supply, fish consumption, etc., and “impairments” can be caused by a variety of things including bacteria, dissolved oxygen, sulfate, algal blooms, metal content, mercury,

etc.). Along with the data concerning pollution in CNMI's non-coastal water bodies, this indicates that water pollution affects all types of water bodies (at differing magnitudes) in CNMI.

Table 6: CNMI water quality assessment report; 2014

	Rivers and Streams (miles)	Wetlands (acres)	Lakes, Reservoirs, and Ponds (acres)	Coastal Shoreline (miles)
Good waters	75.3	43.3	210	150.4
Previously impaired waters now attaining all uses	0	0	0	0
Threatened Waters	0	0	0	0
Impaired Waters	7.1	577.3	45.2	84.9
Total Assessed Waters	82.4	620.6	255.2	235.3
Percent of Assessed Waters that are impaired	8.6%	93.0%	17.7%	36.1%

Source: US Environmental Protection Agency; Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS)

Air

In 2012, CNMI produced 12.49 kilotons of greenhouse gas emissions, 0.13 kilotons of which were nitrous oxide emissions, and 12.36 kilotons of which were methane emissions (World Bank). In 2017, The CNMI Bureau of Environmental and Coastal Quality (BECQ) was awarded $962,275 from the EPA to strengthen its capacity to protect human health and the environment (EPA, 2017).

Land cover

Impervious land cover is a good indicator of development, and is also associated with land-based pollution that can damage coral reefs. Table 7 shows that CNMI had a total of 17.5 square kilometers of impervious cover in 2016, which was approximately 5.8% of its total land area (300.8 square kilometers) (NOAA Digital Coast, C-CAP). Saipan had the highest proportion of impervious cover with 10%.

Table 7: Impervious surfaces in CNMI, 2016

Island	Total Land Area (Sq. km)	Impervious Cover (Sq. km)	Percent of Impervious Cover
Rota (2014)	83.6	2.2	2.6%
Saipan (2015-16)	117.5	11.7	10.0%
Tinian (2015-16)	99.7	3.6	3.6%
CNMI Total	**300.8**	**17.5**	**5.8%**

Source: NOAA C-CAP

As of 2005, the development of man-made shorelines in CNMI reached a total of 9.43 km (5.86 miles), or about 4% of the recorded total, while sandy shoreline represented 48.64 km (30.22 miles), or about 21% of the recorded total (NOAA/OR&R, 2005). For the purposes of this report, man-made shorelines include: sheltered solid man-made structures (wooden or concrete seawalls, boat docks, etc. that are not directly exposed to the ocean); riprap (large stones or other large rough cut solid materials placed on the shore to prevent or reduce erosion due to wave action); exposed, solid man-made structures (wooden or concrete seawalls, boat docks, etc. that are directly exposed to the ocean); and, sheltered riprap (large stones or other large rough cut solid materials placed on shore in an area not exposed to the ocean in order to prevent or reduce erosion due to wave action). Sandy shoreline type classifications include: “fine to medium grained sand beaches” and “mixed sand and gravel beaches.”

Most of the development in CNMI lies on Saipan, with the island’s most densely populated and urbanized region being along the western coast of the island. As one ventures inland, communities become more rural as development becomes progressively less dense, with topography serving as a primary constraint and influence on land use configuration.

Building Permits

Building permits are indicative of development trends, and data concerning these permits are utilized here to further operationalize the indicator of physical infrastructure. As of 2015, the number of granted building permits has increased by 27%; however, the value of building permits (in inflation adjusted dollars) has increased by 415% since 2006 (Table 8). The number of granted building permits in CNMI has fluctuated since 2006, bottoming in 2009. The value of building permits has fluctuated as well, bottoming out in 2012 (CNMI Department of Commerce, 2010; CNMI Department of Commerce, 2012; CNMI Department of Commerce, 2015). In 2015, 107 out of the 212 building permits granted (50%) were for residential structures.

Table 8: Building Permits in CNMI; 2006-2015

Year	Number of building permits	Value of building permits (nominal dollars)	Value of building permits (constant 2015 dollars)
2006	292	$11,790,000	$13,861,262
2007	255	$16,230,000	$18,556,613
2008	213	$43,990,000	$48,426,533
2009	120	$16,230,000	$17,930,641
2010	138	$14,040,000	$15,260,844
2011	144	$32,980,000	$34,750,846
2012	116	$11,050,000	$11,407,257
2013	135	$13,450,000	$13,684,408
2014	113	$32,580,000	$32,618,672
2015	212	$71,420,000	$71,420,000

Source: CNMI Department of Commerce, Central Statistics Division

Waste Management and Water Supply

Of CNMI's 20,850 occupied housing units in 2010, 11,250 (54%) used public sewers, and 8,367 (40%) used septic tanks, cesspools, or some other means of sewage treatment (US Census). The main landfill in CNMI is the Marpi Solid Waste Facility, located on the northern end of Saipan.

The United States Geological Survey (USGS) reports that the water supply in CNMI contains 3 main test holes (all on Tinian), 11 main wells (4 on Tinian; 7 on Saipan), and 5 main surface water sources (2 streams, 1 spring, and 1 lake on Saipan; 1 spring on Rota) (USGS, 2018). As of 2015, 97.5% of CNMI's population had access to an improved water source[6] (World Bank). As of 2008, there were two publicly owned wastewater treatment facilities in CNMI, located on the island of Saipan (Figure 22) that serve approximately 70,000 people (EPA, 2008).

[6] Access to an improved water source refers to the percentage of the population with reasonable access to an adequate amount of water from an improved source, such as a household connection, public standpipe, borehole, protected well or spring, and rainwater collection. Unimproved sources include vendors, tanker trucks, and unprotected wells and springs. Reasonable access is defined as the availability of at least 20 liters per person per day from a source within one kilometer of a dwelling.

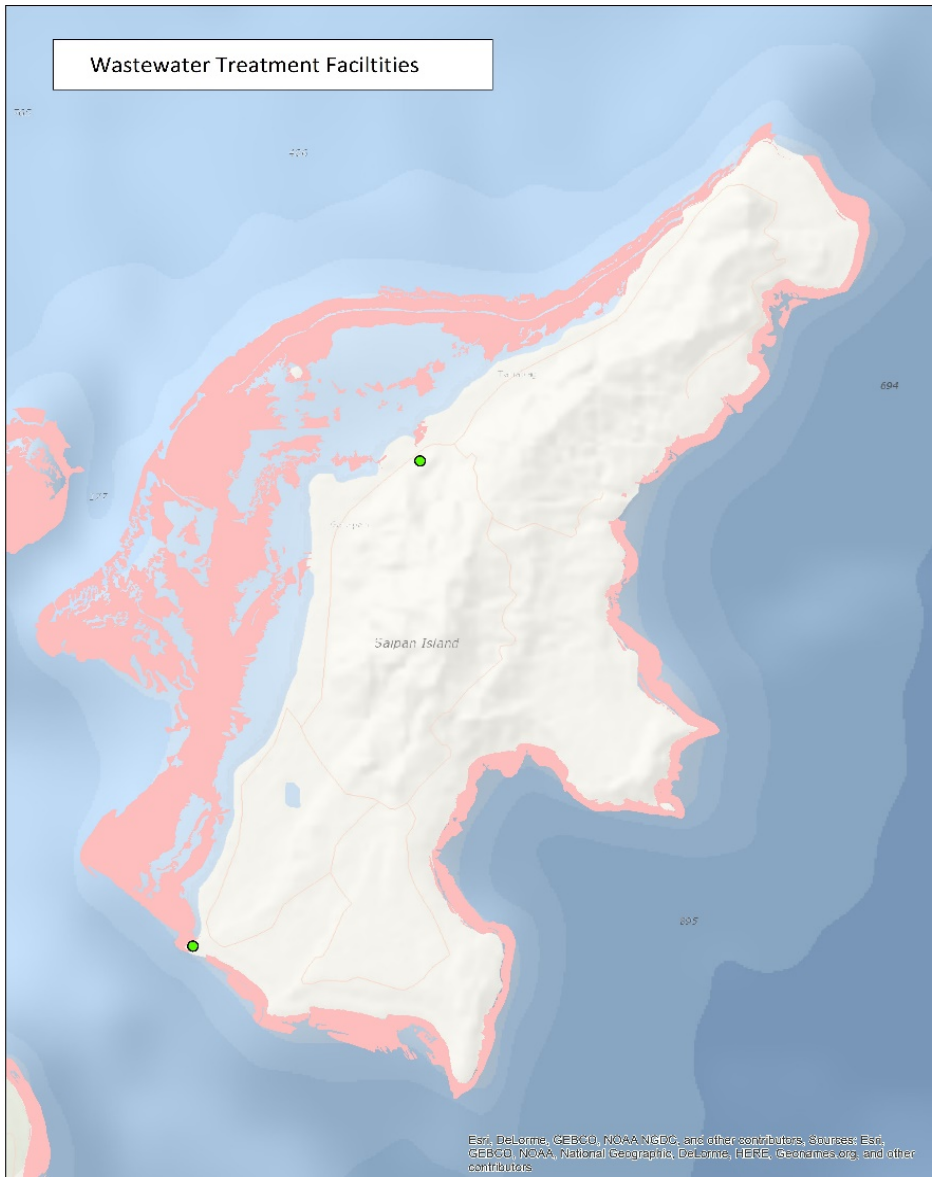

Figure 22: The proximity of wastewater treatment facilities to coral reef cover in CNMI (Saipan).

Physical Access to Coastal Resources

As of 2015, there were 33 identified public coastal access sites on Saipan, 11 on Tinian, and 13 on Rota (CNMI Division of Coastal Resources Management 2015) (Figure 23). In terms of boat access, there are 9 documented boat ramps and 4 documented marinas in CNMI (Steven McKagan pers. comm. 2019).

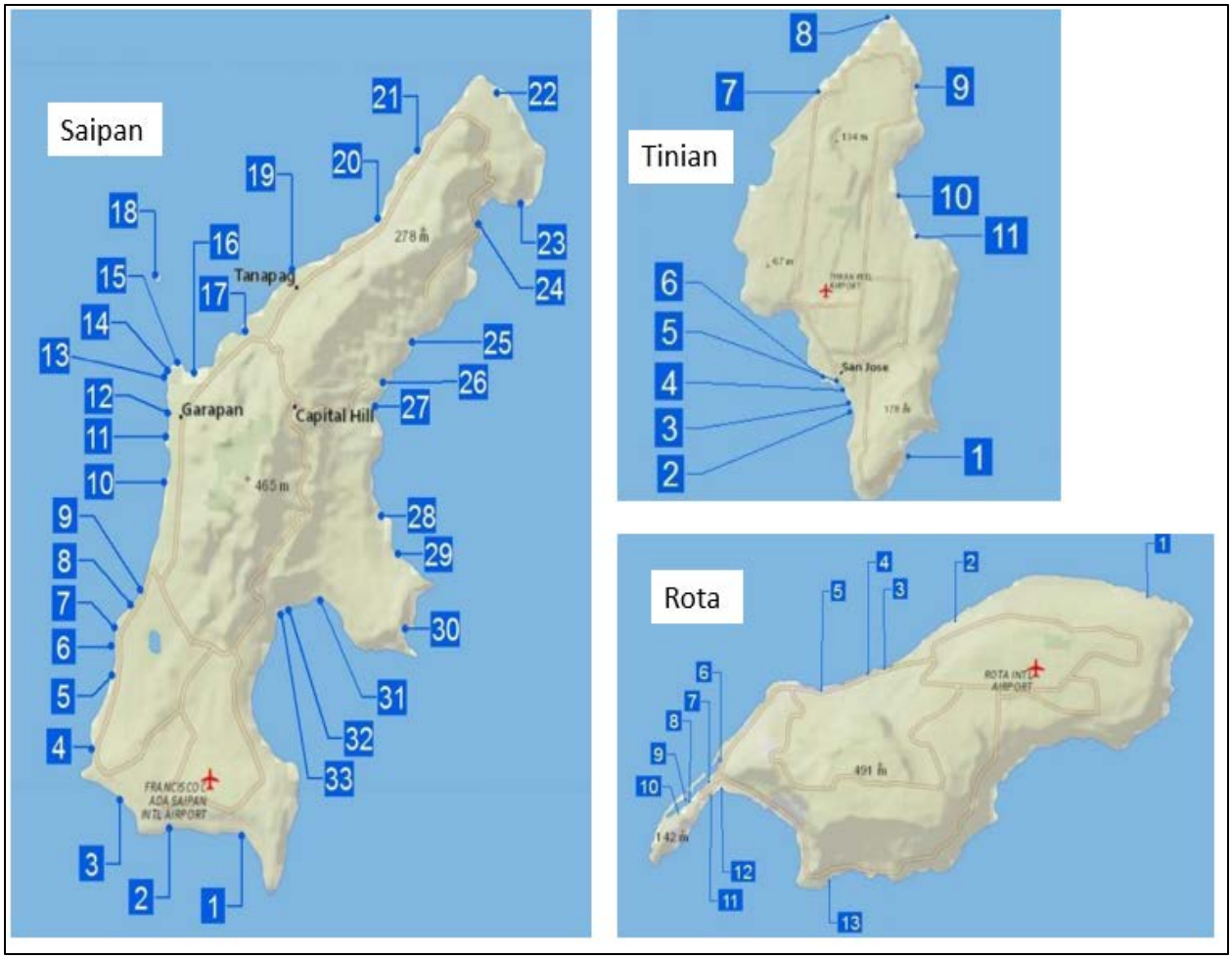

Figure 23: Public coastal access points in CNMI

Economic activities related to reefs

Also relevant to the NCRMP socioeconomic monitoring component are the various economic activities taking place along the coast. These activities can have direct and indirect impacts on coral reefs, and are outlined below.

Ocean-Related Industry

As of 2015, the ocean economy in CNMI was responsible for about 45-50% of total employment in the jurisdiction (Eastern Research Group 2018). Table 9 illustrates the number of establishments and number of employees in the six ocean economy sectors, as defined by NOAA's Office for Coastal Management (OCM) Economics-National Ocean Watch (ENOW) program: living resources, marine construction, marine transportation, offshore mineral resources, ship and boat building, and tourism/recreation. As shown, the tourism/recreation sector is of high importance to CNMI's economy, employing thousands of residents.

Table 9: CNMI Ocean Sector Economy, 2015

ENOW Sector	Number of Establishments	Number of Employees
Living Resources	17	33-128
Marine Construction	23	154-173
Marine Transportation	18	206-487
Offshore Mineral Resources	1	20-99
Ship and Boat Building	1	20-99
Tourism and Recreation	509	6,234-7,353
TOTAL	569	6,667-8,339

Source: Eastern Research Group (2018)

Fishing

Fishing activity in CNMI, both commercial and recreational, is coral reef dependent. Coral reefs provide necessary habitat for several commercially important fish species such as snapper, grouper, spiny lobster, and parrotfish. It has been documented that when coral reefs are healthier and more widespread, fish biomass and abundance increase as well (Vincent *et al.*, 2011; Friedlander and DeMartini, 2002); therefore, the health of coral reefs is an important driver of commercial and recreational fishing harvest and value. While healthy coral reef ecosystems directly impact coral reef fish species, it is also important to note that coral reef ecosystems still support pelagic fish populations and health as they provide critical nursery habitat for juveniles (Thorrold and Williams, 1996; Doherty and Carleton, 1997) and act as a food source for pelagic

species that venture near the coast, such as sharks (Roff *et al.*, 2016). The contribution of fishing to CNMI's GDP was $2.12 million in 2014[7] (0.3% of CNMI's total GDP) (Gillett, 2016).

Hospital and Beavers (2014) surveyed 112 small boat fishermen on Saipan, Tinian, and Rota, and found that roughly 15% of small boat fishermen in CNMI listed reef fish as their *primary* target, and that 93% of these small boat fishermen acknowledge reef fish as an important source of food. Fishermen also reported an average reef fish trip to cost approximately $108 (median of $94).

Saipan fish markets are mostly locally-owned, and many have been in operation for over a decade. Roughly one third of these markets are mobile and operate from a cart or trailer, while the other two-thirds are brick-and-mortar stores. Typhoon Soudelor negatively impacted fish markets on Saipan immensely, forcing some to close for over three weeks due to a lack of ice availability (Ayers 2018), and Typhoon Yutu wiped out several fish markets on the south end of Saipan (Robbie Greene, pers. comm., 2019).

The NCRMP socioeconomic survey asks respondents about how coral reefs contribute to their island's culture, and the CNMI iteration of the survey found that 91% of CNMI residents agree that coral reefs are important to their island's culture. Van Beukering *et al.* (2006) quantified the non-market value of cultural activities related to coral reefs, and found that the cultural value of coral reefs is approximately $23 per household per year on Saipan, with aggregate cultural value ranging from $208,265 to $1,448,189 per year, depending on assumptions concerning household dependence on fishing.

Table 10 displays time-series data from the Pacific Islands Fisheries Science Center (PIFSC) concerning commercial coral reef and bottom fish harvest in CNMI for the years 2000-2015. Although the overall trend is downward for total harvest and for harvest value, there have been spikes upward (2004-2005) throughout this time period as well. Since 2000, CNMI's commercial coral reef and bottom fishery harvest in pounds has decreased by 86%, and CNMI's commercial coral reef and bottom fishery harvest value in inflation-adjusted 2015 dollars has decreased by 87%, indicating that the coral reef ecosystem has lost some of its commercial fishing value over this time. Although, it should also be noted that 2015 was an atypical year due to the number of typhoons (including Soudelor) and the backlash from local *Acanthurus lineatus* die-offs (Steven McKagan pers. comm. 2019). Coral reef and bottom fish species accounted for 18% of total species harvested in 2015.

[7] Includes fishing for all fish species (not limited to coral reef fish).

Table 10: Commercial fishing harvest for all coral reef and bottom fish species in CNMI, 2000-2015[8]

Year	Harvest (lbs)	Value of Harvest (nominal dollars)	Value of Harvest (constant 2015 dollars)
2000	220,707	$579,926	$798,213
2001	226,346	$647,719	$866,857
2002	211,897	$573,012	$754,939
2003	138,181	$372,801	$480,218
2004	120,745	$327,380	$410,771
2005	167,666	$455,378	$552,649
2006	166,141	$452,416	$531,896
2007	138,078	$389,383	$445,202
2008	132,347	$374,350	$412,104
2009	115,457	$322,184	$355,944
2010	84,497	$236,437	$256,996
2011	82,813	$233,304	$245,831
2012	48,761	$154,325	$159,314
2013	40,495	$155,390	$158,098
2014	59,113	$247,661	$247,955
2015	31,096	$104,843	$104,843

Source: Pacific Islands Fisheries Science Center; Western Pacific Fisheries Information Network

Snorkeling/Diving

Van Beukering *et al.* (2006) estimate that approximately 215,300 dives and 137,684 snorkel trips take place in Saipan annually. These dives generate a direct economic value of $4,179,600 annually ($3.99 million attributed to visitors and $189,600 attributed to locals). It was also estimated that snorkel trips generate $798,000 in direct economic value annually.

Tourism

The Marianas Visitors Authority (MVA) tracks tourism arrivals in CNMI. Arrivals reached 653,150 in 2017, up 30% from the year prior. Tourism arrivals in CNMI declined from 2006-2011, but have been steadily increasing since (Figure 24). In 2017, over half of tourists originated from Korea, followed by 35% from China, and 8% from Japan. Main attractions include Bird Island (370,287 visitors in 2017), Banzai Cliff (345,433), and the Grotto (326,150) (MVA, 2017).

[8] This assessment focused on reef and bottom fish species in addition to any other shellfish and marine life that depend on a coral reef or rocky hard bottom ecosystem. Species included in these figures include: wrasses, rabbitfishes, squirrelfishes, parrotfishes, surgeonfishes, unicornfishes, goatfishes, surgeonfish, triggerfishes, soldierfishes, snappers, grouper, yellowtail, jacks, black jack, jobfish, silvermouth, amberjack, emperors, trevallies, sickle pomfret, giant coral trout, alfonsin, mullet, lobster, saltwater shrimp, octopus, squid, and other unknown reef, bottom fish, and invertebrates.

In 2011, tourist expenditures by the Chinese, Japanese, Koreans, and Russians in CNMI reached almost $214 million (MVA, 2012). Coral reef tourism is a major driver of these numbers, as many people visit CNMI annually to dive and snorkel in and near CNMI's coral reefs.

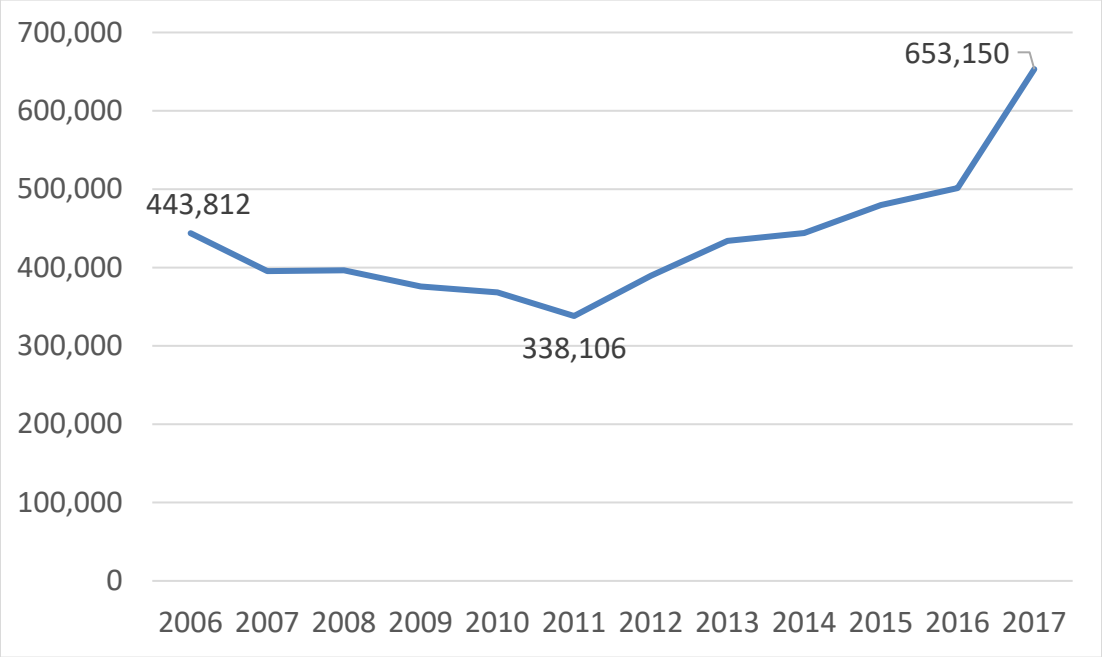

Figure 24: CNMI's international tourism arrivals, 2006-2017
Source: MVA

While the above numbers reflect tourism in general in all of CNMI, it has been reported that, on average, approximately 29.6% of tourists visit Saipan because of its marine-related attractions. By multiplying the cost price of marine-related tourism by the number of marine-related tourist days spent on Saipan, it was found that marine-related tourism provides a producer surplus of $37.7 million per year. Furthermore, the willingness to pay method was used to calculate the consumer surplus of marine-related tourism, and it was found that the consumer surplus of marine-related tourism is $4.61 million per year (van Beukering *et al.,* 2006).

Tourism in Saipan, CNMI (Photo Credit: Takahiro Noguchi; MVA)

Results: Combined Primary and Secondary Data Indicators

The final section of results presents Governance as an example of an indicator that will be measured through a combination of NCRMP survey data and secondary data. Below, examples of both types of measures are featured. The measurements concerning the sources of coral reef-related information, the level of trust for each information source, and involvement in coral reef decision making come from NCRMP survey data, while all other facets of the governance indicator were derived from secondary data sources.

Governance

Governance measures such as public trust, percent areas of coral reefs under management or protection, level of community involvement in decision making/local reef governance, and the presence, longevity, and focus of MPAs and other marine managed areas were used to assess governance related to coral reefs and the marine environment for CNMI.

Sources of coral reef-related information and level of trust

Ninety-eight percent of residents indicated that they use the newspaper as a source for information pertaining to coral reefs (first, second, or third choice). Residents' top 3 sources for information about coral reefs and the environment are newspaper, TV, and radio (Figure 25). The least used information sources are non-profit organizations and community leaders. Residents were then asked to rate their trustworthiness of the top three information sources that they indicated they used: 78% (newspaper), 79% (television), and 80% (radio) of residents indicated that these sources are "very trustworthy" or "trustworthy."

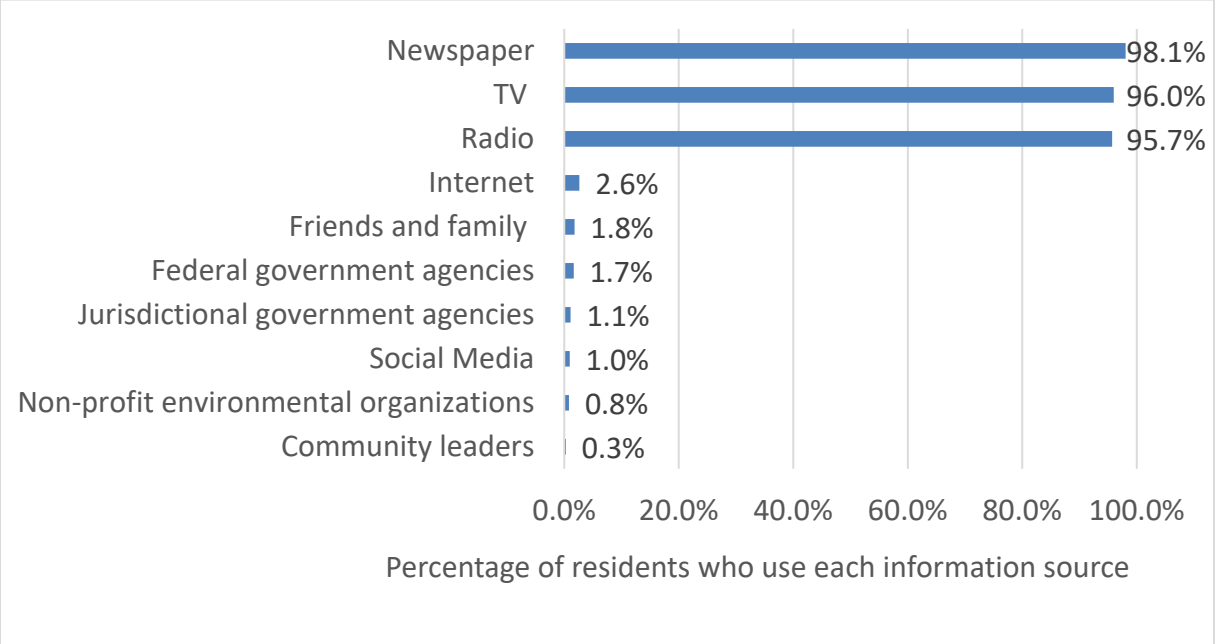

Figure 25: Top sources of information on coral reefs (n = 722)

Involvement in coral reef management decision making

Survey respondents in CNMI were asked how much they felt their communities are involved in protecting and managing coral reefs (Figure 26). Of the 720 that responded, 67% stated that communities are at least "moderately involved," and 5% stated that communities are "not at all involved." Residents were also asked this question at the individual level (Figure 26), and of the 721 that responded, 29% indicated that they themselves are at least "moderately involved" in decisions related to protecting and managing coral reefs, and 39% indicated that they are "not at all involved."

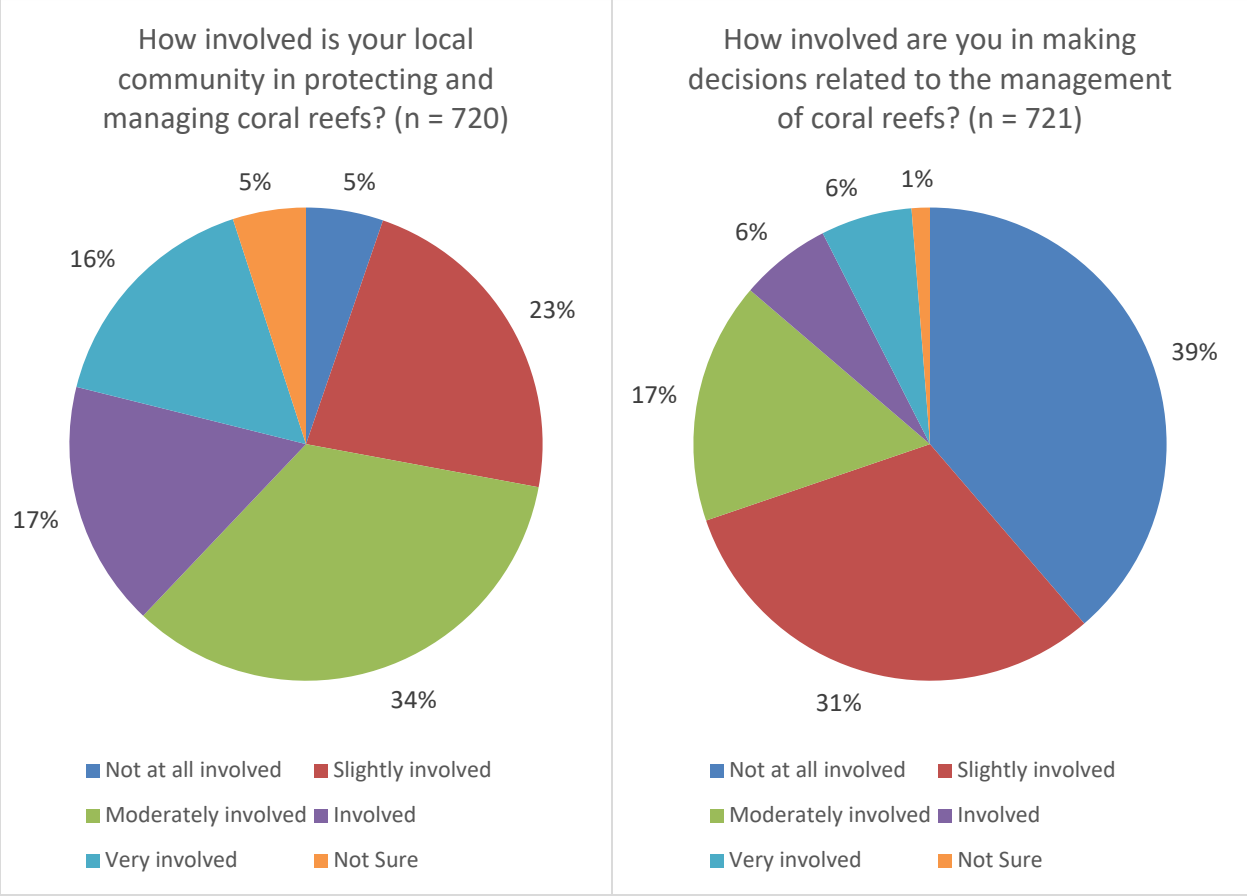

Figure 26: Reported level of involvement in coral reef management

Other governance indicators

Based on the 2017 NOAA MPA Inventory, all marine managed areas in CNMI had management plans in place (Table 11). The oldest inventoried marine managed area was established in 1994, while others were established as recently as 2009. Of the inventoried marine managed areas, cultural heritage was the primary focus of 1, and natural heritage was the primary focus of 11 MPAs. Additionally, commercial and recreational fishing were prohibited at 7 of the marine managed areas. It is also important to note that the Mariana Arc of Fire National Wildlife Refuge and the Mariana Trench National Wildlife Refuge are contained within the Marianas Trench Marine National Monument, the Bird Island Sea Cucumber Preserve is contained within the Bird Island Marine Sanctuary, and the Tank Beach Trochus Reserve is contained within the Forbidden Island Marine Sanctuary (Table 11). Investigation shows that 72.3% of the mapped coral reef ecosystems (defined as "Coral Reef and Colonized Hardbottom") in and around CNMI were under some form of management regime (NOAA, 2014; NOAA, 2016). However, it should be noted that this analysis of known coral reef habitat falling within management boundaries is not intended to equate to an assessment of management adequacy or efficacy. Additional metrics would be required for this type of evaluation.

A survey completed by PIFSC found that 40% of CNMI residents had heard of the Marianas Trench National Marine Monument before it was designated, and an additional 23% had heard of it after it was designated. Only 8% of CNMI residents indicated that they oppose the monument. Furthermore, CNMI residents most often reported moderate or strong confidence in federal agencies' ability to manage the monument (Kotowicz and Allen, 2015).

NOAA's MPA checklist tracks the governance of the Laolao Bay Sea Cucumber Sanctuary and the Managaha Marine Conservation Area through interviews with site managers and other key staff, with the goal of providing insight into management strengths and needs. The 2017 assessment found that "Little or no existing socioeconomic monitoring activity" exists for both assessed sites, but that biological monitoring was more advanced, and that "Little or no community and stakeholder engagement in management planning" exists for the Laolao Bay Sea Cucumber Sanctuary. In terms of success areas, both assessed areas were deemed to have "clearly defined boundaries and zones and information on boundary locations and permitted activities in various zones are provided to public and MPA stakeholders." All of the ratings discussed above were unchanged from the 2014 checklist (NOAA CRCP 2017).

Table 11: Details of the Marine Managed Areas of CNMI

Site Name	Government Level
Bird Island Marine Sanctuary	Territorial
Forbidden Island Marine Sanctuary	Territorial
Laolao Bay Sea Cucumber Reserve	Territorial
Sasanhaya Fish Reserve	Territorial
Bird Island Sea Cucumber Reserve	Territorial
Tank Beach Trochus Reserve	Territorial
Managaha Marine Conservation Area	Territorial
Lighthouse Reef Trochus Reserve	Territorial
Tinian Marine Reserve	Territorial
Mariana Arc Of Fire National Wildlife Refuge	Federal
Mariana Trench National Wildlife Refuge	Federal
Marianas Trench Marine National Monument	Federal

Source: 2017 NOAA Marine Protected Areas Inventory and CNMI Division of Fish and Wildlife (2015)

Discussion

Based on the survey findings, a few general conclusions about the population of CNMI and its relationships with coral reef resources can be made. These can be considered preliminary findings, and more detailed analyses of this data are planned for the future. We conclude this section by proposing directions for future research.

With respect to participation in reef activities, study findings indicate that CNMI residents participate in purely recreational coral reef related activities (e.g., SCUBA diving, snorkeling) at varying frequencies, with swimming and beach recreation being the most common activities. It was found that, on average, those who participate in pro-environmental behavior participate more heavily in recreational coral reef-related activities. When examining the effect of tenure (i.e. how long a resident has lived in the jurisdiction), it was found that lifelong residents, on average, participate more heavily in camping, gathering marine resources, and shore-based fishing. When examining participation rates of Chamorro people, results indicate that they, on average, participate more heavily in camping, beach recreation, fishing from shore, fishing from a boat, and gathering marine resources when compared to those who do not identify as Chamorro. It is likely that the reported activity participation rates are conservative estimates, as these estimates do not take the participation rates of tourists into account.

Fishing and gathering of marine resources are both practiced in CNMI, but do not occur as frequently as swimming or beach recreation. Our findings show that 38% of households stated that they engage in fishing from shore, fishing from a boat, or gathering marine resources. Similar to recreational activities, those who participate in pro-environmental behavior, on average, participate more heavily in extractive coral reef-related activities like fishing and gathering. The survey found that 85% of households consume fish/seafood once a week or more, and that most fishers (76%) do not sell the fish they catch; however, it is uncertain what proportion of fishing targets coral reef species, as these distinctions were not specified in the survey. This distinction was made when asking about seafood consumption, and one third of CNMI residents indicated that they consume reef fish/seafood at least once a week. Additionally, seafood consumed by CNMI residents is predominantly purchased in markets or from roadside vendors. On average, those who identify as Chamorro catch seafood themselves at a higher frequency than non-Chamorro people.

Survey respondents were asked about their perceptions of the health of CNMI's coral reef resources. The findings showed that residents generally perceive **marine resource conditions** to be relatively good, with 61% of residents believing that ocean water quality condition is good. However, residents tended to have more negative perceptions concerning the change in marine resources over the last decade (that is, residents perceived that the condition of marine resources have worsened over time). It was found that, on average, residents who have lived in CNMI for their entire lives have more negative perceptions concerning the condition of marine resources, as do residents identifying as Chamorro. Differences in perceptions concerning marine resource

condition were also identified between residents based on frequency of fishing for sustenance. Those that fish/gather to feed themselves/their family two times a month or more, on average, have more positive perceptions of current ocean water quality, the change in the number of fish, and the current condition of and change in condition of trochus. The initial results provide strong support for continued exploration and analysis of the parameter "differences in perception" as future data collections allow for greater sample sizes.

Regarding the public's **awareness and knowledge of coral reefs**, this study found that the majority of the population stated that they are familiar with threats facing coral reefs (except coral bleaching and invasive species). That being said, 34% believe that the condition of coral reef resources would get worse in the next 10 years, and 45% believe that the threats to coral reefs are "large" or "extreme." This suggests varying levels of confidence amongst CNMI residents that current threats to coral reefs are being (or can be) effectively addressed by current efforts. Another interesting finding is that those who have lived in CNMI their whole lives are less familiar, on average, with the threats of climate change, typhoons, and invasive species. Lifelong residents also agreed less, on average, with the statements "coral reefs are only important to fishermen, divers, and snorkelers," "Coral reefs in good condition provide food for island communities to eat," and "Coral reefs are important to my island's culture." It should be noted that the above is an interpretation of *relative* agreement levels, as the majority of everyone largely agreed with the statements pertaining to food provisioning and cultural importance.

The study found that the public's **attitudes towards coral reef management strategies and enforcement** are largely positive. Residents expressed support for all of the potential marine management measures, some of which are in use in various parts of CNMI. In particular, 90% of residents support more restrictions on construction practices to prevent sediment going to sea. The least supported management option is "Impose a small fee ($1 to $5) for non-residents visiting a locally managed MPA to fund conservation" (it is notable that 76% still support this option, further exemplifying the widespread resident support for management). When examining resident perceptions of MPAs, the overall sentiment toward them is positive; 71% agree that there should be more locally-managed MPAs in CNMI, and 90% agree that MPAs increase the number of fish. However, there is some disagreement on whether marine preserves have negatively impacted fishermen's lives in CNMI (34% agree, 44% disagree, 10% neither). Furthermore, residents that fish to feed themselves/their family are more likely to agree that there has been economic benefit to CNMI from the establishment of locally-managed MPAs. Additionally, fishers who sell their catch are more likely to agree that there has been economic benefit to CNMI from the establishment of locally-managed MPAs when compared to fishers who do not sell their catch; and residents who participate in pro-environmental behavior are more likely to support the establishment of the federally managed Marinas Trench Marine National Monument when compared to residents who do not participate in pro-environmental behavior. Lifelong residents agree less, on average, that MPAs increase fish, MPAs help increase tourism, and on general support for MPAs and the Marianas Trench Marine National Monument.

The research team also attempted to track public participation and attitudes with respect to the **governance** of coral reefs and their resources. It was found that 100% of all marine managed areas in CNMI have management plans in place, and 72.3% of all coral reef habitat is under some form of management. There appears to be a moderate to high level of community involvement in coral reef decision making, as well as high involvement in pro-environmental behavior aimed at improving the health of the marine environment and coral reefs (73% of survey respondents indicated that they participate in pro-environmental behavior). The survey also found that CNMI residents rarely rely on the federal government for information regarding coral reef topics, although the few individuals who do rely on the federal government as an information source find it trustworthy.

The collection of **secondary data,** including economic impacts of tourism and fishing, as well as data contributing to the development of some of the community well-being indicators, will continue over time. As updated data sets are produced by other NOAA offices and relevant agencies, these will be collected, synthesized, and housed within a centralized database, and will be used to track changes over time. These data may be incorporated into indicators that combine or compare biophysical parameters (e.g., fish biomass) with commercial landings data and public perceptions of general reef health. It is notable that tourism growth since 2011 in CNMI may have a potential impact on coral reef resources. More tourism could result in increased demand for coral reef ecosystem services including recreation and provisioning (e.g., food, products). Tourism growth has also resulted in increases in impervious surfaces due to general urbanization, as well as higher volumes of solid and sewage waste production, which in turn, can add more stress to coral reef ecosystems in CNMI.

Future approaches and research ideas

There were a few lessons learned from this first NCRMP socioeconomic data collection in CNMI. As similar surveys are implemented across other US coral reef jurisdictions, the NCRMP team will be making adjustments to the data collection effort to improve on the type of information generated. These findings can be considered a starting point to develop more detailed research questions for future work. For example, there was a need to distinguish between locally caught and imported fish as it related to the seafood consumption questions. In this CNMI-based iteration of the NCRMP socioeconomic survey, the research team differentiated between fish/seafood consumption and coral reef fish/seafood consumption in the survey questionnaire for the first time. The monitoring team will also aim to improve the level of comparability of questions across the different jurisdictions while maintaining questions that will provide information specifically relevant to the local context and management needs in each jurisdiction.

Another future research direction is to conduct analyses that explore relationships between different socioeconomic indicators, as well as comparisons between sub-populations as defined by the sampled respondents. These may include categories such as age, gender, or familiarity

with coral reefs. For example, our results showed that there is a difference in the perceptions of those who fish/gather versus those who do not fish/gather in relation to their attitudes towards some statements concerning MPAs (fishermen are more likely to agree that there should be fewer locally managed MPAs in CNMI). Additional future analysis will include an examination of the possible statistically significant differences in resident agreement levels pertaining to limited entry and access management measures versus top-down management measures in order to understand what types of management strategies are best suited to foster support and adherence amongst the population.

Other potential improvements include the elicitation of public awareness of climate change and ocean acidification, and their potential impacts on humans. Additional parameters for future consideration is the impact of invasive species, in particular the crown of thorns starfish (*Acanthaster planci*), for its detrimental effects on the coral reef ecosystem. Subsequent improvements to the survey instrument might include better distinguishing the sources of information on coral reefs and level of trustworthiness. This would provide information that could be incorporated into specific public outreach and education programs for current and future management measures.

The NCRMP socioeconomic data collection builds on and supplements the considerable social science research that has been conducted in CNMI to date. Integrating NCRMP data with these studies, or comparing and contrasting findings, has the potential to provide a more complete understanding of human interactions with coral reef resources in the territory. For example, Brander and van Beukering (2013) found that CNMI's coral reefs provide an estimated $65 million in ecosystem service benefits per year to humans in year 2007 dollars (includes amenity value, commercial fishery, tourism, recreation, coastal protection, and research value). The socioeconomic monitoring data collected through NCRMP provides further evidence of the contribution of CNMI's coral reefs to the economic stability of the communities of the island. There is currently another study underway contracted by the CNMI Coastal Zone Management and Coral Program to assess coastal vulnerability and coral reef-related ecosystem service values of recreation and tourism. Results from this effort should complement previous work done to estimate economic values associated with coral reefs ecosystems.

By coupling studies like these with socioeconomic monitoring of coral reef-adjacent communities, we can help provide managers with useful information for determining resource management needs that will align to communities' use and value for the resource. At the highest level, NCRMP socioeconomic data are intended to allow for analyses across jurisdictions and regions (e.g., comparisons of Pacific to Caribbean) and within a single jurisdiction over time. These investigations will be, in large part, aimed at answering questions related to the success of US coral reef conservation efforts.

In future years, NCRMP will continue to increase sampling to be statistically significant at smaller geographic scales within the jurisdictions. For example, in CNMI, we intend to adjust

our jurisdictional sampling schedule to enable us to increase the total sample size so that we can survey representative samples of each island. This enhanced sample will enable comparisons between areas with different populations, levels of coastal development, and coral reef management. Expanding our survey sample will improve our ability to compare NCRMP socioeconomic data to biophysical data collected through NCRMP and jurisdictional agencies (for instance, comparing perceived coral reef resource condition to biological indicators), and to inform coral reef management and monitoring across the entire jurisdiction. Finally, ongoing analyses of the individual metrics presented here will move us toward reporting the survey and secondary data collection results for a variety of composite indicators such as governance and perceived resource condition. These indicators will aid in comparisons across jurisdictions, where individual metrics may not be the same. Further, the use of indicators will support communication of complex data in a way that facilitates resource management decision making.

Coral reef in Laolao Bay, Saipan (Photo credit: NOAA)

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Appendix 1: National Coral Reef Monitoring Program

Understanding Socioeconomic Connections

The Socioeconomic Component of the National Coral Reef Monitoring Plan (NCRMP) gathers and monitors a collection of socioeconomic variables, including demographics in coral reef areas, human use of coral reef resources, as well as knowledge, attitudes, and perceptions of coral reefs and coral reef management. The overall goal of the socioeconomic monitoring component is to track relevant information regarding each jurisdiction's population, social and economic structure, the impacts of society on coral reefs, and the impacts of coral management on communities. NOAA's Coral Reef Conservation Program (CRCP) will use the information for research and to improve the results of programs designed to protect coral reefs.

The main purpose of the Socioeconomic Component of NCRMP is to answer the following questions: What is the status of human knowledge, attitudes, and perceptions regarding coral reefs? And, how are human uses of, interactions with, and coral dependence on coral reefs changing over time?

More details can be found here: http://www.coris.noaa.gov/monitoring/socioeconomic.html

Appendix 2: The NCRMP Survey Instrument

NCRMP Resident Coral Reef Survey for CNMI
OMB control Number 0648-0646

Survey conducted in (circle one): *English Chamorro Carolinian Tagalog*

Introduction: *[greeting specific to jurisdiction]*

Hello, my name is [interviewer name]. I'm calling from [CONTRACT COMPANY] on behalf of the National Oceanic and Atmospheric Administration (NOAA) and the National Coral Reef Monitoring Program. We are interested in obtaining your opinions on important issues related to coral reefs in CNMI. You were selected because you live in a coastal area near coral reefs.

This survey is being conducted in accordance with the Privacy Act of 1974 and the Paperwork Reduction Act. Your participation is voluntary, your answers are confidential and you can stop the interview at any time. The interview is expected to take less than 20 minutes. If you have questions or would like to know more about the survey I will provide you with contact information.

Notwithstanding any other provisions of the law, no person is required to respond to, nor shall any person be subjected to a penalty for failure to comply with, a collection of information subject to the requirements of the Paperwork Reduction Act, unless that collection of information displays a currently valid OMB Control Number. The OMB Control number for this survey is 0648-0646

The 25 minute estimate includes the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information.

Please send comments regarding this burden estimate or any other suggestions for reducing this burden to Peter Edwards, National Oceanic and Atmospheric Agency, National Ocean Service, Coral Reef Conservation Program, (1305 East West Highway, Silver Spring, MD, 20910, USA).

1. Are you at least 18 years of age?

IF "YES" CONTINUE TO SCREENING QUESTION 2. IF "NO", END SURVEY.

Now that we have established that you are qualified, we will continue with the survey. Remember that you can stop at any time.

PARTICIPATION IN REEF ACTIVITIES

1. How often do you usually participate in each of the following activities?

	Never	Once a month or less	2-3 times a month	4 times a month or more	No Response
Swimming/wading					
Snorkeling					
Recreational Diving (SCUBA)					
Waterside/ beach camping					
Beach recreation (beach sports, picnics)					
Motorized Boating					
Non-motorized Boating					
Fishing from shore – casting (rod & reel), cast netting/talaza					
Fishing from a boat, canoe or paddle board – rod and reel, trolling, spear gun, free diving, scuba					
Gathering of marine resources (seaweed, trochus, sea cucumber, octopus, clams, mollusks)					
Wave riding (SUP, wakeboarding, surfing, windsurfing)					

SKIP PATTERN-- If respondent answers 'never' to fishing or gathering of marine resources, then skip to #3:

CORAL REEF RELIANCE / CULTURAL IMPORTANCE OF REEFS

2. How often do you fish or harvest marine resources for each of the following reasons?

	Frequently	Sometimes	Rarely	Never	No Response
To feed myself and my family/ household					
To sell					
To give to extended family members and/or friends					
For fun					
For special occasions, religious and cultural events					

3. How often does your family eat fish/seafood?
    a. Every day
    b. A few times a week
    c. About once a week
    d. 1-3 times a month
    e. Less than once a month
    f. Never

4. What are the two main sources of the fish and seafood that you and your family eats?
    a. Purchased by myself or someone in my household at a store or restaurant
    b. Purchased by myself or someone in my household at a market or roadside vendor
    c. Caught by myself or someone in my household
    d. Caught by extended family members
    e. Caught by friends or neighbors
    f. Other, please specify _____
    g. Not Sure
    h. Refused

5. How often does your family eat fish/seafood that is harvested from coral reefs? (For example parrotfish, humphead wrasse, unicorn fish, octopus or shells)?
    a. Every day
    b. A few times a week
    c. About once a week
    d. 1-3 times a month
    e. Less than once a month
    f. Never

PERCEIVED RESOURCE CONDITION

6. In your opinion, how are the marine resources currently doing on the island of your residence? Please rank from very bad to very good.

	Very Bad	Bad	Neither Bad nor Good	Good	Very Good	Not sure
Ocean Water Quality (clean and clear)						
Amount of Coral						
Number of Fish						
Number of trochus (aliling)						
Number of sea cucumber (balati)						

7. How would you say the condition of each of the following has changed over the last 10 years: from 1=it has gotten a lot worse to 5=it has gotten a lot better.

	A lot Worse	Somewhat Worse	No Change	Somewhat Better	A lot Better	Not Sure
Ocean Water Quality (clean and clear)						
Amount of Coral						
Number of Fish						
Number of trochus (aliling)						
Number of sea cucumber (balati)						

8. In the next 10 years, do you think the condition of the marine resources in CNMI will get worse, stay the same or improve?
    a. Get worse
    b. Stay the same
    c. Improve
    d. Not sure

AWARENESS AND KNOWLEDGE OF CORAL REEFS

9. Please say whether you disagree or agree with each of the following statements.

	Strongly Disagree	Disagree	Neither	Agree	Strongly Agree	Not Sure
Coral reefs protect the CNMI from coastal erosion and natural disasters.						
Coral reefs are only important to fishermen, divers and snorkelers.						
Coral reefs in good condition provide food for island communities to eat						
Coral reefs are important to my island's culture.						

10. How familiar are you with each of the following potential threats facing the coral reefs in CNMI?

	Very Unfamiliar	Unfamiliar	Neither Familiar nor Unfamiliar	Familiar	Very Familiar	Not sure
Climate change						
Coral bleaching						
Typhoons and other natural disasters						
Pollution (stormwater, wastewater outfall, terrestrial runoff and trash/littering)						
Increased coastal/urban development						
Invasive species						
Over harvesting of resources						
Damage from ships and boats (groundings or anchoring)						
Erosion/sedimentation, sediment runoff						
Open dumping/littering						

11. Do you believe that the threats to coral reefs in CNMI are:

    a. Extreme
    b. Large
    c. Moderate
    d. Minimal
    e. None
    f. Not sure

ATTITUDES TOWARDS CORAL REEF MANAGEMENT STRATEGIES AND ENFORCEMENT

12. A Marine Protected Area is an area of the ocean where human activity is typically restricted to protect living, non-living, cultural, and/or historic resources such as conservation areas and sanctuaries. How familiar are you with Marine Protected Areas (MPAs)?

    a. Very Unfamiliar
    b. Unfamiliar
    c. Neither Unfamiliar nor Familiar
    d. Familiar
    e. Very Familiar
    f. Not sure

SKIP PATTERN-- If respondent answers 'Very unfamiliar' or 'Unfamiliar', then skip to #14:

13. Please indicate how much you disagree or agree with each of the following statements.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree	Not Sure
MPAs protect coral reefs						
MPAs increase the number of fish						
There should be fewer locally-managed MPAs in CNMI						
There should be more locally-managed MPAs in CNMI						
There has been economic benefit to CNMI from the establishment of locally-managed MPAs						
Fishermen's livelihoods have been negatively impacted from the establishment of locally-managed MPAs in CNMI						
Locally managed MPAs help increase tourism in CNMI						
The establishment of locally-managed MPAs increases the likelihood that people will vacation in CNMI						
I would support adding new locally managed MPAs in CNMI if there is evidence that the ones we have are improving CNMI's marine resources						
I generally support the establishment of locally-managed MPAs						
I generally support the establishment of the federally managed Marina Trench Marine National Monument)						

AWARENESS OF CORAL RULES AND REGULATIONS

14. The following are rules and regulations that can be used to manage the marine environment. We are interested in your opinion about the use of these rules and regulations for the protection of coral reefs. Please indicate how much you disagree or agree with each of the following:

Rules/Regulations	Strongly Oppose	Oppose	Neither Support nor Oppose	Support	Strongly Support	Don't Know
Size limits for certain fish species						
Impose a small fee ($1 to $5) for non-residents visiting a locally managed MPA to fund conservation						
Increased enforcement of wastewater and stormwater regulations to preserve water quality						
Limits on the number of tourism boat operators able to conduct business within locally managed MPAs						
More restrictions on construction practices to prevent sediment going to sea						

PARTICIPATION IN BEHAVIORS THAT MAY IMPROVE CORAL CONDITION

15. How often do you participate in any activity to protect the environment (for example, beach clean ups, volunteering with an environmental group, recycling)?
    a. Not At All
    b. Once a year or Less
    c. Several times a year
    d. At least once a month
    e. Several Times a Month or more
    f. Not Sure

16. Which of the following would you consider to be your top 3 sources of information about coral reefs and the environment in CNMI?

17. To what degree do you trust each of your top rated sources of information to provide you the most accurate information on coral reefs and coral reef related topics in CNMI? ***Respondent rates only the top 3 sources of information in box below.***

Top 3	Sources	Very untrustworthy	Untrustworthy	Neither Trustworthy nor Untrustworthy	Trustworthy	Very Trustworthy	Not sure
	Newspapers, other print publications						
	Radio						
	TV						
	Internet						
	Social Media						
	Friends and family						
	Community leaders						
	Jurisdictional government agencies (BECQ, DFW)						
	Federal government agencies (NOAA, EPA, US Fish and Wildlife)						
	Non-profit environmental organizations (MINA/PMRI, TNC, APASEEM)						
	Other						

18. How involved is the local community in protecting and managing coral reefs?
    a. Not at all involved
    b. Somewhat involved
    c. Moderately involved
    d. Involved
    e. Very involved
    f. Not sure

19. How involved are you in making decisions related to the management of coral reefs in CNMI?
    a. Not at all involved
    b. Slightly involved
    c. Moderately involved
    d. Involved
    e. Very involved
    f. Not sure

DEMOGRAPHICS

I just have a few more questions that will help us to interpret our results. As a reminder, the information you provide is completely <u>confidential</u>.

20. Are you male or female?
    a. Male
    b. Female

21. What is your year of birth? _____

22. How long have you lived in CNMI?
    a. 1 year or less
    b. 2-5 years
    c. 6-10 years
    d. more than 10 years, but less than all my life
    e. all my life

23. Including your primary language, please name each language you speak.
    a. English
    b. Spanish
    c. Mandarin
    d. Japanese
    e. Korean
    f. Tagalog
    g. Chamorro
    h. Carolinian
    i. Other: Please list _____
    j. No Response

24. What race/ethnicity do you consider yourself?
    a. Asian
    b. Carolinian
    c. Chamorro
    d. Chinese
    e. Filipino
    f. Japanese
    g. White
    h. Korean
    i. Native Hawaiian or other Pacific Islander
    j. Taino
    k. Thai
    l. Vietnamese
    m. Other/Mixed
    n. No response

25. What is the highest level of education you have completed?
    a. 8th Grade or Less
    b. Some high school
    c. High School Graduate, GED
    d. Some college, community college or AA
    e. College Graduate
    f. Graduate School, Law School, Medical School
    g. No Response

26. What is your current employment status?
    a. Unemployed
    b. Student
    c. Employed full-time
    d. Homemaker
    e. Employed part-time
    f. Retired
    g. None of the above: Please specify _____
    h. No Response

27. What is your occupation? [***open ended***] _____

28. May I ask, what is your annual household income?
    a. Under $10,000
    b. $10,000-19,999
    c. $20,000-29,999
    d. $30,000-39,999
    e. $40,000-49,999
    f. $50,000-59,999
    g. $60,000-74,999
    h. $75,000-99,999
    i. $100,000-149,999
    j. $150,000 or More
    k. No Response

THANK YOU FOR YOUR TIME

If you would like a copy of the results, please provide us with your mailing address or email address (write on separate contact sheet that is not linked to survey answers).

Appendix 3: CNMI NCRMP Survey Demographic Results[9]

Island	Percent of Sample	Percent of Population (2010 US Census)
Saipan	89%	89%
Tinian	6%	6%
Rota	5%	5%

Gender	Sample	2010 US Census
Male	46%	51%
Female	54%	49%
No Response	0.1%	N/A

Age	Sample	2010 US Census
18-24 year olds	14%	11%
25-34 year olds	14%	19%
35-44 year olds	19%	29%
45-64 year olds	42%	36%
65+ years old	9%	4%
No Response	2%	N/A

Education Level	Sample	2010 US Census
Less than high school	5%	19%
High School Graduate, GED	35%	37%
Some college, community college or AA	31%	26%
Bachelor's Degree	24%	15%
Graduate School, Law School, Medical School	5%	3%
No Response	<1%	N/A

[9] 2010 US Census results in this section refer to the adult population of CNMI.

Annual Household Income	Sample[10]	2010 US Census
Under $10,000	8%	25%
$10,000 to $19,999	21%	25%
$20,000 to $29,999	26%	15%
$30,000 to $39,999	15%	10%
$40,000 to $49,999	10%	7%
$50,000 to $59,999	7%	5%
$60,000 to $74,999	5%	5%
$75,000 to $99,999	5%	4%
$100,000 or more	3%	5%

Race	Sample	2010 Census
Asian	42.1%	56.7%
Chinese	1.4%	8.5%
Filipino	34.6%	39.5%
Japanese	1.1%	1.8%
Korean	1.3%	4.0%
Other Asian	3.8%	2.9%
Black/African American	0.3%	0.1%
Native Hawaiian/Other Pacific Islander	48.4%	33.1%
Carolinian	6.8%	4.5%
Chamorro	34.3%	22.4%
Chuukese	1.3%	2.1%
Kosraean	0.0%	0.1%
Marshallese	0.1%	0.1%
Palauan	1.3%	2.2%
Pohnpeian	0.4%	0.8%
Yapese	0.7%	0.4%
Other Native Hawaiian/Pacific Islander	3.5%	0.5%
White	6.0%	2.7%
Hispanic	0.4%	0.1%
Other race	2.6%	0.3%
2 or more races	N/A	7.0%

[10] Answers of “no response” are left absent from the analysis of household income due to high rate of occurrence (approximately 19%).

Languages Spoken[11]	**Sample**
English	98.9%
Chamorro	42.8%
Tagalog	37.6%
Carolinian	11.9%
Other	7.4%
Japanese	7.1%
Chinese	2.6%
Korean	2.5%
Spanish	2.4%
German	0.7%
French	0.4%
Hindi	0.4%
Arabic	0.4%
Hawaiian Pidgin	0.4%
Italian	0.3%
Hawaiian	0.3%
Portuguese	0.1%
Samoan	0.1%

Employment Status[12]	**Sample**
Unemployed	11.6%
Student	5.7%
Employed full-time	53.3%
Homemaker	7.1%
Employed part-time	6.9%
Retired	13.9%
Other	0.1%
No Response	1.4%

Occupation[13]	**Sample**
Government of CNMI	11.2%
Federal Government	3.9%
US Military	0.3%
Private Company	40.7%

[11] The 2010 US Census did not collect this type of information.
[12] The 2010 US Census did not collect this type of information.
[13] The 2010 US Census did not collect this type of information.

Self Employed	4.0%
Retired	12.7%
Unemployed, but looking for a job	7.9%
Unemployed, but not looking for a job	6.8%
Student (High school or post secondary)	5.3%
Other	1.5%
No Response	5.7%

Year(s) of Residence[14]	**Sample**
1 year or less	1.7%
2-5 years	4.2%
6-10 years	5.5%
More than 10 years (less than all my life)	51.4%
All my life	36.8%
No Response	0.4%

[14] The 2010 US Census did not collect this type of information.

Appendix 4: NCRMP Secondary Data Sources for CNMI

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Central Intelligence Agency	The World Factbook Life Expectancy at Birth	2013	These data represent the average number of years to be lived by a group of people born in the same year, if mortality at each age remains constant in the future.	2014	https://www.cia.gov/library/publications/the-world-factbook/rankorder/2102rank.html
Central Intelligence Agency	The World Factbook Inflation Rate (Consumer Prices)	2014	Inflation rate (consumer prices) compares the annual percent change in consumer prices with the previous year's consumer prices.	2003-2014	https://www.cia.gov/library/publications/the-world-factbook/rankorder/2092rank.html
Central Statistics Division, Department of Commerce, Commonwealth of the Marianas Islands, Caller Box 10007, Saipan, MP 96950	CNMI Yearbook 2002	2002	We have put together an accurate, comprehensive annual statistical yearbook for the CNMI All data are organized in a consistent table format that we hope you will find easy to follow. Following the List of Figures is a conversion table between the English and Metric systems, for those who need to do conversions. The information and data contained in this yearbook were obtained from many sources, including census publications, unpublished manuscripts, annual reports, and administrative reports and records of government offices, agencies and corporations.	1980-2002	http://commerce.gov.mp/wp-content/uploads/2010/08/CNMI-Yearbook-2002.pdf

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Commonwealth of the Northern Mariana Islands, Department of Community and Cultural Affairs	DCCA News Publications	2014	This article reports the number of individuals on Saipan, Tinian, and Rota, CNMI who received benefits from the Nutrition Assistance Program in 2013	2013	http://www.saipantribune.com/index.php/food-stamps-rota-tinian/
Commonwealth of the Northern Mariana Islands, Department of Public Health	Health data report/ Commonwealth of the Northern Mariana Islands	2008	This report includes mortality data for the years 2003-2005 in the Commonwealth of the Northern Mariana Islands by cause.	2003-2005	http://catalogue.nla.gov.au/Record/4600142
Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), Ocean and Coastal Resource Management (OCRM), National Marine Protected Areas Center (MPAC)	MPA Inventory Database (10/2014)	2014	The MPA Inventory is a comprehensive catalog that provides detailed information for existing marine protected areas in the United States. The inventory provides geospatial boundary information (in polygon format) and classification attributes that seek to define the conservation objectives, protection level, governance and related management criteria for all sites in the database. The comprehensive inventory of federal, state and territorial MPA sites provides governments and stakeholders with access to information to make better decisions about the current and future use of place-based conservation. The information also will be used to inform the development of the national system of marine protected areas as required by Executive Order 13158.	2014	http://marineprotectedareas.noaa.gov/dataanalysis/mpainventory/

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Department of Commerce, Commonwealth of the Marianas Islands, Caller Box 10007 C.K., Saipan, MP 96950	Economic Indicators: A Quarterly Report	2000-2013	This report depicts the social and economic conditions of the Commonwealth of the Northern Mariana Islands (CNMI).	1996-2013	http://commerce.gov.mp/divisions/central-statistics/
Department of Commerce, Commonwealth of the Marianas Islands, Caller Box 10007 C.K., Saipan, MP 96950	Economic Indicators: A Quarterly Report	2014	This report depicts the social and economic conditions of the Commonwealth of the Northern Mariana Islands (CNMI).	2012-2013	http://commerce.gov.mp/divisions/central-statistics/
Environmental Protection Agency	EPA Assessment and Total Maximum Daily Load Tracking and Implementation System (ATTAINS)	2014	The Assessment and Total Maximum Daily Load (TMDL) Tracking and Implementation System (ATTAINS) is an online system for accessing information about the conditions in the Nation's surface waters. The Clean Water Act requires states, territories and authorized tribes (states for brevity) to monitor water pollution and report to EPA every two years on the waters they have evaluated. This process is called assessment. Part of this process is deciding which waters do not meet water quality standards because they are too polluted. These degraded waters are called impaired (polluted enough to require action) and are placed on a State list for future actions to reduce pollution.	2002, 2004, 2006, 2008, 2010, 2012, 2014	https://www.epa.gov/waterdata/assessment-and-total-maximum-daily-load-tracking-and-implementation-system-attains

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			This information reported to EPA by states is available in ATTAINS. The information is made available via the ATTAINS web reports, as well as through other EPA tools. The ATTAINS web reports provide users with easy access to view the information on the status of waters at the national, state and site-specific waterbody levels. To access this information, click the Get Data/Tool tab above.		
Environmental Protection Agency	EPA Annual Beach Notification Summary Reports -- Closures and Advisories	2012	These fact sheets summarize beach monitoring and notification data submitted to EPAfor each swimming season. Beach water monitoring is conducted primarily to detect bacteria that indicate the possible presence of disease-causing microbes (pathogens) from sewage or fecal pollution. People swimming in water contaminated with these types of pathogens can contract diseases of the gastrointestinal tract, eyes, ears, skin, and upper respiratory tract. When monitoring results show levels of concern, the state or local government issues a beach advisory or closure notice until further sampling shows that the water quality is meeting the applicable standards. Beach water pollution can occur for a number of reasons including stormwater runoff after heavy rainfall, treatment plant malfunctions,sewer system	2006, 2010, 2011, 2012	http://water.epa.gov/type/oceb/beaches/2011_season.cfm

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			overflows, and pet and wildlife waste on or near the beach. To help minimize beachgoers' risk of exposure to pathogens in beachwaters, EPA is helping communities build and properly operate sewage treatment plants, working to reduce overflows as much as possible, and working with the U.S. Coast Guard to reduce discharges from boats and larger ships. Under the Beaches Environmental Assessment and Coastal Health (BEACH) Act of 2000, EPA provides annual grants to coastal and Great Lakes states, territories, and eligible tribes to help local authorities monitor their coastal and Great Lakes beaches and notify the public of water quality conditions that may be unsafe for swimming.		
Gallup	Gallup Economic Confidence Index	2015	Gallup's Economic Confidence Index is based on the combined responses to two questions asking Americans, first, to rate economic conditions in the country today, and second, whether they think economic conditions in the country as a whole are getting better or getting worse. The Index is computed by adding the percentage of Americans rating current economic conditions (("excellent" + "good") minus "poor") to the percentage saying the economy is ("getting better" minus "getting worse"), and then dividing that sum by 2. The Index has a	2013-2014	http://www.gallup.com/poll/125735/economic-confidence-index.aspx

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			theoretical maximum value of +100 and a theoretical minimum value of -100. Values above zero indicate that more Americans have a positive than a negative view of the economy; values below zero indicate net-negative views, and zero indicates that positive and negative views are equal.		
HML Project Team	Environmental Use and Dependence - HML Project Team Collection	2014	This data set is comprised of uses occurring in study areas as well as attendance figures for parks located in the study areas. Park visitation to national, state, and county parks as well as National Wildlife Refuge areas are included in this data set. Use data includes fishing, diving, and boating in the study area. Sources: -AS Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, National Oceanic and Atmospheric Administration. -CNMI Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, National Oceanic and Atmospheric	2013	

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			Administration. -FL Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, Florida Fish and Wildlife Conservation Commission, Florida Department of Highway Safety and Motor Vehicles, Florida Park Service. -Guam Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, National Oceanic and Atmospheric Administration. -HI Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, Department of Land and Natural Resources, National Oceanic and Atmospheric Administration, Hawaii Tourism		

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			Authority, National Association of State Park Directors, County of Hawaii Fire Department: Ocean Safety Division. -PR Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, Puerto Rico Department of Natural and Environmental Resources, U.S. Department of Agriculture. -USVI Sources: U.S. Fish and Wildlife Service, National Park Service, U.S. Department of Homeland Security/U.S. Coast Guard Office of Auxiliary and Boating Safety, Professional Association of Diving Instructors, Diveadvisor.com, Worldwidefishing.com, National Archives and Records Administration Office of the Federal Register, Department of Planning and Natural Resources Division of Fish & Wildlife.		
Institute for Health Metrics and Evaluation (IHME)	United States Adult Life Expectancy by County 1987-2007	2011	This is a complete time series for life expectancy from 1987 to 2007 for all US counties, and released as part of IHME research published in *Population Health Metrics.*	2007	http://ghdx.healthdata.org/record/united-states-adult-life-expectancy-county-1987-2007

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
National Oceanic and Atmospheric Administration (NOAA), Coastal Change Analysis Program (CCAP)	National Oceanic and Atmospheric Administration, Coastal Change Analysis Program (CCAP) Regional Land Cover Data	2012	The Coastal Change Analysis Program (C-CAP) produces a nationally standardized database of land cover and land change information for the coastal regions of the U.S. C-CAP products are developed using multiple dates of remotely sensed imagery and consist of raster-based land cover maps for each date of analysis, as well as a file that highlights what changes have occurred between these dates and where the changes were located. These data highlight the relative effects of different landscape features on water quality, such as increased polluted runoff from impervious surfaces and the mitigating impacts of forests. NOAA produces high resolution C-CAP land cover products, for select geographies. GIS and tabular data was accessed June 2012 and prepared for the project by NOAA Coastal Services Center, Charleston SC.	2001-2016 (various)	http://www.csc.noaa.gov/digitalcoast/data/ccapregional
National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), Pacific Islands Fisheries Science Center (PIFSC),	Western Pacific Fisheries Information Network	2016	Established in 1981, the Western Pacific Fisheries Information Network (WPacFIN) is a cooperative program involving the WPacFIN central office at the Pacific Islands Fisheries Science Center (PIFSC) and fisheries agencies of American Samoa, the Commonwealth of the Northern Mariana Islands (CNMI), Guam, and Hawaii. WPacFIN compiles fisheries information collected by these agencies and provides them technical	1980-2015	https://www.pifsc.noaa.gov/wpacfin/

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			expertise and tools to help them collect, manage, summarize, and quality control fishery-dependent data needed for local, federal, and international assessment and management decisions. WPacFIN also works closely with the Western Pacific Regional Fishery Management Council and NOAA's Pacific Islands Regional Office (PIRO).		
National Oceanic and Atmospheric Administration (NOAA), National Ocean Service, Office of Response and Restoration, Hazardous Materials Response Division, Seattle, Washington; Coral Reef Conservation Program, Silver Spring, Maryland; and Pacific Services Center, Honolulu, Hawaii.	Guam and the Northern Mariana Islands ESI: HYDRO (Hydrography Lines and Polygons)	2006	This data set contains vector lines and polygons representing coastal hydrography used in the creation of the Environmental Sensitivity Index (ESI) for Guam and the Northern Mariana Islands. The HYDRO data layer contains all annotation used in producing the atlas. The annotation features are categorized into three subclasses in order to simplify the mapping and quality control procedures: GEOG for geographic features, SOC for socioeconomic features, and HYDRO for water features. This data set comprises a portion of the ESI data for Guam and the Northern Mariana Islands. ESI data characterize the marine and coastal environments and wildlife by their sensitivity to spilled oil. The ESI data include information for three main components: shoreline habitats, sensitive biological resources, and human-use resources.	1999-2004	http://archive.orr.noaa.gov/topic_subtopic_entry.php?RECORD_KEY%28entry_subtopic_topic%29=entry_id,subtopic_id,topic_id&entry_id%28entry_subtopic_topic%29=849&subtopic_id%28entry_subtopic_topic%29=8&topic_id%28entry_subtopic_topic%29=1

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
Saipan Tribune	Saipan Tribune	2014	This article reports the cumulative number of individuals on Saipan, Tinian, and Rota who received benefits from the Nutrition Assistance Program in 2013	2013	http://www.saipantribune.com/index.php/nap-seeking-vendor-improve-eligibility-system/
The Henry J. Kaiser Family Foundation	State Health Facts: Infant Mortality Rate (Deaths per 1,000 Live Births)	2013	These data represent the number of infant deaths per 1,000 live births based on linked birth and death records from the period from 2007-2009.	2007-2009	http://kff.org/other/state-indicator/infant-death-rate/
The Henry J. Kaiser Family Foundation	State Health Facts: Number of Cancer Deaths per 100,000 Population	2013	These data represent age-adjusted rates per 100,000 U.S. standard population. Rates for the United States and each state are based on populations enumerated in the 2010 census as of April 1. Rates for Puerto Rico, Virgin Islands, Guam, American Samoa, and Northern Marianas are based on the 2010 census, estimated as of July 1, 2010. Since death rates are affected by the population composition of a given area, age-adjusted death rates should be used for comparisons between areas because they control for differences in population composition.	2010	http://kff.org/other/state-indicator/cancer-death-rate-per-100000/
The World Bank	World Bank – Annual Visitor Arrivals	2014	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The	1995-2014	http://data.worldbank.org/indicator/ST.INT.ARVL

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			World Bank Group comprises five institutions managed by their member countries. Annual visitor arrivals is an international tourism indicator based on the number of tourists who travel to a country other than that in which they usually reside, and outside their usual environment, for a period not exceeding 12 months and whose main purpose in visiting is other than an activity remunerated from within the country visited. When data on number of tourists are not available, the number of visitors, which include tourists, same-day visitors, cruise passengers, and crew members, is shown instead.		
The World Bank	World Bank – Fish/Mammal species threatened	2010, 2011	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. Fish species are based on Froese, R. and Pauly, D. (eds). 2008. Threatened species are the number of species classified by the IUCN as endangered, vulnerable, rare, indeterminate, out of danger, or insufficiently known. Mammal species are mammals excluding	2010, 2011	http://data.worldbank.org/indicator/EN.FSH.THRD.NO http://data.worldbank.org/indicator/EN.MAM.THRD.NO

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			whales and porpoises. Threatened species are the number of species classified by the IUCN as endangered, vulnerable, rare, indeterminate, out of danger, or insufficiently known.		
The World Bank	World Bank – Climate Change Knowledge Portal	2012	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. The World Bank Climate Change Knowledge Portal reports monthly data since 1900 on temperature and precipitation for each world nation	1900-2012	http://sdwebx.worldbank.org/climateportal/index.cfm?page=downscaled_data_download&menu=historical
The World Bank	World Bank - Population, Total	2014	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship--except for refugees not permanently settled in the country of asylum, who are generally considered part of the population of their	2012-2013	http://data.worldbank.org/indicator/SP.POP.TOTL

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			country of origin. The values shown are midyear estimates.		
The World Bank	World Bank - GDP (current US$)	2014	The World Bank is a vital source of financial and technical assistance to developing countries around the world. We are not a bank in the ordinary sense but a unique partnership to reduce poverty and support development. The World Bank Group comprises five institutions managed by their member countries. GDP at purchaser's prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in current U.S. dollars. Dollar figures for GDP are converted from domestic currencies using single year official exchange rates.	2005-2013	http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries/PR?display=graph
The World Bank	World Bank - Total greenhouse gas emissions	2015	This data set provides country-by-country greenhouse gas emissions data. Total greenhouse gas emissions in kt of CO2 equivalent are composed of CO2 totals excluding short-cycle biomass burning (such as agricultural waste burning and Savannah burning) but including other biomass burning (such as forest fires, post-burn decay, peat fires and decay of drained peatlands), all anthropogenic CH4 sources, N2O	1970-2012	http://data.worldbank.org/indicator/EN.ATM.GHGT.KT.CE

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			sources and F-gases (HFCs, PFCs and SF6). Source: European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR), EDGARv4.2 FT2012: http://edgar.jrc.ec.europa.eu/		
The World Bank	World Bank - Methane emissions	2015	This data set provides country-by-country methane (CH4) emissions data. Methane emissions are those stemming from human activities such as agriculture and from industrial methane production. Source: European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR): http://edgar.jrc.ec.europa.eu/	1970-2012	http://data.worldbank.org/indicator/EN.ATM.METH.KT.CE
The World Bank	World Bank – Nitrous oxide emissions	2015	This data set provides country-by-country nitrous oxide (NoX) emissions data. Nitrous oxide emissions are emissions from agricultural biomass burning, industrial activities, and livestock management. Source: European Commission, Joint Research Centre (JRC)/Netherlands Environmental Assessment Agency (PBL). Emission Database for Global Atmospheric Research (EDGAR): http://edgar.jrc.ec.europa.eu/	1970-2012	http://data.worldbank.org/indicator/EN.ATM.NOXE.KT.CE

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
The World Bank	World Bank - Improved water source (% of population with access)	2015	Access to an improved water source refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped water on premises (piped household water connection located inside the user's dwelling, plot or yard), and other improved drinking water sources (public taps or standpipes, tube wells or boreholes, protected dug wells, protected springs, and rainwater collection).	1990-2015	http://data.worldbank.org/indicator/SH.H2O.SAFE.ZS
U.S. Department of Commerce Bureau of Economic Analysis	Gross Domestic Product for the Commonwealth of the Northern Mariana Islands (CNMI), 2013	2014	Estimates of gross domestic product (GDP) for the territory for 2013, in addition to estimates of gross domestic product by industry and compensation by industry for 2012 are presented in this document. These estimates were developed under the Statistical Improvement Program funded by the Office of Insular Affairs (OIA) of the U.S. Department of the Interior. The latest estimates of GDP for 2007 to 2012 are also presented in this release, as well as GDP by industry and compensation by industry for 2007 to 2011.	2007-2013	http://www.bea.gov/newsreleases/rels.htm
U.S. Department of Health and Human Services	National Vital Statistics Reports: Deaths: Preliminary Data for 2011	2012	These are preliminary U.S. data on deaths, death rates, life expectancy, leading causes of death, and infant mortality for 2011 by selected characteristics such as age, sex, race, and Hispanic origin. Preliminary data in this	2011	http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_06.pdf

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			report are based on records of deaths that occurred in calendar year 2011, which were received from state vital statistics offices and processed by the Centers for Disease Control and Prevention's National Center for Health Statistics (NCHS) as of June 12, 2012.		
U.S. Department of Health and Human Services	National Vital Statistics Reports: Deaths: Final Data for 2010	2013	These data represent final 2010 data on U.S. deaths, death rates, life expectancy, infant mortality, and trends by selected characteristics such as age, sex, Hispanic origin, race, state of residence, and cause of death.	2010	http://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_04.pdf
U.S. Energy Information Administration	EIA State Electricity Profiles	1991-2014	The State Electricity Profiles presents a summary of key State statistics for 2000, and 2004 through 2010. The tables present summary statistics; ten largest plants by generating capacity; top five entities ranked by retail sales; electric power industry generating capacity by primary energy source; electric power industry generation of electricity by primary energy source; utility delivered fuel prices for coal, petroleum, and natural gas; electric power emissions estimates; retail sales, revenue, and average revenue per kilowatthour by sector; and utility retail sales statistics. Data published in the State Electricity Profiles are compiled from five forms filed annually by electric utilities and other electric power producers.	1990-2014	http://www.eia.gov/electricity/state/

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
U.S. House of Representatives	Committee on Ways and Means Report: Supplemental Nutrition Assistance Program (Formerly the Food Stamp Program)	2013	This report written by the U.S. House of Representatives Ways and Means Committee details SNAP and some of the figures associated with the program.	2007	http://democrats.waysandmeans.house.gov/sites/democrats.waysandmeans.house.gov/files/documents/food.pdf
United States Census Bureau	Census 2000	2002	Summary File 3 contains population and housing data based on Census 2000 questions asked on the long form of a one-in-six sample of the population. Population items include marital status, disability, educational attainment, occupation, income, ancestry, veteran status, and many other characteristics. Housing items include tenure (whether the unit is owner- or renter-occupied), occupancy status, housing value, mortgage status, price asked, and more. In addition to the 50 states and District of Columbia, the U.S. Census Bureau also conducts censuses and surveys in the the United States' Island Areas. Census and survey operations are conducted in cooperation with the governments of the the Island Areas and frequently include modifications to the questionnaires to help the local and federal governments	2000	http://www.census.gov/main/www/cen2000.html

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			better understand the populations being counted.		
United States Census Bureau	2010 Census	2011	Summary File 1 shows detailed tables on age, sex, households, families, relationship to householder, housing units, detailed race and Hispanic or Latino origin groups, and group quarters.	2010	http://www.census.gov/2010census/data/
United States Census Bureau	2008-2012 ACS 5-Year Estimates	2013	The ACS provides information on more than 40 topics, including education, language ability, the foreign-born, marital status, migration and many more. Each year the survey randomly samples around 3.5 million addresses and produces statistics that cover 1-year, 3-year, and 5-year periods for geographic areas in the United States and Puerto Rico.	2012	http://www2.census.gov/acs2012_5yr/summaryfile/
United States Census Bureau	2010 Census Commonwealth of Northern Mariana Islands (CNMI) Summary File	2013	This summary file contains subject-matter content from the 2010 Census — age (including single years of age), sex, race and ethnicity, household type, relationship, population in group quarters, whether the residence is owned or rented (tenure), and vacancy status among other social, economic, housing, and demographic characteristics.	2010	https://www.census.gov/2010census/news/press-kits/island-areas/island-areas.html
United States Census Bureau	2013 Population Estimates: Annual Estimates of the Resident Population:	2014	The estimates are based on the 2010 Census and reflect changes to the April 1, 2010 population due to the Count Question Resolution program and geographic program revisions. The resident population for each year is estimated since the most recent decennial	2010-2013	http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=PEP_2013_PEPANNR

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
	April 1, 2010 to July 1, 2013		census by using measures of population change. The resident population includes all people currently residing in the United States.		ES&prodType=table
United States Census Bureau	2009-2013 ACS 5-Year Estimates	2014	The ACS provides information on more than 40 topics, including education, language ability, the foreign-born, marital status, migration and many more. Each year the survey randomly samples around 3.5 million addresses and produces statistics that cover 1-year, 3-year, and 5-year periods for geographic areas in the United States and Puerto Rico.	2013	http://www2.census.gov/acs2013_5yr/summaryfile/
United States Census Bureau	Building Permits Survey	2015	Data collected include number of buildings, number of housing units, and permit valuation by size of structure. This survey covers all places issuing building permits for privately-owned residential structures. Over 98 percent of all privately-owned residential buildings constructed are in permit-issuing places.	2004-2014	http://www.census.gov/construction/bps/stateannual.html
United States Census Bureau	Quarterly Workforce Indicators	2015	The Quarterly Workforce Indicators (QWI) are a set of economic indicators including employment, job creation, earnings, and other measures of employment flows. The QWI are reported using detailed firm characteristics (geography, industry, age, size) and worker demographics information (sex, age, education, race, ethnicity). QWI data are available through the following access tools:	2013-2015	http://lehd.ces.census.gov/data/

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
United States Census Bureau	County Business Patterns	2014	County Business Patterns (CBP) is an annual series that provides subnational economic data by industry. This series includes the number of establishments, employment during the week of March 12, first quarter payroll, and annual payroll.	1998-2012	http://www.census.gov/econ/cbp/
United States Department of Agriculture Food and Nutrition Service	Supplemental Nutrition Assistance Program: Average Monthly Participation (Persons)	2015	SNAP offers nutrition assistance to millions of eligible, low-income individuals and families and provides economic benefits to communities. The number of persons participating is reported monthly. Annual averages are the sums divided by twelve.	2010-2014	http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap
United States Government Accountability Office	American Samoa and the Commonwealth of the Northern Mariana Islands: Economic Indicators Since Minimum Wage Increases Began	2014	This report updates GAO's previous reports and discusses for each territory (1) changes in employment and earnings and (2) changes in key industries since the most recent federal minimum wage increase and since the increases began. GAO reviewed local and federal earnings information; collected data from employers in key industries through a questionnaire and from employers and workers through discussion groups and interviews during visits to each area.	2009	http://www.gao.gov/assets/670/662127.pdf
US Geological Survey; National Water Information System	USGS Water Data for the Nation	2017	The U.S. Geological Survey's (USGS) National Water Information System (NWIS) is a comprehensive and distributed application that supports the acquisition, processing, and long-term	1900-2017	https://waterdata.usgs.gov/nwis

Source (originator)	*Data Set Title*	*Publication Date*	*Abstract*	*Data Year(s)*	*URL*
			storage of water data. USGS Water Data for the Nation Site serves as the publicly available portal to a geographically seamless set of much of the water data maintained within NWIS. USGS Water Data for the Nation Site provides access to water data from over 1.5 million sites in all 50 States and additional border and territorial sites. The water data available via this site have been acquired as part of the USGS investigations of the occurrence, quantity, quality, distribution, and movement of the surface and underground waters that constitute the Nation's water resources.		