

Pacific Services Center Needs Assessment for
the U.S. Pacific Island Region:
Literature Review

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ACRONYMS

AIS	Aquatic invasive species
APC	Areas of primary concern
ARC	Application review committee
ASCMP	American Samoa Coastal Management Program
ASEPA	American Samoa Environmental Protection Agency
ASG	American Samoa Government
ASPA	American Samoa Power Authority
BMP	Best management practices
CBFMP	Community Based Fisheries Management Program
CNMI	Commonwealth of the Northern Mariana Islands
CRAG	Coral Reef Advisory Group
CRMO	Coastal Resources Management Office
CRI	Coral Reef Initiative
CSI	Cumulative and secondary impacts
CZM	Coastal zone management
CZMP	Coastal zone management program
DAR	Department of Aquatic Resources
DAWR	Division of Aquatic and Wildlife Resources
DBEDT	Department of Business, Economic Development and Tourism
DEQ	Division of Environmental Quality
DLNR	Department of Land and Natural Resources
DMWR	Department of Marine and Wildlife Resources
DOBOR	Division of Boating and Ocean Recreation
DOC	American Samoa Department of Commerce
DOCARE	Division of Conservation and Resource Enforcement
DoD	Department of Defense
EEZ	Exclusive Economic Zone
UOG	University of Guam
FEMA	Federal Emergency Management Agency
GCC	Global climate change
GCMP	Guam's Coastal Management Program
GIS	Geographic Information System
GLUC	Guam Land Use Commission
HZM	Hazard mitigation plan
IBC	International building codes
LAS	Local Action Strategy
LBS	Land Based Sources (of pollution)
MACZAC	Marine and Coastal Zone Advocacy Council
MHI	Main Hawaiian Islands
MMT	Marine Monitoring Team
MPA	Marine Protected Area
MPLA	Marianas Public Land Authority
NEMO	Non-point source Education for Municipal Officials

NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Plan
NPS	Non-point source
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwest Hawaiian Islands
NWR	National Wildlife Reserve
OCRM	Office of Ocean and Coastal Resource Management
ORMP	Ocean Resources Management Plan
ORR	Office of Response and Restoration
PSC	Pacific Services Center
PNRS	Project Review and Notification System
SMA	Special Management Area
TPC	Territorial planning commission
UFC	Unified facilities criteria
USCRTF	US Coral Reef Task Force
TNC	The Nature Conservancy

I. Introduction

Historically, Pacific Islanders depended on the ocean and its resources to sustain their way of life (American Samoa Coastal Management Program 2007b, Hawaii Office of Planning 2007). Therefore, the people of these islands understood the intrinsic value of the coastal ecosystem and were dedicated to the sustained use and conservation of its resources. Today, coastal ecosystems remain an integral part of our society by providing food, income from tourism, protection from storms, educational opportunities, and biological diversity (Waddell 2005, Hawaii Office of Planning 2007).

The Pacific Islands are currently experiencing significant population growth and effects from global climate change, thus increasing the region's susceptibility to coastal hazards as well as intensifying the stresses on marine resources (Waddell 2005, American Samoa Coastal Management Program 2007b). The magnitude of the impacts from these threats depends on the resilience of coastal communities (U.S. Indian Ocean Tsunami Warning System Program 2007).

Community resilience in the U.S. Pacific Island jurisdictions, including economic, social, and environmental sustainability and stability, is the ultimate goal of National Oceanic and Atmospheric Administration (NOAA) in the region. This resilience is dependent upon two factors: the health of coastal resources and the community's vulnerability to coastal hazards.

Vulnerability to Coastal Hazards

Coastal areas are subject to the damaging effects of natural hazards, such as hurricanes, tsunamis, storm surge, landslides and floods. As there is no way to prevent a natural coastal hazard from occurring, to counter-act the potential impacts of coastal hazards it is important to develop resiliency at the local level, including government agencies and communities (Buikaa 2003, U.S. Indian Ocean Tsunami Warning System Program 2007). There are four components to natural hazard resiliency: mitigation, preparedness, response, and recovery. All four components must be addressed when developing plans to minimize the impacts from natural hazard events.

There are many challenges to decreasing vulnerability to natural hazards, including the lack of management planning, economic development in hazard-prone areas, cost to communities to implement and maintain hazard mitigation policies, lack of public awareness of the risks of natural hazards and the importance of mitigation, and conflicting local interests.

Health of Coastal Ecosystems

Many Pacific Islanders envision a healthy nearshore marine environment that is maintained through effective management and can be used sustainably now and in the future. Unfortunately, there is also a conflict between the need for immediate consumption or use of coastal resources and the need to ensure the long-term

maintenance of those resources. In many areas this conflict has already reached a critical stage, with large parts of the coastal zone polluted from local or upland sources, fisheries severely degraded or destroyed, wetlands drained, and coral reefs destroyed (Hawaii Office of Planning 2007). Increased population and development has intensified these threats to the coral reef ecosystem and reduced the health of nearshore marine resources (Guam Coastal Management Program 2006, American Samoa Coastal Management Program 2007b). It is important that coastal communities plan for and respond to these threats to protect their marine resources and support their well-being.

Needs Assessment

The extent to which the Pacific Islands region and its marine resources are susceptible to natural disasters and anthropogenic impacts is currently unknown. This lack of knowledge is a barrier to the ability of coastal resource managers to optimally perform their jobs, and therefore ensure sustainable use of the marine resources. In response to this lack of information, this study seeks to determine the current issues and threats to the coastal communities and resources and identify priority needs of the U.S. Pacific Island region which includes American Samoa, Commonwealth of the Northern Marianas Islands, Guam and Hawai'i. This study will be used by NOAA's Pacific Services Center (PSC) to build a focused program that addresses priority coastal management issues and to develop a cadre of local coastal resource managers with the capacity to make informed management decisions, communicate with one another, and advance in the areas of greatest opportunity.

II. Methods/Assessment

Current and past literature was reviewed to determine the issues/threats to coastal ecosystems, related to coastal management and coastal community resilience and the needs of the various management agencies in the U.S. Pacific Island region (American Samoa, Commonwealth of the Northern Marianas Islands, Guam, and Hawai'i). Literature was also reviewed from the Indo-pacific area on the same topics to help complete the summary assessment. The literature review included peer-review journals, white papers, grey literature, needs assessments, websites, and grant proposals.

III. Results

Literature Review:

Approximately 142 sources were reviewed to determine the issues and needs of the U.S. Pacific Island jurisdictions. These sources included peer-reviewed journal articles, local management plans and action strategies, previous program reviews and assessments, grant proposals, meeting reports, and technical reports.

For the purpose of the review and to maintain relevance, only documents produced after 1998 were reviewed. Unfortunately, there were very few documents from 2006/2007

time frame, but because of their recentness, more weight was given to these documents. Finally, because the review included documents that dated back to 2000, some of the information contained within these documents may be outdated, certain threats and needs may have already been addressed. Only statements from peer reviewed journals and quoted text were directly cited.

An Endnote® bibliography was created which includes the references used in this review plus additional related references on coastal hazard and management topics in the Pacific Island region.

Identified Issues and Threats:

The Pacific Island jurisdictions have identified eight major threats that affect the status of the coastal ecosystem health and vulnerability to coastal hazards. These threats include insufficient coastal management, inadequate management capacity and resource, lack of public support and participation, impacts to coastal habitats, pollution and water quality, invasive species, coral bleaching and disease, and several cross-cutting issues. There are also several underlying issues that make up each threat. Threats and underlying issues were put into a conceptual model (Figure 1) to best illustrate their relationship to community resilience.

Below is an outline of each threat and its underlying issues, as identified by the U.S. Pacific Island jurisdictions:

1. Insufficient Management
 - a. Insufficient planning and preparedness
 - i. Insufficient remediation plans
 - ii. Insufficient response plans
 - iii. Insufficient recovery plans
 - iv. Insufficient partnerships and collaboration
 - v. Traditional knowledge not included in planning process
 - vi. Lack of coastal management plans
 - vii. Lack of marine protected area (MPA) management plans
 - viii. Lack of evaluation of program effectiveness
 - ix. Lack of planning implementation and enforcement
 - b. Insufficient data
 - i. Insufficient historical data
 - ii. Insufficient geographic information system (GIS) data and layers
 - iii. Insufficient data management
 - iv. Insufficient decision support tools
 - c. Lack of or Improper rules and regulations
 - i. Destructive fishing practices
 - ii. Overly-efficient gear and over-harvesting
 - iii. Insufficient rules and regulations
 - iv. Lack of shoreline access
 - v. Improper coastal development

- d. Insufficient enforcement
 - i. Social ties within community
 - ii. Lack of repercussions or prosecution
 - e. Complicated or ineffective permit process or policy
2. Insufficient Management Capacity / Resources
- a. Insufficient financial resources
 - i. Insufficient staff
 - ii. Lack of equipment
 - iii. Insufficient enforcement personnel and equipment
 - iv. Insufficient marine monitoring and survey personnel and equipment
 - b. Insufficient staff training/capacity
 - i. Insufficient local staff
 - ii. Emigration of educated/experienced population
 - iii. Lack of skills development programs/empowerment
 - iv. Loss or evolution of traditional practices
 - v. Lack of opportunity for 'meaningful' related employment
 - vi. Lack of technical assistance
 - c. Inadequate communication infrastructure
3. Insufficient Support and Participation
- a. Insufficient outreach and awareness
 - i. Insufficient public knowledge of emergency response and evacuation plans
 - ii. Insufficient partnerships and collaboration
 - iii. Lack of awareness of impact of actions.
 - b. Lack / loss of traditional knowledge
 - c. Uninformed, underinformed, and misinformed stakeholders
 - d. Uninformed, underinformed, and misinformed legislative bodies
 - e. Different objectives or motives of stakeholders
 - f. Different objectives or motives of legislative bodies
 - g. Insufficient environmental knowledge
 - h. Insufficient voluntary compliance to rules and regulations (due to lack of knowledge of impacts of activities)
 - i. Lack of awareness of rules and regulations
 - j. Loss of values
 - k. Insufficient coordination and collaboration amongst shareholders, managers, and scientists
 - l. Attitudes towards resources
 - i. Right vs. privilege
 - ii. Desperation and hopelessness
4. Impacts to coastal habitats
- a. Coastal development
 - i. Removal of natural hazard barriers

- b. Abandoned vessels and vessel groundings
 - c. Anchor damage
 - d. Recreational impacts to reefs
 - e. Towline damage
 - f. Dredging
 - g. Seawall, Pier, runway construction
 - h. Marine debris
 - i. Coral mining
5. Pollution / Water Quality
 - a. Non-point source
 - b. Sedimentation/run-off
 - c. Stream diversion
 - d. Marine pollution (from water craft)
 - e. Oil spills
 - f. Hazardous chemical release
 - g. Unexploded ordinances
 6. Coral Disease and bleaching
 7. Invasive species
 8. Cross category coastal management issues
 - a. Contentious relationships amongst shareholders, managers, and scientists
 - b. Economic difficulties/incentives
 - c. Resource use conflict

Prevalent issues such as “over-fishing” and “outreach and education” were further broken down into their root causes. For example, many jurisdictions cited over-fishing or a decline in fisheries resources as an issue, but the underlying causes of the decline varied from insufficient enforcement, lack of or improper rules and regulations, loss of traditional values, lack of awareness, ineffective resource management planning, etc.

For this reason, the various root causes of “over-fishing” were placed in their appropriate categories. Also, outreach and education programs were often cited as a need in the region without directly identifying the threat or reason the program was needed. It was extrapolated from the readings that the threat they were trying to mediate was a lack of public support for and participation in coastal management. Underlying issues included insufficient staff, insufficient staff capacity, lack of resources, and lack of knowledge about the issues.

Finally, there are two intensifying factors, increasing population and global climate change that can exacerbate some of the major issues identified above. Increasing populations leads to increased coastal development, increased pressure on coastal resources, and removal of natural coastal barriers. An increase in coastal populations leads to an increase in the number of people potentially susceptible to coastal hazards,

therefore increasing the risk of loss of lives and property. As development continues, areas that may have previously acted as natural barrier to hazards, such as coral reefs, mangrove forests, and watersheds are removed or filled-in. Finally, more people mean increased pressure on coastal resources, in terms of food supply, recreational activities and commercial exploitation. Global climate change (GCC) threatens to exacerbate these hazards by accelerating the rise in sea level, increasing the frequency and intensity of these coastal hazards, and potentially causing other changes in atmospheric and oceanographic conditions. GCC has a multitude of potential impacts, phase and community shifts of coastal resources, sea-level rise, increased or decreased rainfall, coral loss due to bleaching or increased wave activity, and increased incidents of typhoons and tropical storms.

Despite the fact that all the jurisdictions had identified threats that fall within most of the categories listed above, they each had different priority threat areas. Specific threats for each jurisdiction are listed in the appendices: American Samoa (Appendix 1), CNMI (Appendix 2), Guam (Appendix 3), and Hawai'i (Appendix 4). Also, even though the management approach to coastal hazards is not to prevent them but to prepare for them, a list of the natural hazards and their priority ranking that each jurisdiction identified in their assessment of their coastal zone management programs as dictated by section 309 of the Coastal Zone Management Act (CZMA), is included in each jurisdiction's appendix.

Identified Needs:

Coastal hazards and coastal management in the Pacific Island region, despite their differences in focus and specific issues, have similar needs. Through this study, it has been determined that there are five basic categories of needs, for both coastal hazards and coastal management, in the Pacific Island region (Figure 2).

These need categories and their sub-categories are listed below:

1. Management
 - a. Management planning
 - b. Policy and permitting
 - c. Rules and regulations
 - d. Internal partnerships and collaboration
2. Management Capability and Support
 - a. Resources (financial and personnel)
 - b. Inter-agency coordination
 - c. External partnerships and collaboration
 - d. Technical support
3. Data and Information
 - a. GIS and data layers
 - b. Scientific Research

- c. Information for outreach and education
 - d. Historical data
 - i. Traditional and cultural knowledge
 - ii. Coastal hazards
 - e. Best Management Practices
- 4. Internal Government Capacity-building
 - a. Trainings
 - b. Internships and scholarship programs
 - c. Integration of traditional management and values
 - 5. External Public Empowerment and Involvement

Again, as with the threats and issues, although there was a significant overlap in ‘needs’ among the U.S. Pacific Island region, specific needs and priority needs categories differed with each jurisdiction. The specific needs for each jurisdiction are also listed in the appendices: American Samoa (Appendix 5), CNMI (Appendix 6), Guam (Appendix 7), and Hawai‘i (Appendix 8).

IV. Conclusion

Community resilience is the capacity of a community to adapt to and influence the course of environmental, social, and economic change (U.S. Indian Ocean Tsunami Warning System Program 2007). An important outcome of increasing the resilience of coastal communities is to reduce or avoid the impacts of disasters by reducing hazard risk and vulnerability. A community’s vulnerability is related to both natural hazards such as storms and anthropogenic hazards such as pollution, and the community’s ability to address or prepare for the threats and deal with the issues.

Each jurisdiction faces significant threats and issues that impact the potential resiliency of their communities. These threats are often exacerbated by such factors as population growth and global climate change. As the U.S. Pacific Islands move towards creating healthy and resilient communities, it must address the threats they are facing. To achieve resiliency, jurisdictions need resources, management plans, and preparation, to address their threats and issues. These needs are often as extensive as the threats themselves. Each jurisdiction’s threats and what they ‘need’ to overcome their threats is summarized below.

American Samoa:

American Samoa has identified its primary threats to coastal resiliency as increasing population, global climate change, overfishing, pollution, and lack of awareness and involvement.

For the purposes of this literature review, increasing population and global climate change are treated as factors that exacerbate current or potential issues or threats, and were listed out separately. Also, overfishing is listed as a primary threat, but there are many underlying causes to overfishing in American Samoa. These underlying causes include insufficient management of the resource, lack of knowledge of resource status, lack of enforcement of rules and regulations, improper rules, lack of community involvement and awareness, and loss of essential fish habitat. Therefore, issues related to overfishing were listed under their proper specific threat category.

The majority of issues American Samoa faces are twofold, the first related to the government, the second to the general public/stakeholders.

The government issues are directly related to the management of the coastal areas and its resources – 1) There are a lack of management plans or implementation of management plans for Special Area Management, Watersheds, Territory and community coastal resources, and coastal development; 2) There is a lack of data by which to make sound management decisions, this includes both sociological and biological research, and to determine the effectiveness of management actions; 3) Lack of agency collaboration to ensure efficient management processes (including permits and policy); 4) Lack of enforcement of rules and regulation (there are several underlying causes to this issue including lack of personnel, lack of political support, unenforceable rules, and lack if incentive; 5) Lack of resources (personnel and financial) to carry out management planning activities and implementation.

The public/stakeholder issues are related to support of and involvement in management decisions and programs. In American Samoa, the general public lacks information on the problems they face or are potentially facing, possible solutions to the problems, and effectiveness of management efforts. At the same time, Territorial agencies need to involve the public in the management process to include local and traditional knowledge and to better garner support.

These threats lead to a decrease in ecosystem health and can increase vulnerability to coastal hazards. To address these issues, American Samoa has several needs to help increase and/or ensure coastal resiliency.

American Samoa can address overfishing, pollution, destruction of coastal habitat, issues related to increasing population (including development), and vulnerability to GCC, through proper coastal management, additional government resources and capability, increased data, and capacity building at both the government and public level.

One of the primary needs for American Samoa is an increase in resources. For example, the management agencies need to hire staff, including administration, management, and enforcement to properly implement coastal management programs. In a 2006 Capacity Needs assessment conducted by the NOAA's Office of Ocean and Coastal Resource Management (OCRM) in partnership with Pacific Services Center (PSC), it was determined that American Samoa has 19 out of a desired 26 staff for their CZM program.

The biggest personnel gaps were in the priority areas of ‘public outreach and education’ and ‘review and permitting of coastal development’. In addition to staff, management programs also require supplies, equipment, and contract funds. Along with a lack of resources, other staff support issues include insufficient capacity and training of current staff and lack of potential local applicant pool. In American Samoa there is a lack of collegiate opportunities to develop future resource managers. It is often necessary for management agencies to contract scientists and other resource agents from the mainland, thus greatly increasing the costs of their projects. American Samoa has requested approximately \$1.4 million from NOAA’s CZM grant program and NOAA Coral Management grant program to support their coastal management programs. The majority of this funding went to staff positions and outside contractors. Also, in 2003, American Samoa was awarded \$3.7 million by FEMA to complete its two highest priority hazard mitigation projects identified in the Mitigation Plan.

American Samoa’s specific needs have been detailed in the Appendix 5. Below is a general summary of these needs:

- 1) Management plans - SMA plans, Territory-wide coastal management plan, Wetlands management plan, pollution prevention and remediation, etc.
- 2) Research plans, to including research of past and present conditions of the coastal environment and management techniques.
- 3) Review and update existing rules and regulations for resource extraction and coastal development.
- 4) Increase enforcement of existing rules and regulations.
- 5) Development of Best Management Practices for activities that could possibly impact coastal habitat.
- 6) Increase communication amongst agencies.
- 7) Engage community in planning processes; include local traditional knowledge – collaboration among legislators, community members, and regulatory agencies.
- 8) Hire, train, and retain staff. Staff trainings are necessary in all aspects of job performance.
- 9) Educate, train and recruit local citizens for staff positions.
- 10) Expand financial grant base.
- 11) Expand T-HAT program.

12) Increase awareness and educate public on issues, problems, and solutions.

CNMI:

CNMI has identified its primary threats to coastal resiliency as increasing population, decline in fisheries, impacts from recreational use, insufficient coastal resource management, lack of coastal hazard preparedness, and lack of public awareness and involvement.

For the purposes of this literature review, increasing population is treated as a factor that exacerbates current or potential issues or threats, and is listed out separately. Overfishing and recreational impacts are listed as primary threats, but the underlying issues that contribute to these threats include insufficient management of the use of the resource, lack of knowledge of resource status, lack of enforcement of rules and regulations, improper rules, lack of community involvement and awareness, loss of essential fish habitat, and user conflict. Therefore, issues related to overfishing and impacts from recreational use were listed under their proper specific threat category.

Lack of preparedness for coastal hazards was not explicitly stated in the literature as a threat, but was implied through the CNMI Coastal Hazard Mitigation Plan. This plan was updated in 2007 and includes many activities or actions that still need to be implemented before CNMI can be consider fully prepared for coastal hazards.

The majority of issues CNMI faces are twofold, the first related to the government, the second to the general public/stakeholders.

The government issues are directly related to the management of the coastal areas and its resources– 1) There are a lack of management plans or implementation of managements plans for Special Area Management, Watersheds, CZM zoning, vessel groundings, pollution and solid waste management, flood warnings, and coastal development; 2) There is a lack of data by which to make sound management decisions, this includes information to predict, model, and map coastal hazards; baseline and current data on social, economic, and biological condition of coastal resources; and to determine the effectiveness of management actions; 3) Lack of agency collaboration to ensure efficient management process, including watershed management; 4) Lack of enforcement of rules and regulation, especially pertaining to land development and coastal resources (there are several underlying causes to this issue including lack of personnel, lack of political support, unenforceable rules, and lack if incentive; 5) Lack of resources (personnel and financial) to carry out management planning activities and implementation.

The public/stakeholder issues are related to support of and involvement in management decisions and programs. In CNMI, there are several different user groups, residents, tourists, and guest workers, each utilizing the coastal resources and habitats. These stakeholders lack information on coastal hazards and resource issues including watershed management and coastal hazard preparedness and response. There is also a lack of opportunities for communities to get involved in coastal management through

volunteering. Finally, there is a lack of stakeholder representation (including fishermen) in the management planning process.

These threats lead to a decrease in ecosystem health and can increase vulnerability to coastal hazards. To address these issues, the CNMI has several needs to help increase and/or ensure coastal resiliency.

CNMI can address overfishing, recreational impacts, pollution, lack of preparedness to coastal hazards, issues related to increasing population (included development), and other issues through proper coastal management, additional government resources and capability, increased data, and capacity building at both the government and public level.

One of the primary needs for CNMI is an increase in resources. Management agencies need to hire staff, including administration, management, and enforcement to properly implement coastal management programs. In a 2006 Capacity Needs assessment conducted by the NOAA's Office of Ocean and Coastal Resource Management (OCRM) in partnership with Pacific Services Center (PSC), it was determined that CNMI has 19 out of a desired 28 staff for their CZM program. CNMI's funding request from the NOAA's CZM Program and CRI totaled \$1,486,500 of which approximately 70% went to support or contract personnel.

CNMI's specific needs have been detailed in Appendix 2. Below is a general summary of these needs:

- 1) Management plans (development and implementation) - SMA plans, coastal zone management / MPA plan, storm water management, vessel grounding, local action strategies, pollution prevention and solid waste management, emergency operations plan, etc.
- 2) Research plans (development and implementation), including research of past and present conditions of the coastal environment and management techniques; management effectiveness evaluation; economic value of coastal ecosystem.
- 3) Improved technology for mapping, monitoring and predicting hazards.
- 4) Hazard mapping and monitoring activities in order to better predict and model coastal hazard events, including GIS facilities.
- 5) Development of Best Management Practices for activities that could possibly impact coastal habitat.
- 6) Increase communication amongst agencies and islands.
- 7) Engage community in planning processes; include fishermen.

- 8) Hire, train, and retain staff. Specific trainings are mentioned in results section.
- 9) Increase public involvement on issues, problems, and solutions.

Guam:

Guam has identified its primary threats to coastal resiliency as the U.S. military build-up, decline in fisheries, impacts from recreational use, pollution, lack of coastal hazard preparedness, and lack of awareness and involvement.

Many of the threats to Guam's natural resources are large in scope, pervasive in nature, and often inter-related, even acting together towards resource degradation (Guam Coastal Management Program 2007).

Increasing population is a prevalent problem in the Pacific Island jurisdictions, but Guam faces an unprecedented increase in population due to a massive military expansion project and accompanying commercial and private sector projects. Guam's natural resource agencies have agreed that this expansion is the largest immediate threat to Guam's coastal ecosystems as the U.S. DOD's plans to move approximately 26,000 additional military personnel and dependents to Guam by 2014. Because of this increase, all current issues, such as pollution, impacts to habitat, insufficient coastal resource management, and lack of capacity are magnified. Also, military expansion coupled with global climate change intensifies Guam susceptibility to coastal hazards.

The military build-up situation, while unique to Guam, has similar consequences as the increasing population threat in American Samoa and CNMI and will be treated as a factor that potentially exacerbates current or potential issues or threats, and is listed out separately. Overfishing and recreational impacts are listed as a primary threats, but the underlying issues that contribute to these threats include insufficient management of the use of the resource, lack of knowledge of resource status, lack of enforcement of rules and regulations, improper rules, lack of community involvement and awareness, loss of essential fish habitat, and user conflict. Therefore, issues related to overfishing and impacts from recreational use were listed under their proper specific threat category.

Also, as with CNMI, lack of preparedness for coastal hazards was not explicitly stated in the literature as a threat, but was implied through the Guam Coastal Hazard Mitigation Plan. This plan was updated in 2007 and includes many activities or actions that still need to be implemented before Guam can be consider fully prepared for coastal hazards.

The majority of issues Guam faces are twofold, the first related to the government, the second to the general public/stakeholders.

The government issues are directly related to the management of the coastal areas and its resources– 1) There are a lack of management plans or implementation of managements plans for Special Area Management, Watersheds, coastal resource/zone management, pollution and marine debris, and cumulative and secondary impacts (CSI) management

system; 2) There is a lack of data by which to make sound management decisions, this includes information to predict, model, and map coastal hazards (HAZUS – HM); baseline and current data biological condition of coastal resources; type and extend of impacts to the coastal ecosystem, including military impacts; and to determine the effectiveness of management actions; 3) Lack of enforcement of rules and regulation, especially pertaining to coastal resources (there are several underlying causes to this issue including lack of personnel, lack of political support, unenforceable rules, and lack if incentive; 4) Lack of resources (personnel and financial) to carry out management planning activities and implementation.

The public/stakeholder issues are related to support of and involvement in management decisions and programs. In Guam, tourism and the military are a large part of the economy, which often causes resource use conflicts with residents. Raising public awareness about important coastal resource management issues and gaining support for management activities is a constant struggle and the effectiveness of such activities can always be improved. Lack of local participation in resource management activities, such as watershed restoration, educational campaigns, and beach clean-ups, remains an issue.

These threats lead to a decrease in ecosystem health and can increase vulnerability to coastal hazards. To address these issues, the Guam has several needs to help increase and/or ensure coastal resiliency.

Guam can address the military build-up, decline in fisheries, impacts from recreational use, pollution, lack of coastal hazard preparedness, lack of awareness and involvement and other issues through proper coastal management, additional government resources and capability, increased data, and capacity building at both the government and public level.

One of the primary needs for Guam is an increase in resources. Management agencies need to hire staff, including administration, management, and enforcement to properly implement coastal management programs. In a 2006 Capacity Needs assessment conducted by the NOAA's Office of Ocean and Coastal Resource Management (OCRM) in partnership with Pacific Services Center (PSC), it was determined that Guam has 9 out of a desired 29 staff for their CZM program. Guam's funding request from NOAA's CZM grant Program and CRI grant program totaled \$1,482,000 of which approximately 75% went to support or contract personnel.

Guam's specific needs have been detailed in Appendix 3. Below is a general summary of their needs:

- 1) Management plans (development and implementation) – Seashore Reserve plan, SMA plans, local action strategies (add DoD LAS) emergency environmental response plan, recycling and pollution prevention, mitigation plans for CSI, coastal impacts response plans, hazard mitigation plan, etc.

- 2) Research plans (development and implementation), including research of past and present conditions of the coastal environment and management techniques; impacts to coastal habitats, including marine debris and pollution; management effectiveness evaluation; economic value of coastal ecosystem; land-use practices and shoreline development, etc.
- 3) A centralized, relational database with spatial intelligence capability, in order to store, organize, maintain, analyze, share, and access all data collected from Guam's comprehensive island-wide coral reef ecosystems monitoring plan, within a secure, scaleable, and cost-effective infrastructure.
- 4) HAZUS-HM - Hazard mapping and monitoring activities in order to better predict and model coastal hazard events, including GIS facilities.
- 5) Hire, train, and retain staff. Specific trainings are mentioned in Appendix 7.
- 6) Educate, train and recruit local citizens for staff positions.
- 7) Increase public involvement on issues, problems, and solutions.
- 8) Recruit outside technical help from NOAA and other sources.

Hawai'i:

Hawai'i has identified its primary threats to coastal resiliency as overfishing, impacts from recreational use, land-based pollution, aquatic invasive species, coral bleaching and disease, lack of coastal hazard preparedness, and lack of awareness and involvement. As with CNMI and Guam, overfishing and recreational impacts are listed as a primary threats, but the underlying issues that contribute to these threats include insufficient management of the use of the resource, lack of knowledge of resource status, lack of enforcement of rules and regulations, improper rules, lack of community involvement and awareness, loss of essential fish habitat, and user conflict. Therefore, issues related to overfishing and impacts from recreational use were listed under their proper specific threat category.

Again, as with CNMI and Guam, lack of preparedness for coastal hazards was not explicitly stated in the literature as a threat, but was implied through the Hawai'i Coastal Hazard Mitigation Plan. This plan was updated in 2007 and includes many activities or actions that still needed to be implemented before Hawai'i can be consider fully prepared for coastal hazards.

The majority of issues Hawai'i faces are twofold, the first related to the government, the second to the general public/stakeholders.

The government issues are directly related to the management of the coastal areas and its resources: 1) There are a lack of management plans or implementation of management plans for coastal resource use; coastal zone management; an ecosystem based approach to coastal management; pollution and marine debris; and aquatic invasive species; 2) There is a lack of data by which to make sound management decisions, this includes information on baseline and current biological condition of coastal resources; traditional management techniques; scope and intensity of coastal resource use; type and extent of impacts to the coastal ecosystem; and to determine the effectiveness of management actions; 3) Enforcement - Lack of enforcement of rules and regulations, especially pertaining to coastal resources (there are several underlying causes to this issue including lack of personnel, lack of political support, unenforceable rules, and lack of incentive); and insufficient or outdated rules and policies; 4) Lack of resources (personnel and financial) to carry out management planning activities and implementation and staff capability and capacity; 5) Lack of management agency collaboration and communication.

The public/stakeholder issues are related to support of and involvement in management decisions and programs. Lack of public awareness, of coastal issues and their importance, leads to a lack of support for coastal management initiatives and voluntary compliance and advocacy. Hawai'i also has several stakeholders whose use of marine resources constantly overlaps, causing conflict.

These threats lead to a decrease in ecosystem health and can increase vulnerability to coastal hazards. To address these issues, the Hawai'i has several needs to help increase and/or ensure coastal resiliency.

Hawai'i can address the overfishing, impacts from recreational use, land-based pollution, aquatic invasive species, coral bleaching and disease, lack of coastal hazard preparedness, lack of awareness and involvement, and other issues through proper coastal management, additional government resources and capability, increased data, and capacity building at both the government and public level.

One of Hawai'i's primary needs is an increase in resources. Management agencies need to hire administration, management, and enforcement staff to properly implement coastal management programs. In a 2006 Capacity Needs assessment conducted by the NOAA's Office of Ocean and Coastal Resource Management (OCRM) in partnership with Pacific Services Center (PSC), it was determined that Hawai'i has 10 out of a desired 13 staff for their CZM program. Hawai'i was, by far, the closer to capacity than any of the other islands jurisdiction. Hawai'i's funding request from the NOAA's CZM Program and CRI totaled \$2,608,000 of which approximately 88% is designated to support or contract personnel. Hawai'i's 07/08 grant proposal request funding for 26 different employees (at varying percentages of their time).

Hawai'i's specific needs have been detailed in Appendix 4. Below is a general summary of their needs:

- 1) Management plans (development and implementation) – Watershed management, ORMP (implement), local action strategies, *ahupua'a/moku* management, shoreline management plan, including coastal erosion and hazard mitigation, State-wide hazard mitigation plan.
- 2) Research and monitoring plans (development and implementation), including research of past and present conditions of the coastal environment and management techniques; traditional management and resource knowledge; management effectiveness evaluation; economic value of coastal ecosystem; impacts from aquatic invasive species and coral disease; impacts to coastal habitats.
- 3) Development of Best Management Practices for activities that could possibly impact coastal habitat.
- 4) HAZUS-HM and RVA - Hazard mapping and monitoring activities in order to better predict and model coastal hazard events, including GIS facilities.
- 5) Increase staff capability and capacity
- 6) Create, update, and revise rules and regulations pertaining to coastal resources and hazards.
- 7) Increase and expand public awareness of issues, problems, and solutions.
- 8) Build capacity for community participation in natural and cultural resources management.
- 9) Improve interagency collaboration and communication.

The information presented above is a summary of the limited information provided in available literature and should not be considered as an exhaustive list of issues and threats. Also, due to the date of publication or release of some of the documents reviewed, some of the issues and needs may have already been addressed. Finally, while each jurisdiction has hazard mitigation and several other coastal management-related plans, most jurisdictions have not conducted a full assessment of their community coastal resiliency. As a next step, it is recommended that the jurisdictions review and implement the “How Resilient is Your Coastal Community?” guidebook to evaluate their coastal resiliency and further determine their needs.

References

- Aitaoto, F. (Government of American Samoa). Domestic commercial fishery in American Samoa Annual report, office of marine resources. 1985.
- American Samoa Coastal Management Program. Assessment and Strategy for the American Samoa Coastal Management Program Section 309. 2006.
- American Samoa Coastal Management Program. American Samoa Coastal Management Program: An Assessment of ASCMP's Public Outreach Programs. 2007b.
- American Samoa Coastal Management Program. Strategic Plan 2008 – 2013. 2007.
- American Samoa Governor's Coral Reef Advisory Group. Three-year Local Action Strategies 2004-2007 26 p. 2005.
- American Samoa Coral Reef Advisory Group. Proposal to the Department of Interior and the National Oceanic and Atmospheric Administration from American Samoa Government via American Samoa Coral Reef Advisory Group. 2007.
- American Samoa Government. American Samoa statistical digest 1988 Economic development and planning office. 1988.
- Anderson, Cheryl. State of Hawaii Multi-Hazard Mitigation Strategy Update. 2007.
- Anderson, Cheryl and Colasacco, Nicole. Pacific ENSO Applications Center and the 1997-1998 ENSO in the Commonwealth of the Northern Mariana Islands. (Presentation). 1998.
- Aswani, Shankar and Matthew Lauer. Incorporating Fishermen's Local Knowledge and Behavior into Geographical Information Systems (GIS) for Designing Marine Protected Areas in Oceania. *Human Organization*, v.65, n.1, p.81-102. 2006.
- Birkeland, Charles. Ratcheting Down the Coral Reefs. *BioScience*, v.54, n.11, p.1021-1027. 2004.
- Boehlert, G. Fisheries and marine resources of Hawaii and the U.S.-associated Pacific Islands: an introduction. 1993.
- Buikaa, J., Goosbya, S., Mielbrechta, S., Rebolda, R., Glicka, U., Jamesa, G., Chatmana, A., Hamnett, Dr. M., Anderson, C., Yamashita, E., Vaiagae, T. F., Stevens, E. Natural Hazard Risk and Vulnerability Assessment and Mitigation Plan for the Territory of American Samoa. 2003.

Burdick, David. Guam Coastal Management Program Priorities Assessment and Strategies Development Report: Addressing Existing and Expected Capacity Needs for the Guam Coastal Management Program. 2007.

Centre for Community Enterprise. The Community Resilience Manual: A Resource for Rural Recovery and Renewal. 2000.

Cesar, Herman S., Van Beukering, Pieter, Kirkpatrick, John, and Pintz, William. Economic valuation of the coral reefs of Hawaii. Hawaii Coral Reef Initiative Research Program. 2005.

Christensen, Villy, Guenette, S., Heymans, J. J., Walters, C. J., Watson, R., Zeller, D., and Pauly, D. Hundred-year decline of North Atlantic predatory fishes. *Fish and Fisheries*, v.4, n.1, p.1-24. 2003.

Coastal Fisheries Programme, Marine Resources Division, Secretariat of the Pacific Community. Community-based Fisheries Management in American Samoa. Noumea, New Caledonia: 7/23/2001- 7/27/2001. 2001.

Coles, S. L.; Kandel, F. L. M.; Reath, P. A.; Longenecker, K.; Eldredge, L. G. Rapid Assessment of Nonindigenous Marine Species on Coral Reefs in the Main Hawaiian Islands. *Pacific Science*, v.60, n.4, p.483. 2006.

CNMI Coral Reef Initiative. Commonwealth of the Northern Mariana Islands Coral Reef Initiative Projects and Programs For Fiscal Years 2000 – 2005. 1999, p.47-58. 1999.

CNMI Division of Environmental Quality. Watershed Resoration Action Strategy (Northern Mariana Islands). Division of Environmental Quality. Saipan, MP. 2003.

CNMI Emergency Management Office; Allied Pacific Environmental Consulting. CNMI Standard State Hazard Mitigation Plan. 2007.

CNMI Office of the Governor. Hazard Mitigation Grant Program Administrative Plan. 2007.

CNMI Office of the Lt. Governor. CNMI Coral Management Grant Pre-proposal (CNMI 2009 – 2010 Coordination of the CNMI Coral Reef Initiative Program and Implementation of Local Action Strategies). 2007.

Coastal Resources Management Office (CNMI Office of the Governor). (Proposal) Application for Assistance under the Coastal Zone Management Act. October 2007 through March 2009. 2007.

Coastal Resources Management Program (Office of the Governor). Section 309 Assessment and Strategy Report (June 2006). Office of the Governor (CNMI). 2006.

Commonwealth of the Northern Mariana Islands. Unified Watershed Assessment. 1998.

Coutures, E. The shoreline fishery of American Samoa. P. P. Department of Marine and Wildlife Resources Biological Report Series No 102 2003.

Craig, P. Status of coral reefs in 2002: American Samoa. In: D. D. Turgeon, Asch, R., Causey, B., Dodge, R., Jaap, W., Banks, K., Delaney, J., Keller, B., Speiler, R., Matos, C., Garcia, J., Diaz, E., D. Catanzaro, Rogers, C., Hillis-Starr, Z., Nemeth, R., Taylor, M., *et al* (Ed.). The state of coral reef ecosystems of the United States and Pacific Freely Associated States. Silver Spring, MD, National Oceanic and Atmospheric Administration/National Ocean Service/National Centers for Coastal Ocean Science, 2002. Status of coral reefs in 2002: American Samoa,

Craig, P. Are tropical nearshore fisheries manageable in view of projected population increases? South Pacific Community 11, Noumea. 1995.

Craig, P., Choat, J.H., Axe, L.M., Saucerman, S. Population biology and harvest of the coral reef surgeonfish *Acanthurus lineatus* in American Samoa. Fishery Bulletin, v.95, p.680-693. 1997.

Craig, P., Daschbach, N., Wiegman, S., Curren, F., and Aicher, J. (1999) Workshop report and development of 5-year plan for coral reef management in American Samoa (2000–2004): Government of American Samoa, Pago Pago, 1999.

Craig, P., Ponwith, B., Aitaoto, F., Hamm, D. The commercial, subsistence, and recreational fisheries of American Samoa. Marine Fish Reviews, v.55, p.109-116. 1993.

Dalzell, P. Catch rates, selectivity and yields of reef fishing. In: N. V. C. Polunin, and Roberts, C.M. (Ed.). Reef Fisheries. London: Chapman & Hall, 1996. Catch rates, selectivity and yields of reef fishing., p.161-192

Dalzell, P., Adams, T. J. H., and Polunin, N. V. C. Coastal fisheries in the Pacific Islands. Oceanogr Mar Biol, v.34, p.395-531. 1996.

Dalzell, P., and Adams, T. J. H. (1997). Sustainability and management of reef fisheries in the Pacific Islands. Proc Eighth Int Coral Reef Symp (2), 1997.

Davis, Braxton C. Inventory, Classification, and Analysis of Special Management Areas Associated with U.S. Coastal Programs. Coastal Management, v.31, n.4, p.339 - 354. 2003.

Department of Land and Natural Resources. State of Hawai'i: Aquatic Invasive Species Management Plan. 2003.

Department of Commerce, American Samoa Government. (Proposal) Application for Assistance under the Coastal Zone Management Act. 2007.

Department of Natural and Environmental Resources. (Letter) Re: All Islands CZM Secretariat. D. M. Kennedy 2007.

Department, of Land and Natural Resources/ Hawaii Ecotourism Association. Hawaii's Local Action Strategy to Address Recreational Impacts to Reefs. 2007.

Didonato, Guy T. e Elena B. Pselio. Localized beach contamination in American Samoa: Results from two years of weekly monitoring. *Marine Pollution Bulletin*, v.52, n.4, 2006/4, p.466-468. 2006.

Division of Fish and Wildlife, Department of Lands and Natural Resources, Office of the Governor Division of Environmental Quality. Commonwealth of the Northern Mariana Islands Three-Year Coral Reef Protection Local Action Strategy. 2003.

Donahue, Michael J. Strengthening the Application of Science in Coastal Decision Making -Final Report-. Coastal States Stewardship Foundation, Coastal States Organization, Cooperative Institute for Coastal and Estuarine, Environmental Technology 9/21/07. 2007.

Federal Hazard Mitigation Partners in the Pacific Islands. An Embryonic Action Plan, Including a Conceptual Framework, for Regional Communication, Coordination, and Collaboration among Federal Hazard Mitigation Partners in the Pacific Islands. 2003.

Gillett, R. Pacific Island fisheries: regional and country information. A.-P. F. Commission: FAO Regional Office for Asia and the Pacific (RAP Publication). 2002.

Gillett, R., Lightfoot, C. The contribution of fisheries to the economies of Pacific island countries. Forum Fisheries Agency and World Bank. Manila. 2002.

Green, A. An assessment of the status of the coral reef resources, and their patterns of use, in the U.S. Pacific Islands. Western Pacific Regional Fisheries Management Council. Honolulu 1997.

Green, A. Status of coral reefs on the main volcanic islands of American Samoa. Department of Marine and Wildlife Resources. Pago Pago. 2002.

Green, A. L, Birkeland, C. E., Randall, R. H., Smith, B. D. And Wilkins, S. 76 Years of coral reef degradation in Pago Pago harbor: A Quantative Record. 8th International Coral Reef Symposium 2, 1997.

Guam Coastal Management Program. Guam Coastal Management Program Priorities Assessment and Strategies Development Report. 2006.

Guam Coastal Management Program. (Proposal) Application for Assistance under the Coastal Zone Management Act. 2007.

Guam Coral Reef Initiative. Guam's 5-Year Coral Reef Initiative Program for Research, Monitoring, Enforcement, and Education. p.59-78. 1999.

Hamm, D., Chan, N. T. S., Graham, C.J. Fishery statistics of the Western Pacific Volume XVIII: Territory of American Samoa (2001), Commonwealth of the Northern Mariana Islands (2001), Territory of Guam (2001), State of Hawaii (2001). NOAA Fisheries, Pacific Islands Fisheries Science Center. Honolulu. 2003.

Harvey, Nick and Mike Hilton. Coastal Management in The Asia-Pacific Region. Global Change and Integrated Coastal Management: 39-66 p. 2006.

Hawai'i Coastal Zone Management Program. REPORT ON PHASE 2 OF CZMA PERFORMANCE MEASUREMENT SYSTEM. 2007.

Hawai'i Coastal Zone Management Program. CZMA PMS OP Dedicated Staff Time and Educational/Training Explanation of Terms for Survey Questions*. 2006-2007.

Hawai'i Coastal Zone Management Program. Hawaii Coastal Zone Management Program: Section 309 Enhancement Area Grant Program FY- 2006-2010. Hawaii CZM, Office of Planning. 2006.

Hawaii Office of Planning. Hawaii Ocean Resources Management Plan. 2006.

Hawaii Office of Planning. Coastal Zone Management Act Performance Measurement System County Data Collection (Federal Consistency) 2006-2007a.

Hawaii Office of Planning. Coastal Zone Management Act Performance Measurement System County Data Collection: Educational Activities Registration Form. 2006-2007b.

Hawaii Office of Planning. Application for Assistance under the Coastal Zone Management Act. 2007.

Hawaii, State Of. State of Hawaii Hazard Mitigation Strategy 2004.

Hill, H. B. The use of nearshore marine life as a food resource by American Samoans. Pacific Islands Program, University of Hawaii Honolulu. 1978.

Houk, Peter, Guy Didonato, *et al.* Assessing the Effects of Non-Point Source Pollution on American Samoa's Coral Reef Communities. Environmental Monitoring and Assessment, v.107, n.1, 2005/08/25/, p.11-27. 2005.

Houk, Peter. and Robert. Van Woosik. Coral Reef Benthic Video Surveys Facilitate Long-Term Monitoring in the Commonwealth of the Northern Mariana Islands: Toward an Optimal Sampling Strategy. *Pacific Science*, v.60, n.2. 2006.

Huang, J. C. K. Climate change and integrated coastal management: a challenge for small island nations. *Ocean & Coastal Management Climate Change and Integrated Coastal Management*, v.37, n.1, p.95-107. 1997.

Jackson, J. B. C., Kirby, M. X., Berger, W. H., Bjorndal, K.A., Botsford, L. W., B. J. Bourgue, Bradbury, R.H., Cooke, R., Erlandson, J., Estes, J.A., *et al.* Historical overfishing and the recent collapse of coastal ecosystems. *Science*. 293: 629-638 p. 2001.

Jan C. Post and Carl G. Lundin, Editors. GUIDELINES FOR INTEGRATED COASTAL ZONE MANAGEMENT. 1996.

Leberer, Trina, and Lujan, Vangie. Guam Local Action Strategy United States Coral Reef Task Force. 2004.

Leopold, M., Ferraris, J., and Labrosse, P. Assessment of the reliability of fish consumption as an indicator of reef fish catches in small Pacific islands: the example of Ouvea Island in New Caledonia. *Aquat Living Resour*, v.17, p.119-127. 2004.

Marra, John. Natural Hazard Identification and Mitigation Project Opportunities in the US Flag Pacific Islands. 2002.

Meehl, Gerald A. Pacific region climate change. *Ocean & Coastal Management Climate Change and Integrated Coastal Management*, v.37, n.1, p.137-147. 1997.

NOAA Coastal Services Center. PACIFIC RISK MANAGEMENT 'OHANA (PRiMO): Coordinating Efforts for Risk Management in the Pacific. NOAA Coastal Services Center. 2005.

NOAA Coastal Services Center. Minutes of the All Islands CZM Programmatic Meeting. 3/7/07. 2007.

NOAA Office of Ocean and Coastal Resource Management. Coastal Zone Management Act Performance Measurement System County Data Collection: OP Dedicated Staff time & Educational/ Training Data 2006-2007a.

NOAA Office of Ocean and Coastal Resource Management. Strategic Plan 2007-2012.

NOAA Office of Ocean and Coastal Resource Management. Evaluation Findings for the Hawaii Coastal Zone Management Program from November 2001 through August 2004. 2005.

NOAA Office of Ocean and Coastal Resource Management. Evaluation Findings for the American Samoa Coastal Management Program from July 2000 through June 2005. 2006.

NOAA Office of Ocean and Coastal Resource Management. Evaluation Findings For The Guam Coastal Management Program From April 2003 to February 2007.

NOAA PSC. Workshop on Climate Variability and Change in the Commonwealth of the Northern Mariana Islands (CNMI). Saipan, April 27-28, 2006. 2006.

NOAA PSC. Pacific Islands Region Hazards Needs Assessment. 2007.

NOAA, United States Department of Commerce. (Letter) Re: All islands request for NOAA financial support on new CZM Secretariat Position. E. L. Diaz 2007.

Pacific Disaster Center. Multi-hazard Mitigation Planning: PDC Creates Natural Hazards Risk and Vulnerability Assessment and Hazard Mitigation Plan for American Samoa. Pacific Disaster Center. Kihei, Hawaii. 2003.

Parks, John and Gombos, Meghan. Summary Results from Outreach Interviews Conducted on the Potential Formation of a Pacific Islands Marine Protected Area Community. 2005.

Parks, John, and Millhouser, Bill. Staff and Technical Capacity Needs of the US Pacific Island Coastal Management Programs: Summary Interview Results. 2006.

Parks, John, and Millhouser, Bill. Staff and Technical Capacity Needs of the American Samoa Coastal Management Program (ASCMP): Summary Interview Results. 2007a.

Parks, John, and Millhouser, Bill. Staff and Technical Capacity Needs of the Hawaii Coastal Zone Management Program (HI CZMP): Summary Interview Results. 2007b.

Parks, John, and Millhouser, Bill. Staff and Technical Capacity Needs of the Guam Coastal Management Program (GCMP): Summary Interview Results. 2007.

Pauly, D. Rationale for reconstructing catch time series. Fish Coop Bull, v.11, p.4-10. 1998.

Pauly, D., Christensen, V., Guenette, S., Pitcher, T. J., Sumaila, U. R., e C. J. Walters, Watson, R., and Zeller, D. Towards sustainability in world fisheries. Nature. 418: 689-695 p. 2002.

Pauly, Daniel. The Sea Around Us Project: Documenting and Communicating Global Fisheries Impacts on Marine Ecosystems. AMBIO: A Journal of the Human Environment, v.36, n.4, p.290-295. 2007.

PIMPAC Resource Group. Summary of Recommendations for PIMPAC Organization and Operations And Activities for 2006. 2006.

Ponwith, B. The shoreline fishery of American Samoa: a 12-year comparison. . Department of Marine and Wildlife Resources. Pago Pago. 1991.

Post, Jan C. And Lundin, Carl G. Guidelines for Integrated Coastal Zone Management. Environmentally Sustainable Development Studies. 1996.

Puglise, K. A. And Kelty, R. (Eds). NOAA Coral Reef Ecosystem Research Plan for Fiscal Years 2007 to 2011. NOAA Coral Reef Conservation Program. Silver Spring, MD, p.128. 2007.

Rawlinson, N. J. F., Milton, D. A., Blaber, S. J. M., Sesewa, A., and Sharma, S. P. A survey of the subsistence and artisanal fisheries in rural areas of Viti Levu, Fiji. Australian Centre for International Agricultural Research. Canberra. 1996.

Richmond, Robert H. And Davis, Gerry W. Status of the Coral Reefs of Guam. 2004.

Richmond, Robert H., Teina Rongo, *et al.* Watersheds and Coral Reefs: Conservation Science, Policy, and Implementation. *BioScience*, v.57, n.7, p.598-607. 2007.

Richmond, Robert H., Rongo, Teina, Golbuu, Yimnang, Steven Victor, Idechong, Noah, Davis, Gerry, Kostka, Willy, Neth, Leinson, Hamnett, Michael, and Wolanski, Eric Watersheds and Coral Reefs: Conservation Science, Policy, and Implementation. *BioScience*, v.57, n.7, July/August 2007, p.598-607. 2007.

Riolo, Francesca. A geographic information system for fisheries management in American Samoa. *Environmental Modelling & Software*, v.21, n.7, 2006/7, p.1025-1041. 2006.

Rosenberg, A. A., Bolster, W. J., Alexander, K. E., Leavenworth, W. B., e A. B. Cooper, Mckenzie, M. G. The history of ocean resources: modeling cod biomass using historical records. *Front Ecol Environ*, v.3, p.84-90. 2005.

Saucerman, S. The inshore fishery of American Samoa, 1991 to 1993. Department of Marine and Wildlife Resources. Pago Pago. 1994.

Saucerman, S. Inshore fisheries documentation. Department of Marine and Wildlife Resources. Pago Pago. 1996.

Shea, Eileen and Cheryl Anderson. Climate Variability and Change Workshops in the US Pacific Islands. Pacific RISA. 2007.

Shea, Eileen. PRiMO 2006 Annual Meeting. 2006a.

Shea, Eileen L. (Presentation) Consequences of Climate Variability and Change for Pacific Islands. 2006b.

Shea, Eileen L., and Dyoulgerov, Milen F. Responding to climate variability and change: opportunities for integrated coastal management in the Pacific Rim. *Ocean & Coastal Management*, v.37, n.1, p.109-121. 1997.

Shea, Eileen L. and Milen F. Dyoulgerov. Responding to climate variability and change: opportunities for integrated coastal management in the Pacific Rim. *Ocean & Coastal Management Climate Change and Integrated Coastal Management*, v.37, n.1, p.109-121. 1997.

Solomon, Steven M. and Donald L. Forbes. Coastal hazards and associated management issues on South Pacific Islands. *Ocean & Coastal Management*, v.42, n.6-7, 1999/6, p.523-554. 1999.

Spalding, M. D., Ravilious, C., and Green, E. P. *World Atlas of Coral Reefs*. London: University of California Press. 2001.

Starmer, John. A Case Study of the Commonwealth of the Northern Mariana Islands Marine Monitoring Program (Successes and Failures).

State of Hawaii Department of Land and Natural Resources Division of Aquatic Resources. (Proposal) 2008 State of Hawaii Coral Reef Management Grant. 2007.

Tulagi, F., and Green, A. Community perception of changes in coral reef fisheries in American Samoa. (South Pacific commission and forum fisheries agency workshop on the management of South Pacific inshore fisheries.): South Pacific Community 11, Noumea, 1995.

U.S. Environmental Protection Agency, U.S. Department of Agriculture-Natural Resources Conservation Service, Hawai`i State Department of Health, Hawai`i State Department of Land and Natural Resources, Hawai`i State Department of Business, Economic Development and Tourism, National Oceanographic and Atmospheric Administration Coastal Zone Management Program, U.S. Fish and Wildlife Service, and U.S. Geological Survey. *Hawai`i's Local Action Strategy to Address Land-Based Pollution Threats to Coral Reefs*. 2004.

U.S. All Islands Coral Reef Initiative to Conserve Coral Reefs. **STRATEGIC ACTION PLAN 2008-2013**. 2007.

United States Government Accountability Office. **NATURAL HAZARD MITIGATION: Various Mitigation Efforts Exist, but Federal Efforts Do Not Provide a Comprehensive Strategic Framework**. 2007.

U.S. Indian Ocean Tsunami Warning System Program. How Resilient is Your Coastal Community? A Guide for Evaluating Coastal Community Resilience to Tsunamis and Other Hazards. Bangkok, Thailand. 2007.

Veitayaki, Joeli. Traditional marine resource management practices used in the Pacific Islands: an agenda for change. *Ocean & Coastal Management Climate Change and Integrated Coastal Management*, v.37, n.1, p.123-136. 1997.

Waddell, J. E. (Ed). The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States. NOAA/NCCOS Center for Coastal Monitoring and Assessment's Biogeography Team. Silver Spring, MD, p.522. 2005.

Ward, M. . Quantifying the World: UN Ideas and Statistics. Bloomington: Indiana University Press. 2004.

Wass, R. C. The shoreline fishery of American Samoa: past and present. (Papers presented at a conference, found in *Marine and coastal processes in the Pacific: ecological aspects of coastal zone management.*). UNESCO seminar held at Motupore Island Research Centre. University of Papua New Guinea: United Nations Educational Scientific and Cultural Organization, Jakarta Pusat. 1980. 51–83 p.

Western Pacific Regional Fishery Management Council. Bottom fish and seamount ground fish fisheries of the Western Pacific region, 2002 Annual report. 2004.

Western Pacific Regional Fishery Management Council. Proceedings of the Symposium on Mangrove Responses to Relative Sea-Level Rise and Other Climate Change Effects. Catchments to Coast. The Society of Wetland Scientists 27th International Conference. Cairns Convention Centre, Cairns, Australia. 7/9/06- 7/14/06, 2006.

Wong, Eric. (Presentation) PRiMO Observations and Data Management Hui Natural Hazards Data Framework Development- Hazards Data Framework Workshop. December 5-6, 2005. 2005.

Wright, Andrew, Natasha Stacey, *et al.* The cooperative framework for ocean and coastal management in the Pacific Islands: Effectiveness, constraints and future direction. *Ocean & Coastal Management. Selected Papers From the East Asian Seas Congress 2003*, Putrajaya, Malaysia, v.49, n.9-10, p.739-763. 2006.

Zeller, D., Froese, R., and Pauly, D. On losing and recovering fisheries and marine science data. *Mar Policy*, v.29, p.69-73. 2005.

Figure 1: General conceptual model of issues, threats, compounding factors, effects, and target condition for the U.S Pacific Island jurisdictions.

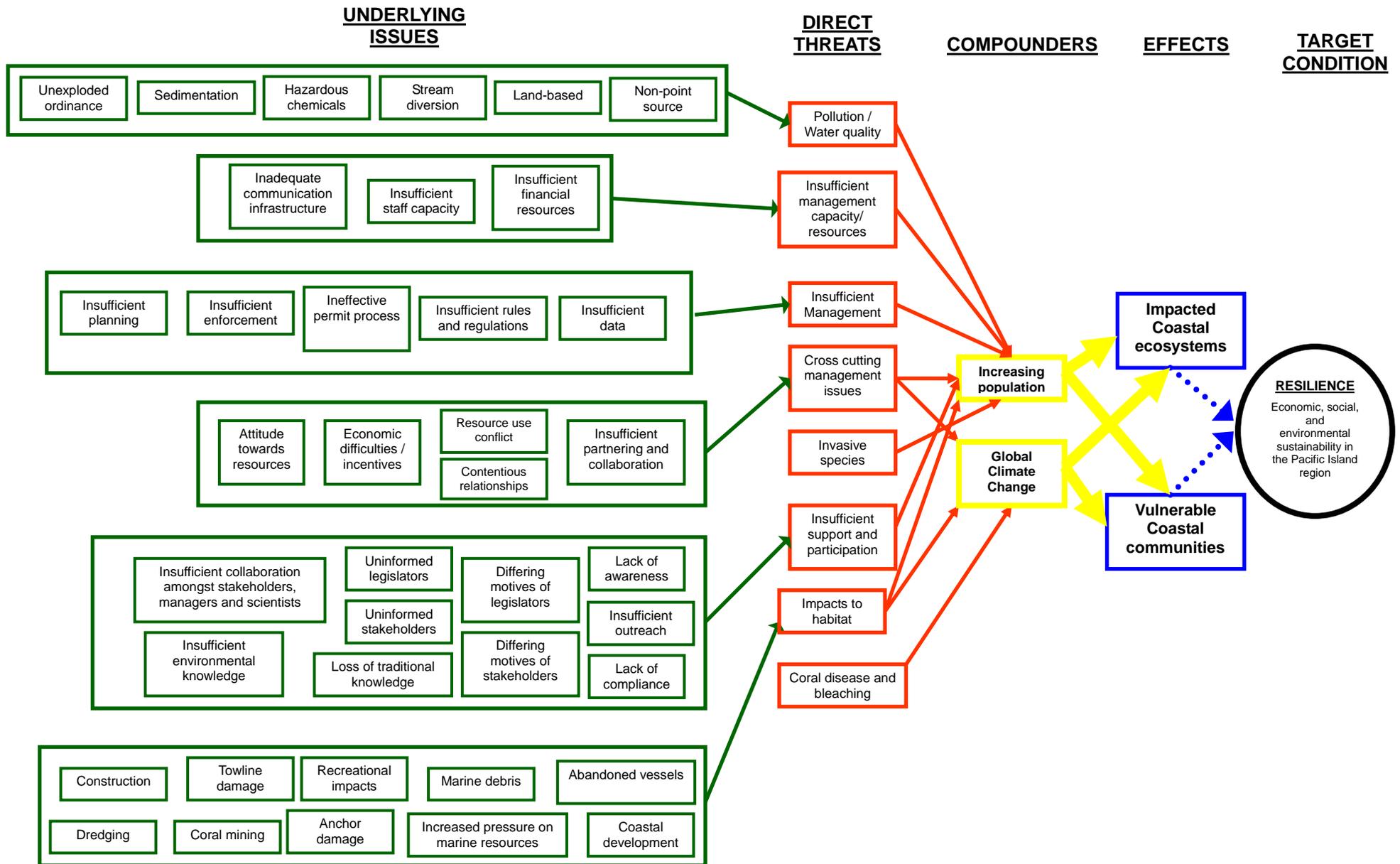
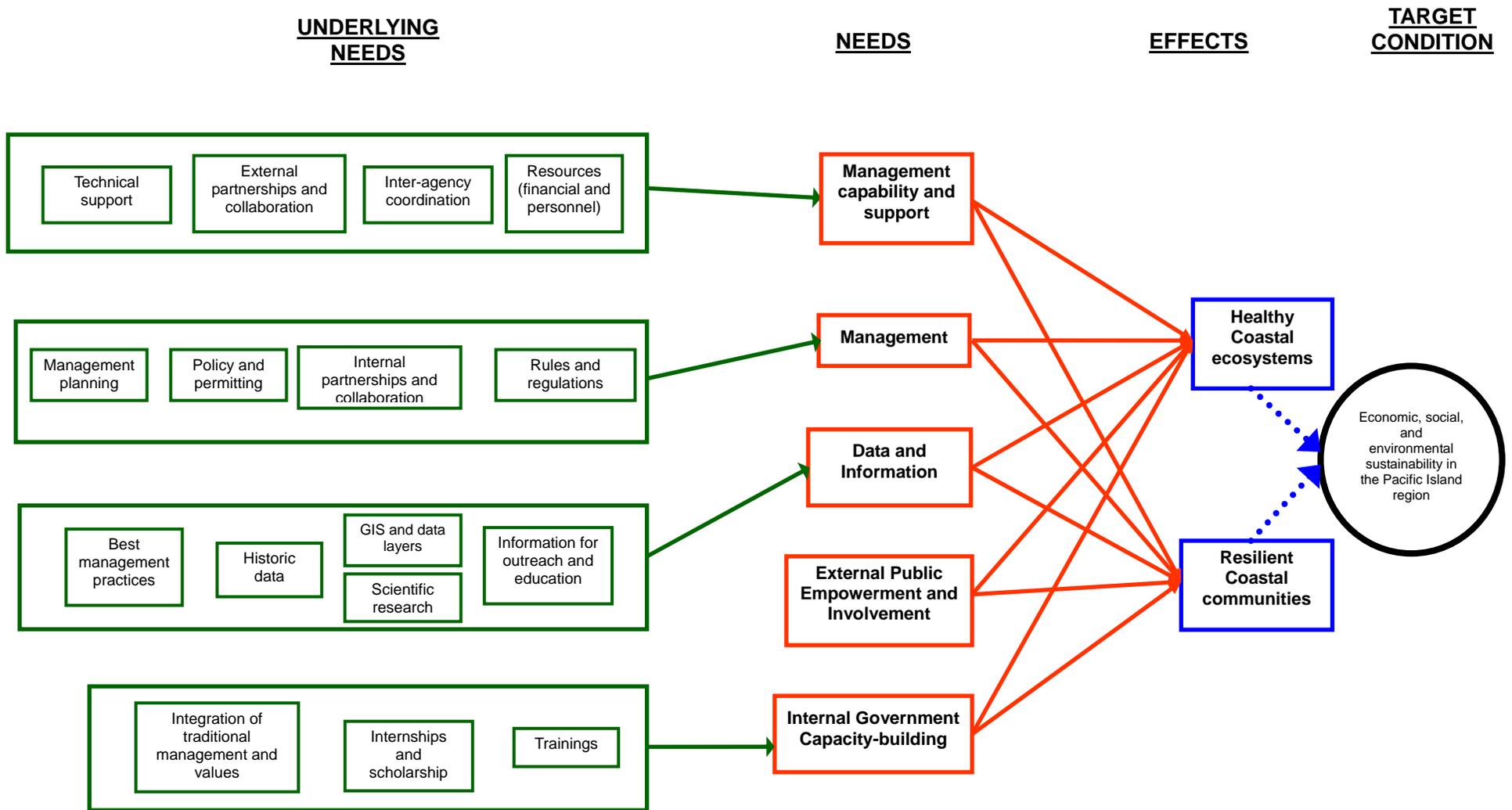


Figure 2: Conceptual model for the 'needs' of the U.S. Pacific Island jurisdictions.



Appendix 1: Specific Threats and Issues Identified for American Samoa

Natural Hazards -

The table below was taken directly from the American Samoa Coastal Management Program (ASCMP) section 309 needs assessment, and lists out natural hazards and their perceived threat level for American Samoa:

Hazard	High Risk	Medium Risk	Low Risk
Hurricane/Typhoons	■		
Storm Surge	■		
Flooding		■	
Shoreline Erosion (episodic or chronic)	■		
Sea level rise		■	
Great Lakes level fluctuation	N/A	N/A	N/A
Subsidence	■		
Geological hazards (including earthquakes and tsunamis)		■	
Other: landslides	■		

The top threats identified for American Samoa were insufficient management, insufficient management capacity / resources, insufficient support and participation, impacts to coastal habitats, and pollution / water quality. Population increase and global climate change were also identified as significant overarching factors that intensified several threats.

Insufficient management -

The majority of issues under the insufficient management threat were grouped under the “insufficient planning and preparedness” and “insufficient data” categories, while a few additional issues fell within “lack of or improper rules and regulations” and “insufficient enforcement”.

Specific issues included:

- There is no mechanism in ASCMP to implement Special Management Area (SMA) Plans called for in ASCMP's "Administrative Rules".
- Lack of plans for the SMAs or inability to implement SMA plans.
- Inadequate long-range planning and projected impact analyses for coastal hazards.
- There is an existing proposal to designate Malaeimi Valley as a SMA, but as of the site visit of the 312 assessment review (2004), no action had been taken by the American Samoa government. Once designated, it is the responsibility of the

ASCMP to develop specific management plans for each area. While designations have been made, there are no rules or regulations to guide what is to occur within the SMA boundary.

- There is no plan to guide the development of SMAs within American Samoa.
- Problems with establishing SMAs in the territory include privately held land, lack of master planning, limited funding, and the need to assist village councils and mayors with managing setbacks and special areas.
- The Tualauta County Master Plan (guidance and regulations) has been completed, but has not been adopted, leading to a lack of management for coastal resources. This document is controversial in the territory as there are fears that it may shift or alter the communal land tenure and cultural aspects of the villages. The Tualauta County Plan was completed and approved by the Territorial Planning Commission (TPC) in 2001.
- The majority of communities do not have coastal management plans. Out of 60 shore-lined villages situated on the outskirts of Tutuila, Aunu'u and the Manu'a Islands, a total of 11 villages are listed under the Community –based Fisheries Management Plan (CBFMP). This is the largest marine management program currently existing in American Samoa. Concerns were raised about monitoring these specific areas due to isolation, intrusion from villages not part of the CBFMP, and violation of fishery management provisions.
- Current fisheries management plan is insufficient to curb the decline of natural resources. For example, coral reef fish and invertebrate resources have declined in abundance. Harvested species such as giant clams and parrotfish are overfished, and there has been heavy fishing pressure on surgeonfish (Craig et al., 1997; Page, 1998; Green and Craig, 1999). Groupers, snappers and jacks seen on the reef are smaller and less abundant than in the past. In addition, most village fishers and elders believe that numbers of fish and shellfish have declined (Tuilagi and Green, 1995).
- There are insufficient marine protected areas to meet the 20% goal of the U.S. Coral Reef Task Force (USCRTF).
- There is a lack of, or in some cases, unknown effectiveness of existing management programs; insufficient performance measures.
- Insufficient knowledge on the historic abundances of coastal resources, how they were utilized, and management regime.
- Insufficient knowledge of historical trends in reef fish stocks and catches.
- Lack of information on the possible impacts from global climate change on coastal ecosystems and communities. For example, accurate information on mangrove response to projected relative sea-level rise over coming decades will enable educated coastal land use planning decisions to minimize and mitigate mangrove losses, reduce the risk of damage to coastal development, and select and implement policies to manage mangrove response (abandonment, adaptation, habitat rehabilitation, and coastal hardening) deemed suitable for different sections of coastline.
- Insufficient historical data to identify historic properties (beyond the 10 percent of territorial area already surveyed) and analysis of cumulative and secondary impacts (CSI) and direct impacts of development.

- Significant discrepancies in population data (e.g., between American Samoa Department of Commerce and American Samoa Power Authority (ASPA), the 1995 "Utilities Master Plan").
- Insufficient data on status of resource populations.
- Insufficient data on key impacts to coral reef fisheries.
- Developing an ocean resources mapping information system.
- Current fishing regulations are insufficient to prevent a decline in the fisheries.
- Unregulated agroforestry and agriculture practices, human and animal waste disposal, and water use.
- Insufficient rules and regulations on fisheries imports and exports.
- The use of destructive fishing methods, which include bleaching agents, dynamite, and traditional plant-derived poisons (ava niukini).
- Lack of enforcement of the wetlands policies.
- The lack of enforcement of un-permitted actions or permit violations remains a serious problem which has the potential to undermine public support for the ASCMP.
- There is limited developable land in American Samoa and projects often occur without obtaining a land use permit. When development occurs without a land use permit, the review process can not occur. Enforcement of these violations remains an issue as the Attorney General's office rarely follows through on cases.

Insufficient management capacity / resources -

Specific issues include:

- Insufficient marine monitoring and survey personnel and equipment
- Insufficient enforcement personnel and equipment
- Lack of employment centers other than existing Pago Pago and Tafuna areas
- Lack of planning staff with GIS competence
- One of the ongoing issues of ASCMP implementation is in developing ongoing capacities for execution. Presently, there is an inability to recruit, retain and maintain trained and knowledgeable staff.
- Lack of new employee orientation and training, new staff does not fully understand their role and how their program operates.
- Lack of direct involvement (technical assistance) by Federal agency regional personnel in American Samoa. Direct involvement in American Samoa by OCRM personnel remains limited, though there is ongoing communication with and between ASCMP and OCRM.
- Staff currently lacks the necessary training to develop and implement a full socioeconomic/human dimensions monitoring program to better develop MPA programs that work within the local social, economic, and cultural dimensions.
- There is no funding for enforcement under the CBFMP. The enforcement division conducts infrequent patrols and monitoring of the area because of the fact that there is limited funding from the local government.
- Lack of enforcement capacity to properly document and develop cases for local resource management violations.

Insufficient support and participation -

Insufficient support and participation is based on the motives for an outreach and education program. The outcome for the majority of these programs is expressed as the education of a user group, including youth and public stakeholders. But it should be noted that the ultimate intent of any outreach and education program is the modification of behavior, in this case to get stakeholders and legislators to support and/or participate in their management efforts. For example, one of the goals of the ASCMP is to have involved and educated coastal citizens. Current outreach efforts are designed to be directly related to management actions and recommendations to protect and preserve resilient reefs as part of MPA programs, in response to global climate change. There are myriad reasons for stakeholders and legislators to not support management, including differences in motives, lack of awareness, loss of traditional value system, and being uninformed about potential threats.

While it is hard to directly identify the underlying issues that justify the need of an education and outreach program, several have been identified below. There is no doubt that this is an incomplete list.

Specific issues include:

- Encroachment threatening pre-historical and historical resources.
- Inadequate attention given to changing trends in economic/social/cultural processes (e.g., shift towards nucleating of the communal family system, thus increasing need for individual homes)
- Inadequate attention given to cultural factors in planning (e.g., importance of physical siting of cultural institutions like the malae, chief's ceremonial houses)
- Lack of public awareness or information concerning over-fishing on coral reefs
- Major impediments to addressing erosion are the lack of public awareness concerning the impacts of upstream practices and lack of understanding of sustainable management practices.
- Lack of awareness of the importance of ocean, coastal, and watershed resource management issues by the general public and the social and physical processes that affect the coastal environment.
- Lack of public engagement in coastal management policy.
- Lack of strong public support for certain management programs.
- Insufficient knowledge of the importance of water resources and their quality and the causes and effects of human behavior on water quality.
- Insufficient efforts in reaching out to and working with traditional Village leadership to support best coastal management practices.
- Lack of awareness of mangrove's functions and traditional wetland uses, causing misuse and overuse of American Samoa mangroves.
- Lack of coordination and collaboration amongst regulatory agencies often results in inefficient programs or incomplete projects.
- Lack of support and compliance that is required to ensure the efficacy and success of ASCMP functions.

- Lack of understanding within the American Samoa government about the ASCMP.
- Lack of understanding of the functions and roles of other government agencies in the ASCMP.
- Lack of a communication strategy to maintain dialogue between the ASCMP and leadership at all levels.

Impacts to coastal habitats -

Impacts to coastal habitats in American Samoa include loss of sensitive and valuable coastal areas due to development, vessel groundings, marine debris and resource mining.

Specific issues include:

- Development has resulted in expansion of housing and industry into environmentally sensitive areas including wetlands and lowland rainforest.
- While mangrove wetlands were once prominent features at the mouths of most freshwater streams in American Samoa, the majority of mangrove area has been filled since the early 1900s, only five large mangrove stands remain, and wetland losses continue at a rate of about 2 hectares per year.
- Since 1961, American Samoa has lost over 30% of its wetlands, yet prior to 1961 a great number of wetland areas were destroyed for the construction of primary infrastructure including roads, schools, hospitals, parks and airports. Some experts estimate that American Samoa has lost in total, approximately 75-80% of its wetlands.
- Increased human activity, such as dredging, sand mining, construction, development on filled land, and upstream development of watershed areas, lead to greater impacts from natural hazards.
- There are only 53 hectares of mangrove wetlands remaining in American Samoa.
- There have also been various reports of fishing nets which are left on the reef and eventually trap and kill many marine species.
- Loss of native vegetation and wildlife
- In the past decade, 10 groundings of fishing vessels, all large (>30 m) foreign-flagged longliners, occurred in the Territory. Nine occurred in Pago Pago Harbor during Hurricane Val in 1991 and their rusting hulls remained on the reefs for nine years. They were finally removed in 2000, due to actions taken by the USCRTF. The tenth longliner ran aground in 1993 at Rose Atoll, a NWR, spilling a full fuel load, fishing lines and other metal debris onto the atoll. Follow-up studies indicate that significant damage occurred to the atoll, with the loss of about 30% of the atoll's foundation of crustose coralline algae and a community shift from a coralline algae substrate to one of fleshy blue-green algae, most likely due to iron enrichment (Green et al., 1998).
- Sand mining has also become a problem as residents freely take sand from various beaches around the island for personal use.
- Vegetation and water storage areas are being eliminated or reduced in upland areas resulting in some increased stream flow and loss of benthic and riparian habitat

Pollution / water quality -

Pollution has been identified as one of the primary threats in American Samoa by the Coral Reef Advisory Group (CRAG). American Samoa has established a Pollution LAS to address this threat. According to the CRAG “Pollution from human activities has directly impacted the coastal resources of American Samoa with the most obvious evidence of this in Pago Pago Harbor.” and “Point source pollution, successfully identified and mitigated, has been replaced by non point source pollution as the primary pollution for coastal areas.” (AS Coral Reef Initiative (CRI) pre-proposal 2009).

Specific issues include:

- Historical industrial, commercial, and military activity in the harbor led to coastal pollution that degraded water quality and local reef habitats.
- Runoff from impervious surfaces directly impacts coastal areas
- Island streams transport elevated levels of nutrients to coastal areas. Nutrient sources to local streams include faulty or improperly constructed septic tanks and concentrated animal waste from small family-owned piggeries.
- Local streams also serve as temporary waste receptacles, and this debris causes unsightly trash deposits in the nearshore coastal areas.
- The island’s main road runs along the water’s edge and has historically been a convenient place to dump unwanted debris.
- Vegetation clearing for crops often occurs on lands with slopes greater than 30%, which in turns leads to excessive erosion and high levels of sedimentation impacting coastal ecosystems.
- Pago Pago Harbor Water Quality - oil discharge, heavy metals, pesticides, non-point source pollution, ship dumping.
- The major culprit to coastal wetland degradation is chemical pollution caused by illegal dumping and improper storage and disposal.
- Pesticides, household chemicals, detergents, runoff from piggeries, batteries and other forms of non-point source pollution pose serious threats.
- The primary source of marine debris is household trash. This includes plastic shopping bags, disposable diapers, glass bottles, aluminum cans, clothing, and shoes. These items are visible in most streams, on most beaches, and on most coastal trails throughout the territory. For many years, households throughout the territory have contributed refuse to the streams and marine waters by depositing trash on their land, which is then washed into the ocean after frequent and heavy rains.
- Illegal dumping is a result of poor solid waste collection, limited alternative dumping sites, lack of understanding about potential downstream effects, and lack of enforcement.
- Indiscriminate littering has been a problem due to lack of trash receptacles, false perception that trash pick up in public areas is the responsibility of American Samoa Government (ASG), lack of enforcement, and general apathy towards littering.
- Oil spills are still a problem because of accidents and illegal dumping.

Population Increase –

Population Pressure has been recognized by the CRAG as the root cause of many of the other key threats to American Samoa's coastal ecosystems. The estimated population in American Samoa was 65,500 in July 2005 (DOC Website – www.asdoc.info), which represents an approximate 14.32 percent increase since 2000. Ninety percent of the population of American Samoa lives on the south side of Tutuila Island, with a population density on the island of between 1,350 and 2,800 people per km². The Population Pressures LAS lists several threats that are intensified by increasing population including increased road construction, land development, shoreline hardening, over-fishing, and waste disposal. Also identified (Craig 2002) were increased strains on the environment, such as extensive coastal alterations, fishing pressure, loss of wetlands, soil erosion and coastal sedimentation, solid and hazardous waste disposal, and pollution.

Coastal hazards have been a major problem in American Samoa for hundreds of years, and this problem has grown with increases in population and development. Today, most development is located in the narrow strips of coastline flanked by steep ridges. Thus, landslides, flooding, storm surges, high waves, earthquakes, high winds, tsunamis, and shoreline erosion are threats to a considerable number of people, their homes and livelihoods. Population growth and development in the territory are putting more people and property at risk. Continued population growth and investment in new buildings and infrastructure will increase the vulnerability of American Samoa to future disasters.

Global climate change -

GCC is an issue in American Samoa because of its potential to exacerbate impacts from other coastal hazards, such as typhoons, rainfall, and coral bleaching. The residents of American Samoa are concerned because they have relied on the reef ecosystem for protection, food (all fisheries are expected to be impacted by Pacific climate change), and goods and services for millennia and because of GCC they may now face severe disruptions in lifestyle, public health hazards, and a decreased ability to be self-supportive (American Samoa 3 year Local Action Strategy 2004).

Appendix 2: Specific Threats and Issues Identified for CNMI

Natural Hazards -

The table below was taken directly from the CNMI CRMP section 309 needs assessment, and lists out natural hazards and their perceived threat level:

Hazard	High Risk	Medium Risk	Low Risk
Hurricane/Typhoons	X		
Storm surge	X		
Flooding	X		
Episodic shoreline erosion	X		
Chronic shoreline erosion		X	
Sea level rise		X	
Subsidence			X
Earthquakes	X		
Tsunamis		X	
Other (Volcano)		X	

The top threats identified for CNMI were insufficient management, pollution and lack of support and involvement. Other threats identified were insufficient management capacity, impacts to coastal habitats, coral bleaching and disease, invasive species, and cross-cutting management issues. Population increase was mentioned as a compounding factor to the above threats.

Insufficient management –

The majority of issues under the insufficient management threat were grouped under the “insufficient planning and preparedness” and “insufficient data” categories, while a few additional issues fell within “insufficient enforcement” and “complicated or ineffective permit process or policy”.

Specific issues included:

- Lack of a long-term CNMI marine management plan
- Lack of marine monitoring and research plan.
- The number one threat to Managaha Marine Conservation Area, Bird Island Sanctuary, Forbidden Island Sanctuary, and Rota’s Sasanhaya Bay Fish Reserve continues to be the lack of an organized management program.
- Insufficient management of recreational and tourism activities on the coastal ecosystem.
- The CNMI Zoning Law was passed in 1990 and Saipan developed a land use plan and then developed a performance zoning plan. However, the zoning element was never implemented.
- Lack of a CNMI Vessel Grounding Action Plan
- The lack of a fully functioning Zoning Board leaves related cumulative and secondary impact (CSI) considerations to the coastal resource management permitting process.

- Lack of guidance on where certain types of development, such as major hotels, marinas, recreational or industrial developments. The APC criteria provide minimal basis for evaluating the cumulative impact of new development.
- There has been no comprehensive master plan developed for management of stormwater in the CNMI.
- If Rota's water supply is not managed properly it may threaten water quality and human health.
- Over the years, the government has made short sighted decisions on coastal land uses and has not positioned the Commonwealth well to take advantage of its resources and their use in any renewable capacity.
- CRM Board's approach does not stress the coordinative and policy direction needs of the overall CNMI Coastal Resource Management Program.
- The Rota Habitat Conservation Plan is incomplete and not an island priority.
- Lack of a flood warning and preparedness plan that utilized rainfall amounts and stream levels information as part of the mitigation strategy.
- Insufficient coastal hazard.
- Insufficient data on the status of coastal resource populations.
- There is a lack of baseline data about past and current coral reef fisheries fish stocks and fishing pressure.
- Insufficient coastal resource oriented research programs.
- Lack of information on the economic value of the coastal ecosystem. The Commonwealth does not have a good way to measure the true value of conserving and restoring CNMI's coral reefs and associated ecosystems or a good way to measure the true costs of current impacts or proposed development.
- No data collection program or comprehensive management plan presently addresses sustainable fishing issues in the near shore (<100-foot contour) coral reef fisheries.
- Designation of the Managaha MPA boundaries was not established based on best scientific information or with well developed biological objectives.
- There is no program to assess the effectiveness of the Managaha marine protected area
- Lack of data to predict and model coastal hazard events.
- Information about the total area and location of MPLA wetland holding is not readily available.
- No current wetland information is available for the island of Pagan.
- Lack of knowledge about groundwater flow and water quality is a major impediment to improving conditions for many of CNMI nearshore marine systems.
- Management of coral reef fisheries in the CNMI has not provided protection against the overexploitation of reef fish resources and degradation of marine habitat by human-induced activities.
- There is no systematic enforcement to ensure that development plans, approved through DEQ and exempted by CRM, are constructed according to specifications, or that the systems are properly maintained.

- Lack of jurisdictional authority, inconsistent or incomplete regulations, and/or lack of statutory power to enforce regulations which has led to the retraction of several coastal resource related administrative actions.
- Technical details and concerns of the different agencies, in regards to permitting function, are not worked out and resolved before Zoning Board consideration; making the process more difficult and time consuming.

Pollution -

The CNMI LAS has identified pollution as one of the primary threats to the coastal environment. According to the CNMI LAS (2003):

“Decreased water quality threatens coral reefs and other marine systems that rely on good water quality to thrive. These marine communities are negatively altered in response to nutrient loads, sediment loads, temperature, turbidity, and other water quality parameters. Both point and non-point source pollution are responsible for lowering the quality of CNMI’s surface and near-shore coastal waters. Sewage out-falls, sewer collection overflows, sedimentation from unpaved roads and development, urban runoff, reverse osmosis discharges, and nutrients from landscaping, golf courses, and agriculture are some of the most significant stressors on CNMI’s surface and marine water quality.”

Specific issues include:

- There is no municipal solid waste collection system in the CNMI. As a result littering and illegal dumping due to widespread individual misconduct, a lack of trash receptacles and collection service at shoreside parks, and the lack of litter control law enforcement occur. Littering and illegal dumping mainly go unchecked due to the lack of certified litter control officers.
- Increased stormwater runoff from developments carries both NPS and point source pollution into Saipan Lagoon and the other islands’ surrounding waters. Stormwater drainage systems associated with Beach Road and Middle Road extending north from Chalan Monsignor Guerrero Rd. continue to deposit untreated stormwater directly into the lagoon.
- Nutrient loading is increasingly problematic as seen by the large algal blooms now easily visible in recent satellite and aerial imagery.
- Coastal resources continue to be threatened by upland runoff, especially sedimentation. Typhoon Chaba, in August 14 2004, caused major sedimentation of the Laulau Bay coral reef.
- Microbiological violations occurred in areas with heavy stormwater runoff. Many of these sites were within the highly developed Garapan district, where drainage issues are in the process of being addressed. Other frequent violations occur within Saipan’s marinas or in waters surrounding docks.
- CNMI’s three major inhabited islands (Saipan, Tinian, and Rota) have unpaved secondary roads that funnel soil and sediment into nearshore waters during periods of heavy rain, thereby increasing turbidity of nearshore waters.

- There have been several reports of sedimentation events associated with major construction projects (e.g. the Nikko Hotel, Laulau Bay Resort, and Bird Island Road) that were deleterious to nearshore corals.
- Treatment of secondary roads with crushed limestone without addressing drainage problems created chronic sedimentation problems along Laulau Bay and Obyan Beach.
- On several of the northern islands, deforestation and overgrazing has led to increased nearshore sedimentation. Deforestation from illegal burning has also created an area of eroding badlands on the southern coast of Rota.
- The CNMI was a major battlefield during WWII, and war debris and unexploded ordnance is still common in the near shore waters. A moderate, but locally concentrated amount of ordnance has been noted by the MMT south of Agingan Point and the southern end of Laulau Bay. Unexploded ordnance was also recorded near Aguijan.
- Hazardous waste from garment industry sites.
- Water quality remains an issue for the CNMI, both in terms of its impact on land and in the waters of the Commonwealth.
- Petroleum product oil slicks originating from offshore vessels and vessels docked at the port or marina. These slicks result from incidental spillage and ballast discharges.

Lack of support and involvement -

Public awareness and involvement in coastal resource management has been identified as a priority in the CNMI LAS (2004). Stakeholders in CNMI agree that education, public awareness, and involvement are an important component for effective coral reef protection and coastal management in CNMI.

Specific issues include:

- Insufficient interagency collaboration and capacity building among coastal management agencies.
- Lack of understanding of audiences and gaps in outreach efforts.
- Lack of resident, visitor, and guest worker awareness of the need to properly manage watersheds and marine habitats in light of the threats to coastal ecosystems.
- Lack of resident, visitor, and guest worker involvement in the protection and enhancement of coastal ecosystem health.
- Lack of Coastal Resources Management Office (CRMO) involvement in coastal hazard discussions occurring within and among the island communities in general.
- Lack of Government Agency Directors participation in the CRM board, which reviews development permits.
- Insufficient knowledge about permitting needs.
- Permit considerations are more directed toward individual, and often parochial, elements of permits, rather than broader issues of steering a course

for the Commonwealth that would assure appropriate resource use and protection.

- Increase fishermen's participation in fisheries management.
- Lack of fishermen's knowledge of fishing rules and regulations
- Minimal volunteer opportunities for interested public and youth in coastal related activities.
- Lack of opportunity for citizens to report possible environmental violations.
- Lack of community awareness about the value and importance of CNMI's coastal ecosystems, the role they play in our ecosystem, and their contribution to the tourism-based economy of the CNMI.

Insufficient management capacity/resources –

Lack of resources, both financial and human, and insufficient staff capacity are often intertwined with or at the root of management problems.

Specific needs include:

- Historically the Commonwealth's government has been financially challenged, leaving little for new initiatives.
- Insufficient staff capacity to identify, adapt, and develop sound and appropriate laws and regulations and administrative legal actions for coral reef conservation, protection, and management.
- Insufficient staff capacity in coastal hazard preparedness and response.
- Insufficient staff capacity in financial and grants management, program planning, permitting and enforcement, and policy development/leadership.
- Insufficient staff capacity to implement the projects identified as part of the CNMI LAS and the CRI.
- Insufficient staff capacity for enforcement of coastal resource management laws.
- Insufficient staff capacity in advanced diving techniques, ecosystem science, and facilitation.
- Minimal opportunity to develop local capacity for coastal management positions.

Impacts to coastal habitats –

Anchor damage, abandoned vessels or vessel groundings, and marine debris are the main issues in CNMI related to impacts to coastal habitat.

Anchor damage is noticeable at some popular fishing and dive sites in the Mariana Islands. Although concerns over anchoring effects prompted the installation of moorings at most commercial dive sites around Saipan, Tinian, and Rota, there are still relatively few mooring buoys for commercial and recreational use. Also, at present, there are no restrictions on recreational anchoring outside of MPAs. The anchoring of large commercial vessels on the extensive shallow (25-40 m) reef platform to the west of Saipan has been impacting reef coral habitat since the mid-1990s (Waddell 2005).

NOAA's Office of Response and Restoration (OR&R) reports 41 abandoned vessels in CNMI. Nine of the wrecks are on coral reefs, fourteen in mangrove habitats, and the rest in sand or sea grass habitats. Also, wreckage of tanks, landing craft, airplanes, and pontoons from WWII are visible on coral reefs. These craft are considered an important part of the historical record and are unlikely to be removed. In the past two decades, more than 20 commercial vessels have grounded in the CNMI. Some of these vessels have since been removed, but nearly half remain in the water.

Plastics and other forms of household solid waste remain the primary types of marine debris found in the CNMI. These originate from a number of sources, including: littering and illegal dumping of garbage by the public; dumping of garbage from private and commercial marine vessels; and garbage in the form of ocean flotsam from unknown origin that washes onto CNMI shores.

Coral bleaching and disease –

Coral bleaching has been noted in the CNMI several times since 1994. However, there has been no quantitative assessment of these events.

Invasive species –

A category for invasive species was added to this section, Invasive species has recently become an issue as there are now increasing numbers of aquaculture and mariculture facilities or plans for facilities, but no agency has taken the lead in studying the potential effects of these and other mechanisms by which invasive species are spread.

The potential for the introduction of invasive species through the discharge of ballast water exists in the CNMI, but the threat has not been evaluated.

Cross-cutting management issues –

The main issues under cross-cutting management issues are related to collaboration and partnerships and user conflicts.

Specific issues include:

- Although several agencies participate in wetland management, there has been less than optimal coordination in the past.
- Currently there is no early consultation process between the permitting agencies and potential permit applicants or their representatives. What is presented is a full application of a planned project which meets the requirements of one agency, but may not meet the requirements of another.
- There is a lack of networking among CRM Program Agency Representatives, Tinian and Rota Coastal Coordinators, and the AGO, because of this there is a lack agency compliance with and enforcement of CRM Regulations to deter unpermitted activities from occurring.
- Saipan Lagoon is heavily used for a variety of activities, such as fishing, port and industry, various water dependent and reliant developments, and marine sports,

e.g., Jet skis, banana boats, swimming, sail boarding, kite boarding, boating, and snorkeling. There is some zoning in place, but there are conflicts amongst the many users of Saipan Lagoon. There are also potential conflicts between recreational users and future developments for marine transportation and industry.

Population increase –

The population of CNMI has increased dramatically since 1960, most prominently in Saipan where the population has increased eight-fold (approximately 8,000 in 1960 compared to approximately 64,000 in the 2004 census). As the population of the CNMI continues to grow and diversify, its effects on adjacent coastal ecosystems become more pronounced and complex. Threats to CNMI's coastal ecosystems become exacerbated and the health of coastal resources is reduced. Development, due to increased populations, in the CNMI has a high potential for damage or destruction due to coastal hazards because of its proximity to the coastline. The risk may be compounded in the Northern Islands by inadequate transportation infrastructure between the islands and Saipan, hampering emergency response. Finally, the risk of development on public and private wetlands remains high due to the public demand for homesteads, for new and expanded business sites and for associated easements and rights-of-way.

Appendix 3: Specific Threats and Issues Identified for Guam

Natural Hazards -

The table below was taken directly from the Guam CMP section 309 needs assessment, and lists out natural hazards and their perceived threat level:

Hazard	High Risk	Medium Risk	Low Risk
Hurricanes/typhoons	X		
Storm Surge	X		
Flooding		X	
Episodic Shoreline erosion	X		
Chronic Shoreline erosion			X
Sea level rise		X	
Subsidence			X
Earthquakes	X		
Tsunamis			X
Other			

Military and associated population increase –

The military expansion, a growing population, and the resulting increase in demand on resources and infrastructure present the most serious challenges to Guam’s coastal management. U.S. DoD’s plans to move approximately 26,000 additional military personnel and dependents to Guam by 2014, with a total expansion that could eventually be as high as 40,000 people.

In addition to the proposed military expansion, primary threats are insufficient management of coastal resources and hazards, insufficient management capacity/resources, insufficient public and government support and participation, impacts to coastal habitats, and pollution and water quality. To a lesser degree, coral bleaching and disease and invasive species may also pose a threat.

Insufficient management –

Insufficient management of Guam’s coastal resources has led to the poor quality and continued degradation of its reef fish stocks, coastal water quality, and native upland vegetation.

Specific issues include:

- Insufficient planning to moderate the public and private development away from hazardous areas along the shoreline and areas inundated by high surf during typhoons, flooding, storm surge, and episodic and chronic erosion.
- Lack of a SMA Plan for Northern Guam which will ensure that significant coastal resources severely affected by cumulative and secondary impacts are protected and monitored.

- Government management and regulation of the island's land and sea resources must be improved.
- Guam Coastal NPS Pollution Management Program does not yet have full approval (GCMP 309 assessment 2006). This single entity will become Guam's driving force for efforts to protect and restore lands, coastal areas, and reefs from further degradation and to minimize new problems as more development occurs.
- Gaps occur in the development permitting process. CSI are not formally addressed in the permitting of projects, in the application review process, or in the GLUC process but rather relies on the experience of the planner involved with the ARC.
- Guam does not have adequate data and analytical models to address natural resource losses resulting from projects proposed by the developers. Very little has been done to address CSI issues as it applies to new development. Analytical models and other tools are needed to fully determine the CSI a development within a particular watershed area.
- Lack of management regulations that would slow down or potentially even reverse the long-term decline in the nearshore fishery.
- There is no program or management plan for marine debris issues.
- Lack of information on the impacts of non-sustainable fishing practices on Guam.
- Inadequate coastal resource management planning to help inshore fisheries recover from an Island-wide collapsed in the 1980s. Also, recent large-scale surveys have reported the conspicuous absence of large reef fish.
- Inappropriate fishing practices are not regulated.
- The majority of coastal hazards lack adequate information and a standard methodology to quantitatively assess vulnerability to that hazard, instead qualitative assessments were conducted.
- HAZUS-MH is not available for Guam and is not expected to become available until 2007. Without HAZUS-MH, the vulnerability assessment for Guam is much more difficult and, in some ways, less precise as would be possible using HAZUS-MH. HAZUS-MH is FEMA's recommended risk assessment software program for earthquakes, flooding, and severe winds (Guam's Hazard Mitigation Plan 2005)
- Lack of data on primary contributors to dramatic shoreline change.
- Lack of data as to whether the GCMP Environmental Education and Outreach campaign is effective.
- Lack of a robust measure of the effectiveness of compliance with marine reserve regulations.
- Lack of an inventory of the reef fish community.
- Insufficient scientific support for additional coastal resource conservation legislation such as a ban against destructive fishing practices.
- Local resource managers do not have the baseline data about the island's coastal resources and information on management that is needed prior to the military expansion.

- Guam lacks a scaleable, centralized, relational database with spatial intelligence capability that could store, organize, maintain, analyze, share, and access all data collected from activities outlined in Guam’s comprehensive monitoring plan.
- Seashore Reserve rules and regulations have not been finalized nor legislated.
- A lack of coastal hazard preparedness, this could result in lose of shoreline, or damage to historic and cultural resources.
- Lack of information (baseline) related to the terrestrial, fresh water, and marine ecosystems which could be impacted by the placement and operation of the new solid waste landfill facility at Dandan.
- Lack of a bibliography of existing data/studies which may have been completed for Guam in various departments of the government, which could be used to identify changes to the environment.
- No data on the current status of Crown of Thorns (*Acanthaster planci*) populations and possible outbreaks.
- There is a gap in the information regarding boat debris (sunken and rusting vessels) in the Apra Harbor area, and in accessing regional information regarding the debris contributions of distant waters fishing fleets.
- No regulations on night-time scuba spearfishing and gill netting even though the fishery has collapsed and the methods are banned in other Pacific Island countries.
- Current land-use laws need to be revised. Changes in laws and regulations or standard operating guidelines need to occur to offset degradation and minimize pollution as much as possible.
- Poaching within areas closed to fishing may further reduce the ability of the marine preserve system to sustain healthy functional diversity. Detected poaching events within marine preserves can be as high as 3 or 4 a month with undetected poaching likely to be considerably higher.
- Legal issues continue to be a barrier to effective coral reef conservation and protection in Guam.

Insufficient management capacity/resources –

Lack of resources, both financial and human, and insufficient staff capacity are often intertwined with or at the root of management problems.

Specific issues include:

- In an assessment of capacity needs for the GCMP, respondents indicated that current staff capability is insufficient (e.g., “low”) in several areas, including:
 - Planning/Zoning of Coastal Ocean Uses
 - Non-point Source Pollution Control/Mitigation
 - Watershed Management
 - SMA/MPA Management Planning and Implementation
- Innovative methods to reduce erosion are not seriously taken into consideration due mainly to inadequate available funds

- Island politics (and U.S. national politics), office politics and culture, organizational resistance to change, insufficient staff size, lack of staff capacity, and dysfunctional networking agencies may have adverse effects on the governments ability to ensure coastal community resiliency.
- The Marine Preserves lack the full-time personnel and equipment necessary for monitoring and enforcement.
- Fishing violations are not being prosecuted because of the reduction of personnel on the Attorney General’s office and low priority.
- Many legal matters, including legal review of proposed regulations (MP eco-permit, volunteer conservation officer, and seashore reserve regulations) and prosecution of MPA violations are currently delayed at the Attorney General’s office due to the lack of a dedicated natural resource attorney.
- Lack of a response team to assess acute impacts to coral reefs such as groundings, coral bleaching, coral disease, and *Acanthaster planci* outbreaks, storms, and oil/chemical spills. The formation of this team prior to the military expansion is essential as the risk of acute impacts will increase with the projected increase in population and development.
- Improvement can be made in all administrative functions of the GCMP, with the program’s ability to conduct effective strategic planning requiring the most assistance.
- Agencies, such as the Departments of Parks and Recreation and Public Works, are faced with various challenges that are difficult to address from outside the particular agency. These challenges range from a breakdown in organizational knowledge transfer to changing management and staff, a lack of strong leadership, organizational resistance to change, and a lack of skilled and motivated staff.
- There are also some coastal management projects that demand a higher level of expertise than the management staff possess.

Insufficient support and participation –

Guam has identified lack of public awareness as one of its LAS threats. The Lack of Public Awareness LAS focuses on improving awareness of and support for coral reef conservation efforts by the community, in the classroom, and with policy makers. Even though the lack of awareness LAS is a priority, carrying out frequent and effective public outreach and education activities is one of GCMP’s strengths. There are extensive outreach efforts related to community resilience in Guam, but the explicit threats these efforts are trying to mediate are not identified.

Two specific issues are listed below:

- Lack of stakeholder participation in resource management activities, such as watershed restoration, educational campaigns, and beach clean-ups. Currently, participation is limited mainly to annual International Coastal Cleanup events and attendance of Island Pride and other festivals.

- Raising public awareness about important coastal resource management issues and gaining support for management activities is a constant struggle and the effectiveness of such activities can always be improved.

Impacts to coastal habitats –

Military activities and trainings, marine debris, anchor damage, abandoned vessels, and trash all have an impact Guam's coastal habitat.

Specific issues include:

- The U.S. Department of Defense (DoD) regularly carries out military training on Guam, often involving Navy and Marine exercises that impact coastal waters and adjacent reefs (U.S. Department of the Navy, 1998). Although attempts are made to minimize impacts by locating operations away from living corals, the explosions related to marine mine detection and demolition and the stress from landing craft have damaged coastal ecosystems.
- Marine debris continues to impact Guam's reefs. According to GCMP, the 2003 International Coastal Cleanup resulted in the collection of 924 bags of debris that weighed 19,640 kg from Guam's beaches and reefs.
- Beverage containers are the most common items collected, but other items include appliances, batteries, car parts, and abandoned fishing gear. Over 100 nets were collected during the 2003 cleanup event, along with fishing line, crab and fish traps, buoys, and lures. The DAWR reported that 35 additional nets were removed from coastal waters in 2002-2003.
- Discarded nets are a problem in Guam due to entanglement and death of coastal animals, including marine mammals, fish, birds, and turtles. There is no disposal system for old nets.
- Between the years 2003-2005, 225 nets were collected at 13 sites during the Coastal Clean-Up efforts. These were mostly nets used by Guam fishermen on the shallow reefs and abandoned. Additionally, more than 574 pieces of fishing line and 472 lures and floats were collected.
- Anchor damage from these ships is a concern due to the lack of operational mooring buoys around the island.
- According to NOAA ORR Abandoned Vessel Inventory, there are approximately 33 abandoned vessels occurring in coral, sand, and mud habitat. As these vessels deteriorate or are moved by storms, they may impact the surrounding habitat. Because of limited funding for the removal of these vessels, most of them will remain a threat to the reefs.

Pollution and water quality –

In a 2003 report to the U.S. Congress on Guam's water quality, the major causes of decline in water quality to marine bays were cited as development (paving and creation of

impervious surfaces), encroachment onto the shoreline without the use of pollution management measures, marine debris, mechanical beach sand raking, and construction without the use of management measures. Also, increased urban runoff associated with impervious surface cover and reduced vegetation cover is of particular concern for coastal ecosystems near the more densely populated and urbanized northern portion of Guam.

Specific issues include:

- Sedimentation, resulting from construction projects and accelerated rates of upland erosion, is commonly considered one of the primary nonpoint source pollution threats to Guam's coastal ecosystem. Sedimentation's negative effects can be seen throughout Guam's rivers and streams and has contributed greatly to the degradation of its surrounding coastal habitats.
- The primary pollutants to most waters, and specifically recreational beaches, are microbial organisms, petroleum hydrocarbons, and sediment. High levels of fecal coliform at several of Guam's beaches and other coastal sites have led to frequent beach closings.
- The trash pickup system is insufficient; litter and abandoned cars are prevalent.
- Expansive areas of coastal habitat in southern Guam have been devastated by sedimentation caused by poorly managed road construction projects and wildland fires set by poachers, and exacerbated by popular off-roading activities.
- Nonpoint source pollutants in the north of Guam, such as nutrients from septic tank systems and agricultural or chemical pollutants from urban runoff and illegal dumping, infiltrate basal groundwater, and discharges in springs along the seashore and subtidally on the reefs. Chemicals detected in the discharges above GEPA water quality standards included perchloroethene (PCE), trichloroethene (TCE), aluminum, antimony, arsenic, magnesium, sulfate, oil and grease, total coliform bacteria and fecal coliform bacteria. The pesticides dieldrin, alpha-chlordane, and gamma chlordane were also detected in discharges.

Coral bleaching and disease –

Until recently, coral bleaching and disease have not been considered major threats to reef health on Guam. A bleaching event in September 2006 provided a powerful reminder of the potential for such events to destroy large portions of Guam's reef system. Although a large-scale post-bleaching assessment was not conducted, anecdotal evidence indicates that up to 50% of the shallow-water acroporid corals were killed in several areas around the island. The extent of the bleaching is unknown, but recent reports suggest the bleaching was more widespread than originally believed (Burdick 2007)

Invasive species –

Paulay et al. (2002) attempted the first systematic survey of nonindigenous marine species in three study sites on Guam: Apra Harbor, Orote Peninsula ERA, and Haputo

ERA. They found a total of 85 nonindigenous species on Guam, recognizing that many taxa have yet to be surveyed. Forty-one of those 85 species were categorized as introduced and 44 as cryptogenic. They found the majority of these species to be sessile (76%) and surmise that they primarily arrived via vessel hulls into Apra Harbor. Despite the high number of non-indigenous species, it is considered a guarded but not serious threat.

Appendix 4: Specific Threats and Issues Identified for Hawai‘i

Natural Hazards -

The table below was taken directly from the Hawai‘i Coastal Zone Management Program (CZMP) section 309 needs assessment, and lists out natural hazards and their perceived threat level:

Hazard	High Risk	Medium Risk	Low Risk
Hurricanes/Typhoons	●		
Storm Surge	●		
Flooding	●		
Shoreline Erosion		●	
Sea Level Rise			●
Subsidence			●
Earthquake		●	
Tsunami	●		
Volcanic Activity		●	

All of the impacts listed above will contribute to a greater vulnerability of communities living in coastal areas, possibly endangering life and property. In addition to coastal hazards, threats to community resiliency in Hawai‘i include insufficient management (of both recreational* and fishery impacts), insufficient management capacity/resource, insufficient support and involvement, impacts to coastal habitats, pollution and water quality, coral bleaching and disease, and invasive species. Increasing population was also cited as an intensifying factor to these primary threats.

*Recreational impacts to coastal ecosystems was listed as a primary threat, but the actual impacts from recreational activities fell into several threat categories, including impacts to habitats, insufficient management, and pollution and water quality. Therefore, the specific issues underlying tourism impacts were described in their appropriate threat categories.

Insufficient Management –

The majority of coastal management issues are associated with “insufficient planning and preparedness”, “lack of data”, and “insufficient enforcement”.

Specific Issues include:

- Hawai‘i’s CZMP has limited ability to assess and manage coastal zone related activities, such as habitat identification and protection, coastal erosion mitigation, non-point source pollution control, natural hazards mitigation, and ocean resources identification and management because of personnel and legal limitations.
- Lack of planning that incorporates future uncertainties associated with coastal hazards.
- Lack of an environmental impact assessment from the Hawai‘i Superferry.
- Lack of best management practices and performance standards in the tourism industry to assess the quality of tourism experience, impacts on the coastal environment and impacts to local residents.
- Lack of implementation of ecosystem based management approaches
- Insufficient regulation to provide adequate safeguards to prevent the development of projects that may have cumulative and potentially irreversible environmental impacts, or to promote environmentally sustainable projects that provide economic and social benefits.
- Lack of community stewardship and co-management process.
- Lack of a management plan to address future economic and population growth.
- Management agencies are faced with continuous and growing challenges to define the appropriate levels of nearshore resource use and how to gauge and monitor its impacts.
- Intensive fishing pressure on highly prized and vulnerable species has led to substantial declines in catch and size as well as raised concerns about the long-term sustainability of these stocks (Smith, 1993; Friedlander and Parrish, 1997; Friedlander and DeMartini, 2002).
- Outdated, invalid, low priority, or inaccurate fishery management rules.
- Lack of regulation of recreational use, exceeding carrying capacity of resource.
- Insufficient management of inshore and bottom fish stocks
- Lack of regulation of non-selective gear and fishing practices that catch and kill juvenile target species, unwanted species and endangered animals.
- Lack of data on carrying capacity and limits of acceptable change
- Insufficient knowledge and use of traditional management approaches by resource management agencies.
- Insufficient scientific data and traditional knowledge used in management decisions.
- Underreporting by commercial fishers and the existence of a large number of recreational and subsistence fishers without licensing or reporting requirements have resulted in uncertainty in actual fisheries catch statistics for the state (Lowe, 1996).
- Lack of information on the scope and intensity of nearshore recreational and subsistence resource harvesting, which is likely equal to or greater than the nearshore commercial catch.
- The use of the older and inconsistent building codes throughout the State of Hawai‘i is problematic because the codes do not incorporate the latest advances in science and engineering.

- The older building codes do not provide a uniform and predictable regulatory environment for homeowners and the design, construction, realtor, and insurance industries.
- Insufficient scientific shoreline data to strengthen the CZM Law's shoreline setback provisions.
- Insufficient data on local coastal hazard conditions and how they would affect the IBC.
- Decision makers do not have enough information on cumulative and secondary impacts of erosion and water quality degradation within a region to properly evaluate development proposals in terms of these impacts.
- Insufficient data collection and analysis on coastal resources to determine if management regime is effective.
- Lack of coral reef disease data on which diseases are present in the ecosystem, which organisms are affected by the diseases and the geographic extent of the different diseases.
- Lack of baseline data on the condition of coastal resources.
- There are currently no agencies or protocols in place to conduct regular, comprehensive monitoring for aquatic invasive species.
- A crucial gap limiting the scope for effective management of herbivorous fishes is the currently limited understanding of the relative importance of different sub-groups of grazers in preventing or retarding the establishment of invasive algae on Hawai'i's reefs.
- Insufficient regulation of aquarium fish trade.
- Inter-island spread of invasive alien species is a major, largely unregulated problem.
- Fishers frequently cite the lack of adequate enforcement of fishing and marine resource laws as one of their major concerns (Harman and Katekaru, 1988; DLNR-DAR, 1998).
- Although the number of enforcement officers has increased substantially over the past 50 years, the number of fishing citations for freshwater and saltwater issued per officer has declined over time to 2.3 citations per officer per year.
- Inadequate enforcement of regulated activities.
- Penalties are inadequately enforced for illegal introductions of invasive alien species. State and Federal laws allow for significant fines and imprisonment, but stiff penalties are rarely imposed.
- Lack of a standardized process for SMA across counties, added complications.

Insufficient management capacity/resources –

As with the other jurisdictions, lack of resources, both financial and human, and insufficient staff capacity are often intertwined with or at the root of most coastal management issues.

Specific issues include:

- Insufficient number of Division of Conservation and Resources Enforcement (DOCARE) officers and support staff.
- Lack of capacity and experience to implement *moku* (traditional Hawaiian land division loosely based on watersheds) management framework.
- Regulations are written by staff biologists and program managers, who have a wealth of experience within the Department of Aquatic Resources (DAR) but have little legal experience and are not trained in the process of creating regulations.
- Lack of staff to administratively prosecute DAR resource damage cases before the Board of Land and Natural Resources for the purpose of assessing fines and recovering fees and costs.
- HI CZM program has a low staff capacity for political leadership outreach and support and medium capacity for public outreach and education efforts.
- Lack of training for State and county officials and building industry professionals in new international uniform building codes for coastal hazards.
- There are no programs in the State budget devoted exclusively to invasive alien species.
- Hawai'i's present biosecurity system lacks the proper funding to support both current efforts and an expanded system that adequately incorporates prevention, early detection, rapid response, and ongoing control for terrestrial and aquatic invasive pests.
- The State of Hawai'i doesn't have adequate funds to do quarantine at ports of entry.

Insufficient support and involvement –

Lack of public and government support and involvement in Hawai'i's coastal management program remains a primary threat to coastal management in Hawai'i. Most management agencies have an outreach program and are doing their best to educate the public. Although, very few specific issues were identified, the ultimate goal remains the same, an educated and informed community that supports good coastal policy and is involved with coastal management issues.

Specific issues include:

- Lack of awareness and insufficient support for CZM policies and activities.
- Lack of awareness of how CZM objectives and policies guide ocean and land use decisions and management strategies.
- Lack of awareness and preparedness for natural hazard events.
- Lack of awareness of coastal management regulations by residents and visitors
- Lack of voluntary compliance with existing rules and regulations on the use of ocean resources.

- Lack of public awareness of the underlying rationale of coastal management rules and regulations.
- Lack of collaboration among management agencies, specifically DAR, DOCARE, the Division of Boating and Ocean Recreation (DOBOR), and the Department of Business, Economic Development, and Tourism (DBEDT).
- Inadequate public understanding of the purpose of the CZM Program.
- Misunderstanding by the public and counties of the SMA permit as a land use policy determinant
- Lack of understanding of State and County land use and zoning programs
- Lack of clearly stated purposes, procedures, and explanations for public participation.
- Lack of awareness of pollution prevention and control measures statewide.
- After western contact, a breakdown of the traditional *kapu* (regulatory system based on prohibited activities) system and the demise of the *ahupua'a* (political subdivision of land) as a management unit led to the virtual elimination of traditional Hawaiian fisheries management practices (Smith and Pai, 1992; Lowe, 2004).
- Lack of public awareness of the importance of the coral reef ecosystem to Hawai'i's lifestyle
- Lack of voluntary participation among the general public to 'take action' in coastal management issues.
- Tourists and many residents are not aware of different coastal hazard response plans, including tsunami evacuations plans.
- There is a lack of awareness of invasive species issues, and few programs dedicated to raising public awareness.

Impacts to coastal habitats –

In Hawai'i, the majority of impacts to coastal ecosystems stems from development, ship groundings, tourism activities, marine debris and military operations.

Specific issues include:

- Over the past two centuries, about one-third of the coastal wetlands have been lost to development activities (Hawai'i CZM 2002), including most of Waikiki.
- Many of Hawai'i's urban streams have been channelized for flood control, and no longer support the lush riparian vegetation that is the basis of wetlands and estuaries.
- On average, three to five ship groundings are reported each year in the Main Hawaiian Islands (MHI), but these values are likely an underestimate as many recreational vessel groundings go unreported.
- According to NOAA OR&R Abandoned Vessel Inventory, there are currently approximately 4 abandoned vessels in Hawai'i.

- 80 percent of the marine debris is generated from land-based sources, including storm-water runoff, dumps and landfills, streams, sewer overflow, storm drains, and litter.
- Marine-based sources of marine debris include trawl nets, gill nets, and other fishing gear lost or discarded by North Pacific fishing fleets. Fishing gear can snag on a reef, leading to the damage of coral heads and possible mortality
- In 2002, nearly 2,000 volunteers across the state collected over 13,000 kg of marine debris along 151 km of shoreline in this one-day event. Over 100 divers removed 590 kg of underwater debris from 38 km of underwater area. The majority (54%) of the collected debris was derived from shoreline and recreational activities, with the remainder comprised of debris from smoking related (37%) and ocean/waterway activities (7%). Of all the debris types noted, cigarettes, plates, utensils, caps, and lids were the most common, accounting for over half of all debris collected (The Ocean Conservancy, 2002). Debris from ocean and waterway activities (i.e., fishing line and nets) are the most common types of entangling debris and many times do not wash ashore.
- Recent studies have shown that extensive damage to corals can occur in shallow, calm water sites with high levels of human use (Rodgers and Cox, 2003). Trampling can occur in shallow nearshore reef flats which often possess fragile and delicate coral species. The greatest concentrations of human-substrate contacts occurred at shoreline access points where people stood or waded as they enter and exit the water (Holland and Meyers, 2003).
- Tourism activities in coastal areas increase the potential for damage to the habitat from direct contact and sedimentation of the reefs from standing, walking or kicking live coral.
- Negative impacts on coral reefs resulting from military activities include unexploded ordnance, pollution, and vessel groundings. Unexploded ordnance has been observed around the MHI, especially in areas that were previously used as bombing targets and live-fire training areas. Amphibious training exercises have resulted in groundings and reef damage on several occasions.
- Seawalls and other hardened shoreline structures to protect coastal properties exacerbate erosion and beach loss.
- Harbor facilities on all the MHI are being improved to accommodate new large cruise ships, an inter-island car/ cargo ferry, and large container ships. Harbor improvements involve dredging to deepen and widen entrance channels and turning basins, as well as construction of new piers, waterfront work areas, jetties, and break-walls. The harbor improvements have the potential to impact coral reefs and areas used for recreation, such as surfing and canoeing.

Pollution / Water Quality –

The State of Hawai‘i has a LAS to address the effects of land-based sources of pollution on the coastal habitat. Sedimentation, nutrient loading, agricultural run-off, solid and human waste and bacterial contamination are all forms of pollution observed in the Main Hawaiian Islands. Hawai‘i’s LBS LAS has identified three

priority watersheds in which they will focus their efforts. 1) Honolua watershed on Maui, which has a long history of diverse land uses that may have contributed to landbased pollution, including grazing, agriculture, activities of feral animals, and recreation uses. 2) The south coast of Moloka‘i, where the major landbased pollution threat is suspended solids and sedimentation from soil erosion. 3) Hanalei Watershed on Kaua‘i, where pollution sources consist of increased runoff of suspended solids, nutrients, and pathogens in surface water, nutrient and bacterial contamination of groundwater by cesspools and septic systems, polluted surface water runoff from agriculture (mainly taro ponds), grazing practices, waterbird impoundments, oil and grease, solid waste, and human wastes.

In additions to the issues identified above, other issues include:

- Land-based sources of pollutants are considered priority threats to coastal habitats in Hawai‘i. Excessive sediments, nutrients, and pollutants are transported in surface water runoff and by groundwater seepage into coastal waters altering the ecosystem.
- Improper control of runoff from agricultural lands and construction sites causes silt plumes that degrade water quality of coastal areas by diminishing light penetration on the reef and suffocating reef organisms.
- Fertilizers, pesticides, and other pollutants from farms, golf courses, resorts and urban development lead to harmful algal blooms and accumulation of toxins in marine life, and limit safe and enjoyable ocean recreation.
- Land-based sources of pollutants, such as sediment, nutrients, and other pollutants, are one of several factors threatening the quality of coral reef ecosystems in Hawai‘i. These pollutants are transported in surface water runoff and by groundwater seepage into coastal waters. While the complex interrelationship between land-based sources of pollution, water quality, overfishing, and the health and integrity of coral reef ecosystems is not well understood, enough is known to require management policies that minimize polluted surface water runoff and prevent overfishing (Davidson et al, 2003).
- Transport ships, cruise ships, recreational boats, and military vessels are the primary sea-based sources of marine pollution. Accidental and sometimes deliberate releases of oily and hazardous waste may occur in coastal waters.
- The consequences of nonpoint source pollution include: increased risk of disease from water recreation, algae blooms, fish kills, destroyed aquatic habitats, and turbid waters.
- During times of heavy rain, sediment, fertilizers, chemicals and other pollution that emanates from upland sources travels via streams, runoff and underground pathways to the coastal areas. Runoff like this can kill offshore reefs, and pollute rivers and streams.
- Urban storm-water runoff from construction activities and increased impervious surface is increasing.
- Polluted surface water runoff, combined with aging sewage systems incapable of handling system overloads, is threatening our coastal water quality.

- Channelized streambeds for floodwater control exacerbate water quality issues and contribute to stream and estuarine habitat loss.
- Runoff is generally diverted to storm drain systems that, like underground rivers, transport trash, soil, pathogens, and chemical pollutants to Hawai‘i’s streams and coastal waters.
- As coastal areas are developed, floodplains filled, storm drains constructed, and streams channelized, more sediment is delivered to nearshore waters.
- Dollar and Grigg (2004) have documented a decrease in coral cover of about 30% in a sheltered embayment on Maui (Honolua Bay), which they attributed to burial by sediment emanating from storm runoff from pineapple fields.
- In southern Kaneohe Bay, Hunter et al. (1995) reported elevated concentrations of lead, copper, chromium, and zinc in oyster tissues near stream mouths. High levels of dieldrin and chlordane were also found in oyster tissues at some sites. Toxic pollutants are seldom measured in Hawai‘i’s marine waters.
- The approximately 2,024 hectares of sediments (e.g., mud and sand) comprising the bottom of Pearl Harbor act as a sink or repository for many of the chemicals entering the harbor. Chemical contaminants found in the harbor have led State of Hawai‘i, U.S. Navy, and other Federal officials to notify the public and issue warnings to alert fishers not to eat any fish caught in the harbor.

Coral bleaching and disease –

Coral bleaching and disease are not prevalent in the Hawaiian Islands, although it remains a significant issue as pollution, global climate change, and human activities continue to impact coastal ecosystems.

- Jokiel and Brown (2004) report on the first large-scale coral bleaching to occur in the Hawai‘i region. This occurred predominantly in Kaneohe Bay in 1996. The bleaching event was attributed to increases in Sea Surface Temperatures (SST) and high light during a cloudless period. Differences in bleaching susceptibility among genera were noted with pocilloporids and montiporids showing the highest level of bleaching and having the highest mortality following the event. Overall bleaching mortality was estimated at ~2%. They have also shown that the SST in Hawai‘i has increased over the past couple of decades. They predict that if the warming trend continues then bleaching events will continue to occur in Hawai‘i with increasing frequency and severity.
- A major difference exists between the occurrence of marine disease in the MHI and the NWHI. The difference is in the frequency of occurrence of growth anomalies in two coral genera (*Porites* and *Montipora*). *Porites* growth anomalies were found at 60% of the sites surveyed in the MHI compared to 5.2% of the sites within the NWHI. Likewise, *Montipora* growth anomalies were found at 25% of the MHI sites compared to 4.5% of the NWHI sites.

Invasive species –

Aquatic invasive species (AIS) are a serious problem in Hawai‘i, posing a significant threat to residents and visitors, as well as to Hawai‘i’s native plants, animals, and associated native ecosystems. Hawai‘i has developed a LAS to help address the concerns and impacts caused by AIS. Summary of aquatic invasive species in Hawai‘i –

- At least 19 species of macroalgae have been intentionally or passively introduced into Hawai‘i since the mid-1950s; (State of Hawai‘i’s Aquatic Invasive Species Management Plan 2003). At least five have successfully established and dispersed around the Hawaiian Islands, and are now ecologically dominant in some locations, where they appear to be outcompeting native benthic species (Smith et al. 2002).
- Thirty-four species of marine fishes have been introduced into Hawaiian waters, and at least twenty of these introduced species have become established (State of Hawai‘i’s Aquatic Invasive Species Management Plan 2003). Of those that have become established, thirteen species have been authorized, planned releases and at least seven species were accidental introductions (Englund and Eldredge 2001).
- Two hundred and one marine and brackish water invertebrate species have been identified as introduced to Hawai‘i, and 86 cryptogenic (not demonstratively native or introduced) (State of Hawai‘i’s Aquatic Invasive Species Management Plan 2003). In total, this makes up about 7% of the known marine and brackish water invertebrate fauna in the Hawaiian islands (4099 species).

Specific issues include:

- *Kappaphycus alvarezii* and *Eucheuma denticulatum* are particularly threatening to the integrity of Hawaiian reefs, as they are able to overgrow, smother, shade, and kill reef-building corals.
- The introduction and spread of AIS harms or threatens to harm biological diversity in the marine environment and may result in significant economic costs to remediate or control.
- It is theorized that a large proportion of the total passenger, cargo, and other traffic entering Hawai‘i may not be inspected, including materials known to be significant sources of new aquatic invasive species.
- The effectiveness of inspections is hampered by inadequate sampling strategies.
- Lack of dedicated law enforcement capabilities and resources to address AIS.
- Federal quarantine programs do not adequately address Hawai‘i’s special vulnerability to foreign pests.
- Response to new infestations is frequently delayed by jurisdictional or organizational problems, allowing pests to become established and, in some cases, to spread beyond control.
- Control efforts are not taking fullest advantage of available technologies.

- Agency mandates sometimes call for maintenance of AIS or potential AIS as resources for recreational fishing, commercial crops, aesthetic resources, or other values.
- The current prohibited species review process for plants is complex and cumbersome, allowing known invasive plants to be imported, sold, or spread to new areas.

Population Increase –

Coastal community resilience in the Main Hawaiian Islands is under increasing strain from recreational and commercial use and development as Hawai‘i’s resident population and thriving marine tourism industry continue to grow at nearly exponential rates. Population in Hawai‘i is expected to increase 30% in the coming 25 years, exacerbating threats to coastal resources and habitats, human safety, and water and land use. An increase in the number of residents and tourist in Hawai‘i will only intensify the threats including; increased pressure on coastal fisheries, more solid waste and pollution, more impacts to coastal habitats, and more intense impacts to manage.

Appendix 5: Identified Needs for American Samoa

The majority of American Samoa's non-funding needs are related to management: the establishment of management plans and the partnerships necessary to implement the plans. There is also a significant need for data and information upon which to base the management decisions. Finally, building the capacity and empowering the people to become involved in coastal management of American Samoa, whether they work for the government, are youth, or are concerned citizens. Specific needs are outlined below:

1. Management and Management Planning Needs

- Finalize the Territorial Executive Order on Ocean Policy to provide specific policies and recommendations for ocean resource management (ASCMP 309 Assessment 2006).
- SMA planning, development, and implementation
 - include land-use planning in SMA planning
 - assist village councils and mayors with managing setbacks and special areas.
 - plans for Nu'uuli Pala SMA, Leone Pala SMA, and Pago Pago Harbor SMA
 - develop policies, rules and regulations for the identified SMA's and identify additional critical areas needing protection or SMA designation
- Comprehensive Statewide Coastal Management plan
 - coastal management plans for communities
 - community-based fisheries management plans
 - community involvement in coastal planning
 - Marine Protected Areas plan
- Develop Village Habitat Conservation Agreements to protect and restore habitats within villages. Similar to the village wetland agreements, this would create a habitat plan for all habitat types within a village. These agreements would plan areas for development and identify areas for conservation or restoration.
- Complete and adopt waterfront planning through the Shoreside Master Plan for the Pago Pago Harbor (Planning Division and ORMP).
- Development guidelines and encourage "smart growth" design principles to minimize paved and impermeable surfaces and improve projects to minimize flooding and reduce traffic congestion.
- Establish a Wetlands Management Council, to include DMWR, Natural Resource Conservation Service, Soil & Water Conservation District, Land

Grant, American Samoa Environmental Protection Agency (ASEPA), Public Health and ASPA to increase coordination between agencies and help promote multi-lateral wetland protection and enforcement.

- Finalize village wetland ordinances in Masefau, Tula, and Vatia and get AS DOC Management to recognize these accomplishments
- Utilize existing Wetland Management Plan to identify potential restoration sites
- Increase size and number of MPAs to meet USCRTF goal of 20% of coastal waters in MPAs.
- Conduct long-range planning and impact analyses for coastal hazards
- Implementation of the American Samoa Watershed Protection Plan
 - village-based watershed management program.
- Village-based stream waste management and control program.
- Village leaders, the American Samoa legislature (Fono), and other locally elected officials, must be actively engaged and educated on the coastal issues facing the territory.
- Finalize and implement the Consolidated Application Administration Process to streamline the land-use permitting and licensing within the AS Department of Commerce.
- Pollution Prevention and Remediation plan
 - Pago Pago Harbor
- Increased regulation of agroforestry and agriculture practices, human and animal waste disposal, and water use.
- Update rules and regulations on fisheries imports and exports.
- Better enforcement of current coastal resource rules and regulations
 - destructive fishing practices
 - poaching in marine protected areas
 - wetlands policy
- Prepare a territorial Marine Research Plan
- Enforcement of non-permitted development activities or building permit violations.

- Effective and consistent regulation of development while minimizing cumulative and secondary impacts and enforcing consequences for resource degradation.
- Create enforcement and monitoring network with representatives from all PNRS agencies to develop and implement an integrated enforcement and monitoring program.
- Review/recommend changes to current fisheries regulations, including strengthening of scuba fishing ban.
- Create annual “State of the Coast” report produced by ASCMP staff summarizing current status of ocean and coastal resources and how they have changed over time, development and development impacts on island resources, and progress on achievement of strategic plan goals and grant proposals
- Collaborate with the Planning Division to create and implement planning guidelines that will lead to sustainable growth using development information gathered from land use permit applications
- Develop, coordinate, and implement education and outreach programs that target land-based impacts on coral and human health.
- Collaborate with ASEPA to promote clean boating practices and encourage the installation of a sewage pumpout station, bilge pumpout station, used oil collection/recycling center, and derelict fishing gear collection center
- Increase coordination and cooperation with the Piggery Management Council to promote sustainable piggery management.
- Complete an Interagency Collaboration Program to strengthen and enhance land use controls in the Territory.
- Create an outreach and education plan that has tangible performance measures
- Establish a Governor’s Task Force on Global Climate Change

2. Management Capability and Support Needs

- ASCMP has requested approximately \$859,000 from NOAA’s CZM program for the 2008 grant cycle. The majority (>70%) of this funding will go to fund personnel and contractors.

- The American Samoa Coral Reef Advisory Group has requested \$562,396 from NOAA's Coral Reef Conservation program. Again, the majority of the grant proposal requests funds for personnel and contractors.
- According to a capacity needs assessment of ASCMP (2006), American Samoa has 19 out of a desired 26 staff for their CZM program. Priority areas with staff needs include public education and outreach (2 staff), GIS and data management (1 staff), SMA/MPA management planning and implementation (2 staff), enforcement of permitted land uses (2 staff), and Monitoring of CRM program effectiveness (1 staff).
- Personnel
 - enforcement personnel and equipment
 - marine monitoring and survey personnel and equipment
 - recruit, retain and maintain trained and knowledgeable staff
 - contract lawyer to review and revise coastal regulations.
 - Separate GIS from the information technology (IT) role by encouraging DOC to hire an IT manager for the entire department
 - In-house environmental or civil engineer (2005).
 - The vacant wetlands position should be filled (2005).
- Apply for wetland conservation grants from the United States Department of Agriculture.
- While Federal agency support is given to American Samoa, it more often takes the form of funding, than direct involvement by Federal agency staff. What is needed, and desired, along with the funding, is the direct involvement by Federal agency regional personnel (NOAA was named specifically) in American Samoa.
- Collaborate with ASEPA and DMWR to expand technical assistance through GIS activities, wetland restoration, piggery waste management systems, aquaculture, and best management practice demonstration sites.
- A particular need is to hire local individuals who will have a long-term commitment to the ASCMP.
- Increase community-based programs empowering the citizens of American Samoa to protect their resources. This can create educational and employment opportunities for local residents while improving the talent pool from which ASCMP and other ASG agencies can hire from in the future.
- Continue and expand partnership with the Natural Resource Conservation Service, Americorps and American Samoa Community College internship program.

- Collaborate and coordinate exchange programs with regional partners with their community-based programs.
- Support, facilitate, and collaborate with Land Grant on territorial wetland and habitat restoration and research projects.
- Encourage the Office of Samoan Affairs to assign a specific person to work with ASCMP and the Wetlands Program on village based projects to assist in empowering villages to protect their own village resources, including wetland areas.
- American Samoa's section 312 evaluation suggested strengthening the support of ASCMP's role among ASG agencies and developing the partnership support and compliance required to ensure the efficacy and success of ASCMP functions.
- Collaborate with ASPA and the Governor's CRAG to reduce household waste in our coastal environment. Of particular importance are efforts to minimize the use and improper disposal of plastic throughout the island, specifically plastic bags and plastic bottles.
- The State needs to collaborate directly with villages, which can help with planning efforts.
- The success of long-term goals and programs depends on talented, dedicated local staff members who can grow with the program.
- Work to ensure that developers and environmental planners understand the importance of ecosystems, including wetlands and watersheds, and that consequences for damaging or destroying them are in place and enforced.
- Technical assistance on Manu'a Island for wetland restoration and taro production in wetland areas.
- Territorial Marine Lab on Tutuila, with a field station in Ofu.

3. Data and Information

- Information on current effectiveness of management plans.
 - need to develop performance measure and identify indicators
- Documentation of traditional knowledge related to coastal resources and hazards
 - historic resource population estimates
 - historic resource management regimes

- historic use of coastal resources
 - historic coastal hazard occurrence
 - traditional coastal hazard preparedness
 - identification of historically significant properties
- Assessment and monitoring of coastal resource
 - reef fish populations
 - mangrove acreage
 - coral reef health
 - watershed health
 - water quality
 - primary impacts and threats to coastal resources
 - Cumulative and secondary impact trends analysis study to identify specific areas for SMA designation, specific villages for habitat conservation agreements, specific mitigation policies, sensitive habitats facing encroachment (e.g., Wetlands, Shoreline, Hazard areas, Unique areas), and cumulative and secondary impacts requiring attention and possible mitigation policies (e.g., increased flooding, degraded water quality, traffic congestion, degraded aesthetics).
 - Development of a resource mapping information system.
 - Information on the possible impacts from global climate change on coastal ecosystems and communities.
 - Facilitate research that develops climate change vulnerability assessments and adaptation strategies for the islands of American Samoa.
 - Analysis of CSIs and direct impacts of development to significant historic areas.
 - Accurate census of population and population growth rates.
 - GIS data layers
 - Tutuila Hazard Assessment Tool (T-HAT)
 - Updated satellite imagery for use in T-HAT and other planning purposes.
 - Improve T-HAT by creating an automated report function, upgrading the interface using a new ArcIMS template, and installing the flood information from the updated Flood Insurance Rate Maps to improve safe development and protection from hazards.
 - Expand the T-HAT to include Aunu'u Island and the Manu'a group of islands.

- Include ecosystem boundaries, including wetlands, stream buffers, and watersheds, in T-HAT application.
- Obtain Light Detection and Ranging (LIDAR) technology to obtain fine scale elevation data to indicate where steep slopes occur and incorporate this data into the T-HAT
- Regular and continuous updates of maps relating to buildings, businesses and infrastructure.
- Research and promote appropriate technologies for living near wetlands (e.g. composting toilets, building on stilts rather than a foundation).
- Establish mechanisms for public to report bleaching events.
- Evaluate effectiveness of regulations with regard to fishery, fish populations, public awareness and enforcement.

4. Internal Government Capacity-building

- According to a capacity needs assessment of ASCMP (2006), capability building for ASCMP staff is needed in the following areas:
 - Community-based programs
 - Biological monitoring of coastal resources/health
 - Removal/management of marine debris
 - Strategic planning
 - Grants management
 - Program budgeting and finances
- Training in effective communication, professional conflict resolution and partnership brokerage for improved services to the public. This can be accomplished by an ongoing training program within ASCMP conducted by staff as well as add to the skill sets among existing personnel with the completion of facilitation and GIS training.
- Training and development continues to be a priority project of ASCMP due to the limited professional pool of staff and lack of collegiate opportunities on island to harness future resource managers. The benefits believed in conducting training and development is primarily to increase staff knowledge, capacity and skill sets to effectively operate in their positions. Increased staff capacity, skill development and enhanced processes and program image are expected outcomes.
- Staff trainings on reviewing and enhancing the present tracking and database systems, and providing general direction for internal improvements in information management and using GIS as a review and analytical tool. Additional training will provide a crucial link between

planning, permitting and analyzing the trends of past and current land use change in American Samoa.

- Develop a Coastal Management Training Module that will provide training to new and existing ASCMP staff, government leaders, village leaders, Samoan Affairs staff, and the public in areas such as: the consolidated agency application process, PNRS regulations, customer service, report writing, ASCMP programs, grant proposal writing and follow through, ASCMP value system, enforcement, erosion control best management practices, piggery management, wetland science and basic restoration.
- Enforcement training; enforcement workshop for local enforcement officers.
- Orientation for new employees both within the AS DOC, and within the networked Departments should be provided so that they are fully aware of the intent of the ASCMP and how it operates.
- Develop scholarship opportunities for local staff in programs that will support agency needs.
- Develop mentoring programs with visiting scientists and local staff to transfer knowledge and skills.
- Conduct internal outreach and education within the various departments of AS DOC and with other key Territorial government agency partners.
- Need to educate the partnered agencies about their responsibilities in implementation of coastal management, not just the implementation of their own regulations.
- Regular ASCMP staff training on PNRS rules and enforcement techniques
- Training to develop and implement a full socioeconomic/human dimensions monitoring program
- Workshops and informational materials to ensure that the PNRS process is understood by PNRS member agencies.

5. External Public Empowerment and Involvement

- Signage for SMA - Signs should also educate the public on the importance of these areas and the reasons for protecting them.

- Initiate an Adopt-A-Wetland program to encourage citizens to monitor, protect, and restore wetlands throughout the territory.
- Work with village leaders, matai's, and pulenu'u's to instill a basic knowledge of the importance of coastal and ocean resources through workshops, seminars, and training sessions.
- Need to focus outreach on priority ASCMP issues rather than events.
- Create an intern ladder system beginning with the enviro-discovery camps and other annual outreach programs, where interested young adults can become junior counselors, then interns, possibly obtain scholarships, then possibly become employees in an attempt to build capacity, and instill interest in ASCMP and the environmental field in American Samoa.
- Develop an *American Samoa Public Access Guide* that will highlight developed and undeveloped trails as well as the public parks and other public access sites around the island.
- Empower villages in the Pago Pago harbor area to prevent and minimize debris entering harbor waters and to collect existing debris in harbor waters.

Appendix 6: Identified Needs for CNMI

1. Management and Management Planning Needs

- Manage Tourism and recreational activities to protect long-term sustainability of marine ecosystems.
- Develop a Saipan lagoon area of primary concern (APC) for managing all recreational sports in the lagoon as well as providing for future beach recreation facilities, boat launches, fishing piers, etc.
- Update the Saipan Lagoon Use Management Plan, including providing for future facilities and infrastructure, boat launches, piers, and other uses. This will prevent future use conflicts.
- Institute a no-net loss wetland policy by adopting policy changes from those recommended in the “CNMI Wetlands Report”.
- Comprehensive MPA System Plan to improve the overall effectiveness of the MPA program.
- Development of a stormwater management master plan for Saipan that assesses current conditions; gathers and analyzes existing plans and engineering designs; identifies priority areas and potential infrastructure improvements based upon present/future needs; develops conceptual stormwater, management plans for priority areas.
- Stormwater management master plans should be developed for the islands of Saipan, Tinian, and Rota.
- Appropriate management of all recreational uses is necessary so that reef resources and the tourism economy can both be sustainable through marine use planning.
- Development of a CNMI Vessel Grounding Action Plan that will guide the CNMI in closing communication gaps, creating or revising laws and regulations, strengthening enforcement, developing preventative measures, and addressing funding and resources limitations.
- Development of a formal Special Area Management Plan through planning and funding efforts of CNMI Watershed Group agencies.
- Rota Island-Wide Habitat Conservation Planning - Working with the Mayor of Rota and/or his staff and the U.S. Fish and Wildlife Service, the CRMO should work with DFW to revitalize the completion of the Rota Habitat Conservation Plan as a priority for the island.

- Rota management and conservation activities under the CRMO Program should be strengthened.
- Develop public access guide for Rota and Tinian, update public access guide for Saipan.
- Develop a Managaha Marine Conservation Area Special Area Management Plan.
- Develop a Rota Sabana Special Area Management Plan.
- Develop a Laolao Bay Special Area Management Plan.
- Update and continue implementing the Coral Reef LAS.
- Marine monitoring and research plan.
- Flood warning and preparedness plan that utilizes rainfall amounts and stream levels information as part of the mitigation strategy.
- Need to create more conservation areas, including purchasing land for their creation.
- Systematic enforcement of DEQ permits to ensure that approved plans are constructed according to specifications, or that the systems are properly maintained.
- A clear, consistent, and formal relationship should be developed between CRM and the Zoning Board to ensure compatibility and consistency of respective policies and enforcement actions.
- Municipal solid waste collection system, as a result littering and illegal dumping due to widespread individual misconduct, a lack of trash receptacles and collection service at shoreside parks, and the lack of litter control law enforcement.
- CRM Program Agency Representatives, Tinian and Rota Coastal Coordinators, and the AGO need to better coordinate and collaborate.
- Develop and implement best management practices (BMP) for watershed use.
- Implement stormwater BMPs for roads and farms.

- Review and improve polices and enforcement of building standards and codes, particularly the IBC, UFC, and NFIP requirements.
- Review and update existing master plans for land use designations.
- Promote interagency communication among CNMI agencies, federal agencies, private sector organizations and private non-profit organizations.
- Improve the existing Emergency Operations Plan and communications routing.
- Develop and implement a public awareness program for coastal hazards in coordination with Federal, State and local offices. The information gathered would be disseminated among the local communities, integrated into the public school curriculum, and incorporated into the existing disaster awareness activities currently employed.
- Develop a regulated and monitored system for exporting hazardous waste to licensed off-island hazardous waste storage facilities.
- Develop a surface water quality control program that should include the installation of ponding basins to control and filter surface water runoff. Program should promote the control sedimentation and other forms of pollution that destroy the inner reef areas by installing drainage and seepage tanks to control non-point source pollution during heavy rains.
- Develop a program of water conservation among businesses, communities, and individual residences. Program should include the development of public information material and the installation and monitoring of water meters.
- Develop a water-recycling program. Support the development of wastewater treatment that produces effluents that can be recycled for industrial process, irrigation, and other non-drinking uses.
- Army Corps of Engineers needs to develop and update the water master plan for Saipan, Tinian and Rota, and the Confidence Consumer Report for water quality.
- Develop a protocol for accessing information and for improving information sharing among CNMI agencies. Develop a protocol for sharing information with community organizations that could benefit from using GIS in community planning activities.

2. Management Capability and Support Needs

- The CNMI CRMP has requested \$845,000 from NOAA's CZM program for the 2008 grant cycle. The majority (>70%) of this funding will go to fund personnel and contractors.
- CNMI has requested \$623,561 from NOAA's CORAL program. Again, the majority of the grant proposal requests funds for personnel and contractors.
- According to a capacity needs assessment of CNMI CRMO (2006), CNMI has 19 out of a desired 28 staff for their Coastal Resource Management program.
- Personnel:
 - Tri-agency coral reef coordinator positions
 - DFW Marine Management and Protected Areas Specialist
 - Coral reef outreach and education coordinator
 - Dedicated Attorney General for coastal resource related issues
- There is significant need for legal assistance in coral reef related activities, and the Attorney General's Office presently does not have the resources to dedicate an attorney to coral reef protection issues.
- Improvement of GIS facilities, including hardware, software, training, and the hiring of staff to inventory and provide metadata for existing GIS data layers as well as generate new urgently needed data layers for emergency response.
- Hazard mapping and monitoring activities in order to better predict and model coastal hazard events.
- Assistant Attorney General dedicated to coordinating and conducting coastal protection related activities.

3. Data and Information Needs

- Fish abundance data and baseline information, including inshore creel surveys determine catch per unit effort and by gear type.
- Access to published and unpublished data and research findings on coastal resources.
- Measurement of the effectiveness of marine protected areas.
- Hazard mapping and monitoring activities in order to better predict and model coastal hazard events.

- Improved technology for mapping, monitoring and predicting hazards.
- Regular and thorough investigation of public access to shoreline demand would enable CRMO to better plan enhancement projects and accommodate the needs of residents and visitors.
- Update the flood study the Army Corps of Engineers performed for the Chalan Kanoa area in the 1980s.
- Data on the economic value of the coastal ecosystem. The CNMI needs to be able to measure the true value of conserving and restoring CNMI's coral reefs and associated ecosystems or a good way to measure the true costs of current impacts or proposed development.
- Study on the potential spread of invasive species through the establishment of aquaculture and mariculture facilities and other mechanisms.
- GIS data layers for determining the actual linear feet of the stream systems and associated watersheds.
- No current wetland information is available for the island of Pagan.
- Disaster mitigation database that will contain all public data as well as confidential data necessary for disaster response and mitigation.
- Data on groundwater flow and water quality is needed to improve conditions for many of CNMI coastal systems.
- Quantitative assessment of coral bleaching.
- Characterize near-shore water quality by studying the surface, groundwater, and marine water quality between Tago Beach and Barcinas Bay.
- Use risk and vulnerability assessment and maps to improve the quality of public awareness materials distributed within the CNMI.
- Identify existing coastal hazard mitigation policies and activities currently employed within participating government agencies and private organizations for each potential hazard type.
- Identify critical facilities that lie in vulnerable coastal hazard areas and determine potential projects that will reduce the impacts of the identified hazards on the facility.

- Identify missing data and gaps in the risk and vulnerability assessment, and incorporate these into the CNMI GIS system.

4. Internal Government Capacity-building Needs

- According to a capacity needs assessment of CNMI CRMO (2006), capability building for CNMI CRMO staff is needed in the following areas:
 - Planning/zoning of coastal ocean uses
 - Enforcement of permitted land uses
 - Protection of critical habitats
 - SMA/MPA management planning & implementation
 - Coastal hazards (preparedness and/or mitigation)
- CRM and other government agency staff could use further training in coastal hazard preparedness and response.
- Trainings:
 - Environmental enforcement training.
 - Project management training.
 - GIS and software applications, beach profiling.
 - Train and deputize CRM Enforcement personnel for anti-litter enforcement efforts.
 - Scientific and enforcement diver training.
 - Species identification and assessment training for agency staff.
 - Grant training - Grants.gov and Grants Online systems, process for submitting grant proposals, proposed amendments, no-cost extension requests, reprogramming requests, or other post-award action requests.
- Improve the database and geographic information systems developed for the risk and vulnerability assessment to make decisions for disaster response plans and mitigation activities.
- Enable use of the GIS systems including hazard risk and vulnerability assessment information for the building and land use permit system.

5. External Public Empowerment and Involvement

- Increase dialogue between fishermen and managing agencies
- Increase resident, visitor, and guest worker awareness of the need to properly manage watersheds and marine habitats.
- Increase resident, visitor, and guest worker involvement in the protection and enhancement of coral reef health.

- Enhance stakeholder involvement in planning and implementation of conservation projects in Laulau watershed.
- Minimize degradation of coral reef resources through enhanced awareness of indirect and cumulative impacts.

Appendix 7: Identified Needs for Guam

1. Management

- Develop LAS to address DoD expansion.
- Develop the rules of regulations for the implementation of the new Seashore Reserve Plan.
- Implement the new Seashore Reserve Plan.
- Develop a Special Area Management Plan for Northern Guam.
 - Determine appropriate land use activities, zoning criteria and building code regulations that will guide developers in Northern Guam.
- Creation of coordinating body that assist in the completion of the comprehensive plan for the Northern Guam SMA.
- New policies and guidance for the protection of Guam's sole source aquifer from irreversible damage.
- Direct future public and private development and redevelopment away from hazardous areas along the shoreline and areas inundated by high surf during typhoons, flooding, storm surge, and episodic and chronic erosion.
- Develop and implement program similar to Florida's Coastal Training Program.
- Develop and implement program similar to the BWET Hawai'i program.
- Implement modified Non-point source Education for Municipal Officials (NEMO) program on Guam.
- Better federal coordination with TNC and other NGOs.
- Establish GIS Cooperative and GIS Point of Contact in each agency.
- Establish the Guam Bureau of Statistics and Plans as a regional hub for sharing/exchange of spatial technology training, spatial data, and technical support.
- Environmental Emergency Response Plan needs to be incorporated into the overall Emergency Response Plan.
- Department of Agriculture and DAWR to develop a marine debris program.

- Develop a regional recycling plan with other Micronesian Island jurisdictions.
- Implement Guam Coastal NPS Pollution Management Program.
- Updates in land use laws and standard operating guidelines need to occur to offset degradation and minimize pollution as much as possible.
- A mitigation plan that evaluates area where mitigation projects can be conducted and develop guidelines for mitigation for Guam will assist GCMP in monitoring CSI. The mitigation plan will assist in defining the Government of Guam's mitigation policies for all projects that result in loss to the natural resources.
- Implementation of the citation system that fines fishing violations to be cited with a ticket.
- Agreements with neighboring, island countries for the joint management of migratory pelagic fish stocks.
- Assessments of EEZ resources, future management needs and development potential.
- Strategic plan for aquaculture development.
- Formally establish the multi-agency coral reef response team through appropriate agreements.
- Formalize response plans for coral disease, coral bleaching, *A. planci* outbreaks, storm damage, vessel groundings and oil/chemical spills.
- Formalize guidance on restoration / mitigation selection and scaling for impacts.
- Management of *Acanthaster* breakouts on Guam through an outreach and removal campaign.
- Reduce risks of disaster damage to existing buildings and infrastructure, especially critical facilities.
 - Comply with outstanding requirements of the Floodplain Management Retrofit Plan.
 - Implement technological solutions to protect vulnerable facilities.
 - Establish or amend programs or policies to protect vulnerable facilities.
 - Protect facilities associated with fire protection and police service

- Protect facilities associated with health care
 - Protect facilities associated with education
 - Protect facilities associated with electricity generation, distribution, and transmission
 - Protect the domestic water and sewage system infrastructure
 - Protect facilities associated with port operations
 - Protect the stormwater system infrastructure
- Promote disaster-resilient development and disaster recovery.
 - Plan, design, and build publicly owned and operated facilities to decrease vulnerability
 - Use the plan review and building inspection processes as defined in the building code and zoning ordinances to ensure new construction and improvements are designed and built to minimize disaster damage
 - Educate plan reviewers, building inspectors, A&E contractors, and the public to design and construct in compliance with building code and zoning ordinances
 - Facilitate the transition of low-income families from self-built, vulnerable residences to disaster-resistant housing
- Develop institutional support of the hazard mitigations within GovGuam agencies and the public.
 - Create a single entity responsible for hazard mitigation within GovGuam
 - Maintain an active Hazard Mitigation Advisory Committee of the Civil Defense Advisory Council
 - Apply hazard mitigation standards in the plan review and building permit processes
 - Educate decision makers and the public on the need for hazard mitigation
- Protect human health and safety (related to coastal hazards)
 - Maintain a safe transportation infrastructure system during and after typhoons
 - Properly dispose of disaster-generated debris in a rapid and sustainable manner
 - Protect agriculture from typhoons and droughts
 - Protect natural resources from hazard-generated pollution
 - Remove health and safety hazards associated with unsafe buildings
 - Use only properly designed buildings, in good condition, as evacuation shelters
 - Reduce the spread of communicable disease
 - Maintain functioning emergency communication system service during and after typhoons

- Maintain a functioning health care system during and after typhoons
- Minimize the potential for aircraft accidents
- Reduce injury and loss of life resulting from tsunami events

2. Management Capability and Support

- Guam Coastal Management program has requested approximately \$884,000 from NOAA's CZM program for the 2008 grant cycle. The majority (>92%) of this funding will go to fund personnel and contractors.
- The Guam has requested \$598,274 from NOAA's CORAL program. The majority (87%) of the grant proposal funds are for contractors.
- According to a capacity needs assessment of GCMP (2006), Guam has 9 out of a desired 29 staff for their CZM program. Priority areas with staff needs include Federal Consistency Administration (2 staff), GIS and data management (2 staff), SMA/MPA management planning and implementation (3 staff), Planning/zoning of coastal ocean uses (3 staff), Watershed management (1.7 staff), Planning/zoning of coastal land uses (2.2 staff), Non-point source pollution control/mitigation (1.5 staff), Political leadership outreach and support (1 staff).
- Increase number of full-time personnel in specific areas required to accomplish GCMP goals and objectives
- Involve NOAA's OR&R in threat reduction and ecosystem restoration efforts.
- PSC could hire a sustainable development/renewable energy specialist to work with GCMP, GEPA, and other local agencies.
- PSC Staff person on Guam.
- Personnel:
 - Community-based management specialist to foster community-based management program development.
 - An Attorney to address program changes, new building code policy, new zoning code policy, seashore reserve rules and regulations and federal consistency.
 - A Natural resource attorney dedicated solely to prosecuting environmentally related infractions, such as but not limited to MPA violations and arson related incidents; and providing assistance to the natural resources agencies to draft and/or amend pertinent legislation that strengthens marine resource protection and give legal counsel.

- MC Coordinator to work with networking partners, federal partners, stakeholder groups, and the regional members of the Micronesian Challenge.
- LAS coordinator
- Funding for enhancement and/or development of public access areas.
- The Marine Preserves require additional full-time personnel and equipment for monitoring and enforcement.

3. Data and Information

- Develop a centralized, relational database with spatial intelligence capability, in order to store, organize, maintain, analyze, share, and access all data collected from Guam's comprehensive island-wide coral reef ecosystems monitoring plan, within a secure, scaleable, and cost-effective infrastructure.
- Conduct public awareness assessments regularly.
- Studies that determine the primary contributor to dramatic shoreline change are critical.
- A baseline map and database of areas open to public access pre-September 11, 2001 should be created.
- Monitoring of the public access to the ocean shore routes.
- Agencies need more information on the extent of net debris on Guam's eastern shoreline.
- Information regarding boat debris (sunken and rusting vessels) in the Apra Harbor area.
- Information regarding the debris contributions of distant waters fishing fleets.
- CSI analytical models are needed to fully determine the impacts development will have within a particular watershed area.
- Information (baseline) related to the terrestrial, fresh water, and marine ecosystems which will or could be impacted by the placement and operation of the new solid waste landfill facility at Dandan.
- Bibliography of existing data/studies which may have been completed for the Dandan landfill area in various departments of the government, which

could be used to identify changes to the environment which might occur as a result of the solid waste facility operation in the area.

- Research alternative methods to reduce shoreline erosion using natural systems.
- Study of the impact of development along Guam's shoreline and in hazardous areas.
- Assessment of the various land use activities that exist and their potential negative impacts including improper land use practices and activities that contribute to non point source pollution.
- Collect data and information from various agencies and stakeholders regarding the existing land use practices, and laws, rules and regulations concerning development.
- Determine gaps in the existing subdivision laws, zoning laws and other development guidelines for Northern Guam management area.
- High resolution LIDAR for more accurate modeling of coastal flooding by typhoons, tsunami run-up, and watershed management.
- Data on vegetation land cover, land cover change, aquifer sub-surface and re-charge characteristics and other factors that may affect and threaten the northern aquifer.
- Assessment of fish functional diversity inside and outside Guam's marine preserves to measure the effectiveness in the MPAs.
- Assessment of SCUBA spearfishing and its impact on fish assemblages.
- Evaluation of International Year of the Reef (IYOR) 08 and past Environmental Education Campaign public outreach.
- Improve the quality and comprehensiveness of the information on assets and hazards.
 - Determine the detailed characteristics of publicly owned and operated critical buildings, facilities, and infrastructure.
 - Determine the detailed characteristics of the general building stock.
 - Define the extent of high wind vulnerability to identify population, critical facilities, and general building stock at greatest risk.
 - Define the extent of flood vulnerability to identify population, critical facilities, and general building stock at greatest risk.

- Define the extent of seismic hazard vulnerability to identify population, critical facilities, and general building stock at greatest risk.
 - Define the extent of wildfire vulnerability to identify population, critical facilities, and general building stock at greatest risk.
 - Define the extent of hazardous materials vulnerability to identify population, critical facilities, and general building stock at greatest risk.
 - Improve GIS capabilities to support risk assessment activities.
- Analyze fisheries stock assessment data, including creel surveys and in situ visual assessments, to determine the condition of different functional groups (e.g., herbivores, detritivores, and piscivores) and determine possible causes of any community shifts, if present.
 - Assess the role of soft corals as reef fish habitat.
 - Evaluate the effectiveness of using soft corals as bioindicators of persistent contaminants in Guam's coastal waters.
 - Model water circulation patterns around reefs and adjacent inshore habitats.
 - Develop a digital watershed atlas for Guam.
 - Develop a GIS-based erosion potential model to estimate sediment delivery to estuarine and coral reef environments of southern Guam.
 - Conduct primary screening for chemicals of environmental concern in Guam's coastal waters.
 - Conduct screening for heavy metals in marine organisms in Pago Bay into which the Ordot Dump Watershed drains.
 - Study the effects of tree planting and erosion control measures in reducing pollution from Fouha Watershed.
 - Conduct an assessment of all recreational activities along Guam's coastline and their effects on coral reef ecosystems, including seagrass beds.
 - Determine the effects of motorized personal watercraft on coral reef ecosystems.
 - Expand Guam's coral reef valuation study to better capture the value of the coral reef to Guam's traditions and culture.

- Assess the societal costs of coral reef ecosystem degradation.
- Conduct a feasibility study of instituting a recreational user fee for management and monitoring parameters.
- Assess the effectiveness of coral restoration efforts that are coupled with watershed restoration, MPA designation, and pollution abatement programs.
- Characterize the role of protected species (i.e., marine mammals, sea turtles, and birds) in coral reef ecosystems and the threats impacting these species, and develop measures to enhance their conservation.
- Assess the connectivity and replenishment among the offshore banks and the island of Guam with particular attention to the role of marine preserves.
- Develop protocols and tools to control the growth of the native green alga, *Enteromorpha clathrata*, in the intertidal zone of Tumon Bay and East Agana Bay.
- Assess the population and distribution of the native invasive red algae, *Gracilaria salicornia* and *Acanthophora spicifera*, in Pago Bay and in reefs of Tumon Bay, East Agana Bay, and Cocos Lagoon; and develop protocols and tools to control the growth of the algae.
- Assess and quantify the impacts of bleaching on corals during and after bleaching events.

4. Internal Government Capacity-building

- According to a capacity needs assessment of GCMP (2006), capability building for GCMP staff is needed in the following areas:
 - SMA/MPA management planning & implementation
 - Planning/zoning of coastal ocean uses
 - Watershed management
 - Non-point source pollution control/mitigation
 - Shoreline erosion control/management
 - Monitoring of CRM program effectiveness
 - Strategic planning
- Develop and implement Coastal Resource Management Internship Program

- Recruit University of Guam (UOG) undergraduate and graduate students as well as students that obtain degrees in Hawai‘i and the U.S. mainland to work with GCMP.
- Build capacity in natural resource management and geospatial technologies in local educational institutions.
- Facilitate greater connection with resource among staff and encourage and improve staff access to on-the-ground performance indicators.
- Improve awareness of spatial technologies among policymakers and upper-level management.
- Trainings:
 - Strategic planning
 - New laws
 - Planning techniques
 - Resource management methods
 - Resources evaluation
 - Public outreach approaches
 - Environmental risk analysis
 - Computer applications
 - Grant administration
 - GIS and computer applications such as excel, power point
 - Coral Reef Conservation
 - NEPA
 - Nonpoint Source Management Practices
 - Watershed Management and planning
 - SCUBA/swimming skills

5. External Public Empowerment and Involvement

- Conduct Green Infrastructure workshops and workshops that promote renewable energy and sustainable development.
- Develop outreach material targeting foreign-born populations to involve them in coastal stewardship and hazard preparedness.
- Provide environmental leadership training to promising young leaders.
- Training to help citizens set up NGOs.
- More spatial technology-focused outreach at multiple levels of education as well as for the general public.

- Develop the Micronesian Challenge and Guam's strategy to meet the challenge.

Appendix 8: Identified Needs for Hawai‘i

The primary needs in Hawai‘i center around management (management planning, policy and permitting, and rules and regulations), data and information, and public empowerment and involvement.

1. Management

- Implement and monitor best management practices to reduce upland soil erosion caused by feral animals, loss of native forest species, and other anthropogenic factors.
- Expand watershed partnerships and similar public-private partnerships to improve management of upland forest ecosystems and conservation lands.
- Implement watershed implementation plans, total maximum daily load implementation plans, and local action strategies to address land-based pollution threats.
- Implement best practices to reduce pollutant loads.
- Improve interagency coordination, effectiveness and efficiency in wetlands management through the creation of a watershed coordinating committee to ensure ecological function is maintained to the greatest extent practicable.
- Develop, implement, and institutionalize an integrated planning approach for the Hawai‘i CZM Program to assess and manage cumulative and secondary impacts using the traditional Hawaiian *ahupua‘a/moku* concept for purposes of implementing the Ocean Resources Management Plan (ORMP).
- Develop comprehensive policies adopted through interagency agreements that treat shoreline management as a single integrated administrative unit and provide agencies with practical tools and skills necessary to improve management and minimize shoreline erosion and protect communities from coastal hazards.
- Encourage permitting authorities to analyze coastal hazards and risks prior to any zoning changes, SMA/Shoreline setback variance permits or building permits.
- Develop a Hawai‘i beach and shoreline management plan with specific management measures to address coastal erosion and other hazards in priority coastal areas.

- Develop and implement coastal erosion and hazard mitigation management measures in priority areas.
- Develop long-term infrastructure plan to ensure complete hookup to and adequate capacity and maintenance of wastewater systems.
- Develop a risk-based approach to identify species and areas with the highest potential for introduction and spread of marine AIS and ecological and economic damage.
- Review existing State laws and regulations to increase effectiveness of marine AIS prevention and control.
- Establish wastewater-discharge restricted zones and conditions for commercial vessels in archipelagic waters.
- Enforce existing federal and State regulations on wastewater-discharge restricted zones in archipelagic waters with a monitoring and enforcement plan.
- Provide appropriate waste management infrastructure to support commercial and recreational marine facilities.
- Develop and implement a marine protected area policy framework that allows for management by agencies, communities, and appropriate nonprofit organizations.
- Develop ecosystem-based approaches for nearshore fisheries management.
- Develop and implement a strategic research and monitoring agenda to improve management decision making.
- Establish and institutionalize approaches for restoring, operating, and preserving ancient Hawaiian coastal fishponds and salt ponds for the benefit of coastal communities around the state.
- Improve enforcement capacity and voluntary compliance with existing rules and regulations for ocean resource protection.
- Develop recreational management areas for waters with high tour vessel activity to limit overall impacts to protected species.
- Develop enhancement and restoration plans to increase public access and restore priority beaches and scenic vistas.

- Develop and amend Ocean Recreation Management Area rules as tools to avoid and/or mitigate ocean recreation user conflicts and to address capacity issues.
- Establish and enforce ecotourism-related permit systems to protect the resources and visitor experience.
- Establish an appropriate growth policy on ocean tourism considering the carrying capacity and levels of acceptable change of the resource, quality of the experience, and visitor satisfaction, and ensuring access to the marine environment by residents is not compromised.
- Develop a streamlined, one-stop approach, to permitting coastal and ocean aquaculture projects, which includes guidelines for sustainable operations that ensures the conservation of ocean and coastal ecosystems.
- Develop integrated natural and cultural resources planning process and standardized tools.
- Establish demonstration *ahupua'a* and *moku* sites that integrate traditional natural resource management.
- Develop mechanisms and streamlined permitting processes to support community-based natural resource restoration and other activities designed to benefit *ahupua'a* management.
- Expand the Mauka-Makai Watch program and provide standardized training programs and guidelines for participating community volunteers and organizations.
- Develop the principles for an *ahupua'a* /*moku* management framework for the further development and implementation of the ORMP.
- Develop, implement and institutionalize an integrated planning approach to assess and manage cumulative and secondary impacts on the basis of a traditional Hawaiian *ahupua'a* structure.
- Update or change State statutes, State and county rules, or administrative policies that will equip the CZM program entities to incorporate *ahupua'a* and *moku* concept into policies.
- Establish multi-sectoral ORMP implementation and monitoring group.
- Hazard mitigation assessments and planning, especially pertaining to hurricanes.

- Adoption of the latest building codes that include state-of-the-art standards for coastal hazard mitigation specific to each of the four counties in the State of Hawai‘i. Adoption of the International Building Code will help to mitigate wind, flood, and seismic hazards.
- Protect life and ensure safety of people in Hawai‘i
 - Ensure adequate sheltering space for residents
 - Ensure adequate sheltering space for visitors
 - Improve lifelines, infrastructure, ports of entry and critical facilities, and reduce their vulnerability to hazards
 - Work with the Counties to assist in improvements of building codes and building inventories and assessments.
 - Ensure knowledge and accessibility of response plans, security threat levels, and evacuation routes.
 - Ensure emergency services and medical facilities can care for victims of disasters.
 - Encourage appropriate coastal-dependent development that reduces risks from coastal hazards at all stages of development.
- Develop and implement the Statewide Hazard Mitigation Plan based on a comprehensive, multi-hazard risk and vulnerability assessment
 - Develop a statewide risk and vulnerability assessment (RVA)
 - Maintain and update RVA based on new and improved data and technology
 - Develop appropriate protocols for data sharing and management at federal, state, and local levels
 - Use HAZUS and RVA models and scenarios to identify risks and develop improvements
 - Continue to monitor, evaluate, and update the assessments and plan, especially with respect to changes in climate, and proactively use the plan.
 - Encourage and support the adoption, enforcement, training in, and updating of building codes and standards that minimize the threat to life, health, and property damage caused by natural hazards
 - Encourage and support the adoption, implementation, and updating of plans (including land use, resource management, and other state and county plans) that incorporate natural hazard elements (including risk and vulnerability, hazard maps, hazard mitigation best practices and standards).
- Ensure the protection of the State’s natural, built, historical, and cultural assets against coastal hazards.
 - Identify and map assets, including sensitive environmental features and natural habitats, buildings and urban developments, historical buildings and properties, and cultural sites and use areas.

- Maintain and update databases on new and improved data and technology with attention to securing data that should not be shared publicly (i.e. sacred sites for heiau and burial)
 - Incorporate indigenous knowledge into hazard mitigation planning
 - Ensure adequacy of building codes and standards
 - Ensure adequacy of land use regulations and zoning standards
 - Minimize environmental degradation and ensure habitat recovery
 - Encourage and support the adoption, enforcement, training in, and updating of building codes and standards that minimize the threat to life, health, and property damage caused by natural hazards
 - Encourage and support the adoption, implementation, and updating of plans (including land use, resource management, and other state and county plans) that incorporate natural hazard elements (including risk and vulnerability, hazard maps, hazard mitigation best practices and standards)
- Ensure the long-term viability of the State's economy and the livelihood of the local population through coastal resiliency.
 - Assess economic risk and vulnerability for multiple hazards
 - Develop strategies to ensure that financial institutions and other critical businesses can operate during crises
 - Develop small business strategies and contingency plans to help businesses reopen quickly following crises
 - Develop reconstruction and rehabilitation plans to ensure rapid recovery from disasters.
 - Make plans with the Hawai'i Visitors and Convention Bureau to ensure the operability of the visitor industry to prevent long-term repercussions to the tourism industry, which is critical to Hawai'i's economy.
- Revise the statutory definition of shoreline.
 - Implementation of development standards to incorporate additional hazard mitigation requirements.
 - Establishment of watershed/ahupua'a management structures with Low Impact Development applications and the principles to guide such structures.
 - Develop and incorporate into governmental rules and regulations methodologies for assessing and evaluating surface water runoff and erosion impacts of a development project cumulatively on a region.
 - Litter law enforcement programs to reduce marine debris.

- Develop and incorporate into governmental rules and regulations a methodology for assessing the proportionate regional impacts of surface water runoff and erosion generated by any individual development project on the cumulative region.
- Strengthen the role of CZM in responding to citizen complaints, increase opportunities for public involvement in the SMA permit process, and provide training for those involved in SMA permit processing.
- Improve administration of the SMA permit system, searching for streamlining and simplification opportunities through CZMP collaboration with Counties.
- Update and revise the Aquatic Invasive Species LAS.
- Revise Recreational Impacts to Reefs LAS.
- Revise and update the Land-based Sources of Pollution LAS.
- Clarifying shoreline and water quality rules.
- Develop proactive and mitigative long-term management strategies to increase resistance and resilience of reef ecosystems to impacts from climate change and marine disease.

2. Management Capability and Support

- The Hawai'i CZMP has requested \$2,021,000 from NOAA's CZM program for the 2008 grant cycle. The majority (>90%) of this funding will go to fund personnel and contractors, including all 11 of the CZM program staff, 2 student helps, and an intern.
- Hawai'i Department of Aquatic Resources has requested \$587,020 from NOAA's CORAL program for 2008/2009 grant cycle. Approximately 70% of grants funds will go to support personnel and contractors.
- According to a capacity needs assessment of HI CZM (2006), Hawai'i has 6 out of a desired 11 staff for their CZM program. Priority areas with staff needs include Public education and outreach (2 staff), Political leadership outreach and support (2 staff), Federal Consistency Administration (1 staff), SMA/MPA management planning and implementation (1.5 staff), Coastal hazards (preparedness and/or mitigation) (1.5 staff).
- Personnel:
 - Enforcement officers (the State has recently authorized 25 new DOCARE positions out of a requested 50).

- Two LAS coordinators
 - Law fellow for DAR
- Leverage State, federal, and private sector funding to implement best management practices to reduce upland soil erosion.
 - Identify and implement innovative mechanisms for coastal land acquisition and funding as an effective measure to preserve beaches and other coastal assets.
 - Organize technical, financial, and management resources for effective prevention; monitoring and early detection; and response, eradication, and control for high-risk species and areas.
 - Organize and train local action teams for the monitoring and control of marine AIS.
 - Increase the presence of conservation and resources enforcement officers and natural resource rangers to increase educational opportunities, deter infractions, and improve compliance.
 - Technical support to state and county officials and building industry professionals on the application and interpretation of International building codes.
 - Development and training of a local team for rapid response of events of coral bleaching or disease on the reefs of Hawai‘i.
 - Create a multi-agency investigatory team and protocol for responding to sedimentation events.
 - Funding is needed to complete the analysis of a 10-year data set on coral cover for Hanalei Bay, Kaua‘i, which was not included in Hanalei’s EPA Watershed Initiative Grant.

3. Data and Information

- Identify priority watersheds, major land covers, land uses, and polluting activities.
- Characterize pollutant loads from surface runoff, point sources, and groundwater discharge.
- Increase water quality monitoring in identified areas of concern.

- Conduct carrying-capacity analyses for priority marine protected areas and identify limits of acceptable change with local stakeholder involvement.
- Identify channelized streams in priority watersheds for restoration and revitalization of wetland and estuarine habitats.
- Conduct statewide beach and shoreline assessment to identify priority areas based on risk of coastal erosion and hazards, vulnerability of coastal communities, and presence of coastal resources and recreational areas.
- Conduct coastal hazard and resource assessment and risk analysis for any proposed coastal development.
- Develop an on-line statewide shoreline information management system on coastal hazards and risks in coastal areas.
- Research, develop and institutionalize a methodology for assessing what proportion of a region's surface water runoff and erosion impacts are generated by any given development project.
- Conduct an inventory of beaches, shoreline areas and scenic vistas requiring protection as open space.
- Conduct a baseline study of ocean recreation and tourism, building on existing information and data that focuses on user conflict and potential impacts from threats to the ocean environment.
- Conduct a feasibility study for demonstration and scale-up of appropriate ocean energy technologies for Hawai'i.
- Conduct analyses of the impacts of ocean and non-ocean-related energy alternatives on ocean health.
- Research on environmental impacts to coastal ecosystems from open ocean farming.
- Establish a GIS based site identification database to locate coastal and ocean aquaculture projects in environmentally suitable sites.
- Comprehensive database and maps of wetlands in the State.
- Research on probable tsunami impacts on the Hawaiian Islands.
- Adoption of international building codes with customized coastal hazard mitigation standards.

- Document traditional management approaches used by ancient Hawaiians to manage land and sea as well as recent efforts to move toward ecosystem-based approaches to ocean resources management.
- Assessment of the scope and intensity of recreational and subsistence fishing effort in Hawai‘i.
 - Develop community-based creel surveys.
- Improved data collection and analysis pertaining to coastal resource management, including indicators of fish abundance and ecosystem health, to determine effectiveness of management regime.
- Systematic disease surveys are needed to develop baseline information on the major organisms on coral reefs including corals, key reef fish, turtles, non-coral invertebrates and algae.
- Research to determine the importance of different sub-groups of grazing fish in preventing or retarding the establishment of invasive algae on Hawai‘i’s reefs.
- Assessment of cruise ship visitor-use patterns and the effects of site usage by local ocean recreation operators.
- Comprehensive library of digital spatial data of the best available Hawai‘i-related information.
- Evaluate the potential of restocking ecologically important species (e.g., parrotfish, jacks, spiny lobster).
- Assess the ecological impact of aquarium collection on species of special concern, such as endemics, and develop scientific guidelines for aquarium fishery management.
- Document historical and cultural knowledge of Hawaiian coral reef resources and their ecology, as well as their historical trends in abundance size, distribution, and community composition.
- Quantify nutrient, fertilizer, and sediment inputs from different sources (e.g., surface water, groundwater, injection wells, septic systems, and cesspools) and determine their impacts on coral reef ecosystems.
- Create science-based guidelines for the evaluation, improvement, and/or development of permitting and regulatory tools for protecting coral reef ecosystems from pollution stress.

- Examine the economic and legal factors contributing to destructive development and construction practices, and recommend economic incentives, regulatory changes, and BMPs to mitigate these impacts.
- Evaluate Hawai‘i’s artificial reef program. Provide scientifically-based recommendations for expanding the program if it is deemed effective and shown to have minimal impacts.
- Develop coastal and beach restoration techniques (e.g., stream channels, beach replenishment, and harbor development) that minimize impacts on adjacent reefs.
- Quantify the effects of invasive algae on reef building corals, other invertebrates, and fishes, and identify taxa of particular concern.
- Determine the ecological interactions between established invasive species and native species (e.g., ta‘ape and juvenile snappers), and their impacts on native populations.

4. Internal Government Capacity-building

- According to a capacity needs assessment of Hawai‘i CZMP (2006), capability building for Hawai‘i CZMP staff is needed in the following areas:
 - Political leadership outreach and support
 - Monitoring of CRM program effectiveness
- Training programs that utilize practical tools to build capacity of government agencies to plan for and implement integrated shoreline management

5. External Public Empowerment and Involvement

- Develop an education program for land owners, land managers, farmers, and others on the importance of incorporating best management practices to preserve riparian and wetland habitats.
- Conduct training programs utilizing practical tools to build capacity of the private sector to plan for and implement integrated shoreline management.
- Conduct public education campaign explaining the impacts of illegal storm-water discharges to public sewers on coastal water quality.
- Conduct education and outreach campaigns on underlying rationale for existing rules and regulations related to ocean resource use.

- Employ community-based partnership programs, including the Mauka-Makai Watch Program.
- Develop public education programs to build stewardship ethic toward the coastline and ocean.
- Develop community-based frameworks and practices for identifying and mitigating ocean recreational use conflicts.
- Establish a *moku* support network to increase community dialogue, develop a framework for education, and build partnerships among various stakeholders.
- Build capacity for community participation in natural and cultural resources management.
- Establish public advisory group to help assess and monitor *ahupua'a* or *moku* issues and maintain a dialogue at the community level to learn about each *ahupua'a* or *moku*.
- Public education and outreach on hazard preparedness and natural hazard mitigation.
- Public education and outreach are necessary to improve voluntary compliance with existing rules and regulations on the use of coastal resources.
- Need to develop local community groups and watershed councils to address coastal resiliency issues.
- Engage communities in marine stewardship efforts through programs like Makai Watch.
- Strengthen public awareness about the ecological, economic, social and cultural value of coral reefs and associated ecosystems.
- Improve public understanding of the critical threats to coral reefs and generate both practical and innovative solutions to reduce these threats and to mediate their impacts.
- Promote and enhance awareness and support for CZM policies and activities through public outreach and education activities and collaborative work of the MACZAC and working groups.
- Ensure public awareness of risks, vulnerability, and multi-hazard mitigation actions through public education.

- Improve the State Hazard Mitigation Forum's website www.mothernature-hawaii.com with updated risk and vulnerability assessments and plans.
- Continue the public awareness campaign to direct attention to the website for information distribution.
- Run drills and training exercises to make sure that organizations, community-based groups, and emergency services know how to respond during crises.
- Ensure that non-structural mitigation measures are incorporated into mitigation public awareness programs.
- Ensure adequate understanding of characteristics and dangers associated with natural hazards.