Chapter 3

Why Is Resilience Critical to Coastal Communities?

Community resilience is the capacity of a community to adapt to and influence the course of environmental, social, and economic change. The resilience of social-

ecological systems is often described as a combination of three characteristics: the magnitude of shock that the system can absorb and remain within a given state; the degree to which the system is capable of self-organization; and the degree to which the system can build capacity for learning and adaptation (Folke et al. 2002). Common characteristics of resilient systems include redundancy, diversity, efficiency, autonomy, strength, interdependence, adaptability, and collaboration (Godschalk 2003). Resilience provides the capacity to absorb shocks while maintaining function. When change occurs, resilience provides the components for renewal and reorganization (Gunderson and Holling 2002, Berkes and Folke 2002). Vulnerability is the flip side of resilience: When a social or ecological system loses resilience, it becomes vulnerable to change that previously could be absorbed (Kasperson and Kasperson 2001). In a resilient system, change has the potential to create opportunity for development, novelty, and innovation. In a vulnerable system, even small changes may be devastating.

Some Definitions of Resilience

"Resilience determines the persistence of relationships within a system and is a measure of the ability of these systems to absorb change of state....and still persist." (Holling 1973)

"...Resilience for social-ecological systems is often referred to as related to three different characteristics: (a) the magnitude of shock that the system can absorb and remain within a given state; (b) the degree to which the system is capable of self-organization, and (c) the degree to which the system can build capacity for learning and adaptation." (Folke et al. 2002)

"The capacity of a system to absorb disturbance and re-organize while undergoing change so as to still retain essentially the same function, structure, identity and feedback." (Walker et al. 2004)

Characteristics of Resilient Coastal Communities

Resilient coastal communities take deliberate action to reduce risk from coastal hazards with the goal of avoiding disaster and accelerating recovery in the event of a disaster. They adapt to changes through experience and applying lessons learned (Figure 3-1).

CCR serves as a unifying framework for community-based plans and programs. Enhancing CCR requires integrating and maintaining an optimal balance of three community-based frameworks typically viewed as independent and separate domains: community development, coastal management, and disaster management (Figure 3-2). Community development provides the enabling governance, socioeconomic, and cultural conditions for resilience (IMM; CED 2000). Coastal management provides the framework for managing human uses of coastal resources and the coastal zone in order to maintain environmental and ecosystem resilience (White et al., 2005; Chua 1998; DENR 2001). Disaster management focuses on preparedness, response, recovery and mitigation to reduce human and structural losses from disaster events (ADPC 2005; 2004).



Figure 3-1. Role of Resilience in Determining Community Response to a Hazard Event

Notes:

- 1. The y-axis represents the condition or state of the community's economy, society, and environment.
- 2. Hazard events can be either episodic, such as cyclones and tsunamis, or more chronic, such as erosion or sea level rise.
- 3. Resilient coastal communities are able to absorb or avoid impacts of hazard events. Enhancing resilience decreases the magnitude of impacts of hazard events on the community.
- 4. A community crosses the threshold between a hazard event and a disaster when it cannot function without considerable outside assistance.
- 5. Resilient coastal communities are able to recover from hazard events quickly. Enhancing resilience accelerates recovery time.
- 6. Resilient coastal communities are able to adapt to changing conditions. Enhancing resilience builds the capacity of communities to learn from experience.



Figure 3-2. Resilience as an Integrating Framework for Community Development, Coastal Management, and Disaster Management Domains

Resilience Elements and Benchmarks

The CCR framework presented in this guide was developed through a series of workshops and discussions with community development, coastal management, and disaster management practitioners and specialists from government agencies and nongovernmental organizations throughout the Indian Ocean region. Through this participatory process, eight elements of resilience were identified as essential for CCR (Figure 3-3). These elements incorporate long-term planning and implementation such as society and economy, coastal management, and land use and structural

design. Hazard event-oriented resilience elements focus on contingency planning and preparedness for warning and evacuation, emergency response, and disaster recovery. Governance as a resilience element provides the enabling framework for resilience in all other elements. Risk knowledge is a crosscutting requirement within each resilience element. Enhancing resilience in all of these elements is considered essential to reduce risk from coastal hazards. accelerate recovery from disaster events, and adapt to changing conditions in manner that is consistent with community goals.



Figure 3-3. Elements of Coastal Community Resilience

The desired outcome or overarching vision for each element of CCR can be described as follows:

- **A. Governance:** Leadership, legal framework, and institutions provide enabling conditions for resilience through community involvement with government.
- **B.** Society and Economy: Communities are engaged in diverse and environmentally sustainable livelihoods resistant to hazards.
- **C. Coastal Resource Management:** Active management of coastal resources sustains environmental services and livelihoods and reduces risks from coastal hazards.
- **D.** Land Use and Structural Design: Effective land use and structural design that complement environmental, economic, and community goals and reduce risks from hazards.
- **E. Risk Knowledge:** Leadership and community members are aware of hazards and risk information is utilized when making decisions.
- **F. Warning and Evacuation:** Community is capable of receiving notifications and alerts of coastal hazards, warning at-risk populations, and individuals acting on the alert.
- **G. Emergency Response:** Mechanisms and networks are established and maintained to respond quickly to coastal disasters and address emergency needs at the community level.
- **H. Disaster Recovery:** Plans are in place prior to hazard events that accelerate disaster recovery, engage communities in the recovery process, and minimize negative environmental, social, and economic impacts.

Benchmarks for each resilience element were identified to evaluate the resilience condition or status of a community (Table 3-1). Each benchmark represents desired conditions against which to evaluate the resilience status of a coastal community. The benchmarks for each resilience element characterize desired conditions in four core capacities: policy and planning, physical and natural resources, social and cultural, and technical and financial. These core capacities were adapted from the TOSE dimensions (technical, organizational, societal, and economic) outlined in Bruneau et al. (2003) and the Sustainable Coastal Livelihood Framework assets (human, natural, social, and financial) described by IMM.

Benchmarks on policies and plans describe enabling conditions for community resilience. Physical and natural resource benchmarks describe infrastructure or coastal resource capacity to support resilience. Benchmarks on social and cultural capacity highlight self reliance of the community achieved through networks, cultural norms, and education and outreach. Finally, the technical and financial resource benchmarks characterize the support needed to sustain resilience efforts. The benchmarks provided in Table 3-1 are the foundation of the CCR assessment tool, which will help identify the strengths, weaknesses, and gaps in community resilience.

Some benchmarks may need to be adapted to better reflect the local context in which they are used. Chapter 4 provides an approach for reviewing and adapting the benchmarks, as needed, to reflect the local context. Chapter 6 provides detailed descriptions of the elements and benchmarks of CCR.

	Benchmarks				
Resilience Element	Policy and Planning Capacity	Physical and Natural Capacity	Social and Cultural Capacity	Technical and Financial Capacity	
Governance	A1. Community development policies, plans, and programs are implemented and monitored in a participatory and transparent manner.	A2. Basic services (i.e. water, transportation, security, etc.) are accessible to all sectors of society.	A3. Participatory collaboration mechanisms among different sectors and various levels of government are established and used to manage for resilience.	A4. Technical and financial support mechanisms are transparent, accountable, and available to support planned community actions.	
Society and Economy	B1. Development policies and plans build social capital and skills for economic diversity and self reliance.	B2. Local economies are characterized by diverse and environmentally sustainable livelihoods.	B3. Social and cultural networks promote self-reliant communities and have the capacity to provide support to disaster-stricken areas.	B4. Technical and financial resources are available to promote stable and robust economies, reduce vulnerability to hazards, and aid in disaster recovery.	
Coastal Resource Management	C1. Policies and plans are implemented and monitored to effectively manage natural coastal resources.	C2. Sensitive coastal habitats, ecosystems, and natural features are protected and maintained to reduce risk from coastal hazards.	C3. Communities are actively engaged in planning and implementing coastal resource management activities.	C4. Communities and local governments value and invest in management and conservation to sustain their natural resources.	
Land Use and Structural Design	D1. Land use policies and building standards that incorporate measures to reduce risks from hazards and protect sensitive habitats are established, monitored and enforced.	D2. Critical infrastructure are located outside high-risk areas and constructed to address risks from priority hazards.	D3. Developers and communities incorporate risk reduction into the location and design of structures.	D4. Education, outreach, and training programs are established to improve compliance with land use policies and building standards.	

Table 3-1. Benchmarks for Each Resilience Element by Core Capacities

	Benchmarks				
Resilience Element	Policy and Planning Capacity	Physical and Natural Capacity	Social and Cultural Capacity	Technical and Financial Capacity	
Risk Knowledge	E1. Coastal hazard risk assessments are completed at a scale appropriate to the community and routinely updated.	E2. Coastal hazard risk assessments are comprehensive and incorporate risks to all elements of resilience (e.g. livelihoods, coastal resources, land use, etc.).	E3. Community participates in the hazard risk assessment process.	E4. Information from risk assessment is accessible and utilized by the community and government.	
Warning and Evacuation	F1. Community warning and evacuation systems, policies, plans, and procedures are in place and capable of alerting vulnerable populations in a timely manner.	F2. Community warning and evacuation infrastructure is in place and maintained.	F3. Community is prepared to respond to hazard warnings with appropriate actions.	F4. Technical and financial resources are available to maintain and improve warning and evacuation systems.	
Emergency Response	G1. Predefined roles and responsibilities are established for immediate action at all levels.	G2. Basic emergency and relief services are available.	G3. Preparedness activities (drills and simulations) are ongoing to train and educate responders.	G4. Organizations and volunteers are in place with technical and financial resources to support emergency response activities.	
Disaster Recovery	H1. Disaster recovery plan is pre-established that addresses economic, environmental, and social concerns of the community.	H2. Disaster recovery process is monitored, evaluated, and improved at periodic intervals.	H3. Coordination mechanisms at international, national, and local levels are pre- established for disaster recovery.	H4. Technical and financial resources are available to support the recovery process.	

Table 3-1. Benchmarks for Each Resilience Element by Core Capacities (continued)

Resilience at National and Local Levels

Many opportunities exist to enhance resilience at national and local levels. The generic planning and implementation cycle provides a framework for identifying these opportunities (Figure 3-4).

Information and data sharing is fundamental to preparing national and local plans that incorporate resilience. Information and data needed to address coastal hazards is typically managed by multiple entities including government, nongovernmental, and academic institutions. Data-sharing agreements and protocols need to be developed to make information and data accessible for plan development

Multi-agency review of national disaster management and coastal management plans and programs can provide valuable insights for enhancing resilience by ensuring risk mitigation measures are comprehensive. Typically, different national and local government agencies are responsible for addressing coastal hazards, managing coastal resources, issuing hazard warnings and evacuation notices, and responding to emergencies. Government agencies together with partner organizations need to meet regularly and work together to develop long-term and contingency plans that address all elements of resilience. Plans need to address both chronic hazards and potential hazard events. Reducing risks from chronic coastal hazards, such as sea level rise and shoreline erosion, should be integrated into medium- and long-term development plans and programs.

National and local programs need to reinforce good practices and build capacity to avoid disaster. Disasters, although marked by human suffering and loss, provide special opportunities to enhance resilience, such as rebuilding to reduce exposure of the population to hazard prone areas.

Monitoring and evaluation provides the insight and lessons learned to adapt plans and programs for enhanced resilience. Monitoring and evaluation of plans and programs provides information and data to measure progress and enhance resilience.



Pacific Risk Management 'Ohana (PRiMO)—Working Together to Address Natural Hazards

The U.S. Pacific Islands (Hawaii, American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands) are susceptible to a wide variety of coastal hazards including tsunamis, typhoons, hurricanes, flooding, coastal erosion, volcanic eruptions, earthquakes, and drought. Throughout history, the islands have been impacted by numerous events and, due to their isolation, have had to respond to and recover from these events with minimal outside assistance. The original inhabitants of the islands had developed traditional knowledge and practices to build resilience toward coastal hazards. In more recent times, many of these islands have experienced significant changes culturally and demographically that have resulted in a loss of some of the traditional knowledge and practices, and thus a reduction in resilience.

In 2002, the U.S. National Oceanic and Atmospheric Administration (NOAA), Pacific Services Center, initiated activities to help lessen the impacts of coastal disasters in the islands. Recognizing the limitations of any one organization or institution to properly address the issue, the NOAA Pacific Services Center looked to build upon existing partnerships and establish new partnerships. From the outset, efforts focused on building a collaboration network across the three domains: community development planning, coastal resource management, and disaster management. Through these efforts, a new interagency working group, the Pacific Risk Management 'Ohana (PRiMO), evolved to help enhance collaboration among numerous federal, state, county, private, academic, and NGO representatives and stakeholders that play a role in disaster risk management. The foundation of PRiMO is based on the Hawaiian word "`ohana," or "family," reflecting the concept of working for the benefit of the collective and not the individual.

PRiMO can be compared to the ancient Hawaiian voyaging canoes and the spirit and determination of its navigators, steersman, and paddlers to reach their destination. Through interagency coordination and collaboration PRiMO, as a voyaging canoe, has charted a course to reach its destination, hazards resilience. A destination that is based on the value that the needs of the collective, the 'ohana (family) outweigh those of the individual. With this guiding principle, PRiMO has already made significant contributions to the Pacific Region.

Linkages between community development, coastal management, and disaster management processes and activities are needed to build CCR to both chronic and episodic coastal hazards. These linkages need to be explicit and driven by community members themselves, working in concert with national and local government programs and NGOs. Community-based planning and assessment of coastal hazards and risks is a fundamental first step in building CCR. Plans must be regularly reviewed and updated based on new information and experiences and lesson learned from implementation and monitoring. Some of the efforts undertaken by governments in the Indian Ocean Region to incorporate elements of resilience into their development are summarized in Table 3-2.

Table 3-2. Enhancing Resilience in National Development Plans and Actions of Indian Ocean Countries

Governance: In Sri Lanka and Thailand in 2005, new national disaster management organizations were formed and supported, and their efforts coordinated with those of existing government agencies. Other countries strengthened existing organizations to provide warnings, disaster management, and disaster recovery services to build resilience.

Society and Economy: Community development programs to develop alternative livelihoods, both post-tsunami and for long-term resilience, were initiated and are ongoing in Indonesia, Sri Lanka, and Thailand.

Coastal Resource Management: National coastal management agencies in Indonesia and Sri Lanka have actively incorporated resilience measures into their programs, including mapping of hazards, coastal setbacks, protection of vulnerable habitats, and other measures. India has revitalized its coastal management legislation to address coastal issues in relation to hazards and development.

Land Use and Structural Design: Thailand undertook an analysis of structural design and land use practices that would minimize tsunami impacts. Sri Lanka and India revised their national setback laws to be more sensitive to inundation along coasts.

Risk Knowledge: Maldives and most other Indian Ocean countries have undertaken major programs to enhance their collective national and local knowledge about risk from multiple hazards. Risk knowledge has increased across all countries in relation to primary hazards such as tsunamis, flooding, and earthquakes as well as more chronic hazards.

Warning and Evacuation: National disaster and warning centers in Thailand, Sri Lanka, India, Indonesia, and Maldives have all been striving to make national warning systems functional from the national to the local level. In Thailand, a sophisticated warning and evacuation system has been tested several times with local participation.

Emergency Response: Incident command systems have been initiated in India, Sri Lanka, Indonesia, and Thailand in response to the need for effective response and coordination among national and local agencies.

Disaster Recovery: Thailand has strengthened its national disaster management organization to address recovery from any disaster.

Need for Conducting an Assessment of Coastal Community Resilience

This guide provides an approach to CCR assessment to highlight strengths and address weaknesses in each resilience element. A CCR assessment can serve as a powerful tool that allows the stakeholders of a given community, together with government, NGOs, and other stakeholders, to begin the process of enhancing resilience. Assessment is the first step in providing inputs to planning decisions to address primary issues of concern in a community. Keeping the eight elements of resilience in the forefront during the assessment and planning process ensures that a balanced approach for program implementation. For example, if a community is primarily concerned about minimizing the impacts of storm surge to which it is vulnerable, assessing the eight CCR elements will ensure that all the factors that can minimize the impact of storm surge are brought into the planning discussion.

A CCR assessment provides an opportunity to initiate dialogue among key stakeholders in the area. Dialogue is crucial to encourage the stakeholder community to recognize the need for better resilience and to better understand what forces need to be addressed to lessen the community's vulnerability through planning. Such dialogue is also an educational process, in which the various stakeholders can learn together through a guided assessment of CCR.

Reasons to Conduct an Assessment of CCR

- Initiate a dialogue between the community, government and nongovernmental institutions, and other stakeholders on the goals and key elements of CCR
- Increase awareness and understanding of the risks associated with both episodic and chronic coastal hazards and the need to build resilience capacity at the community level
- Characterize the resilience status and trends at the community level
- Determine the capacity of an organization to provide assistance in each resilience element
- Provide input to local and national planning for community development, coastal management, and disaster management measures to enhance CCR
- Identify strengths, weakness, and gaps in resilience capacity that need to be addressed to achieve the long-term desired outcome of CCR