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TSUNAMI DISPLACEMENT: LESSONS FOR CLIMATE CHANGE ADAPTATION PROGRAMMING

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TSUNAMI DISPLACEMENT: LESSONS FOR CLIMATE CHANGE ADAPTATION PROGRAMMING

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December 2010

Cover Photo: by J. Baker

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ACRONYMS

BCCSAP	Bangladesh Climate Change Strategy and Action Plan
CCA	Climate Change Adaptation
CMZ	Coastal Management Zone
DMMD	Disaster Management & Mitigation Department (Tamil Nadu State)
DRM	disaster risk management
DRR	disaster risk reduction
FGD	focused group discussions
GIS	Geographic Information Systems
GFDRR	Global Facility for Disaster Reduction and Recovery
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (German Technical Cooperation)
HDI	Human Development Index
ICMZ	Integrated Coastal Zone Management
IDP	Internally displaced persons
IPCC	Intergovernmental Panel on Climate Change
IRG	International Resources Group
NAPA	National Adaptation Plan of Action to Climate Change
NDMC	National Disaster Management Center (Republic of the Maldives)
PPP	Purchasing Power Parity
PRA	Participatory Rural Appraisal
SSI	Semi-structured interviews
UNDP	United Nations Development Program
UNISDR	United Nations International Strategy for Disaster Reduction
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development

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The study team included field consultants Jock Baker, Kimti Sharma, Philip Brown, Vivek Rawal, Elhadi Mohamed, Paul Chiles Perumal, Thamzoli Bilalji, and Chowhan Singh; and IRG home office staff members John Williams, Christine Herridge, Sandra Shuster, Austin Morton, and Celeste Patel.

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1. EXECUTIVE SUMMARY

This study was sponsored by the United States Agency for International Development (USAID) Asia Bureau and carried out by International Resources Group (IRG) to capture learning from displacement caused by the 2004 Indian Ocean tsunami. The expectation is that relevant lessons can be used by development and disaster management professionals tasked with designing programs to both cope with displacement caused by climate-related disaster events and mitigate the effects of climate change adaptation over the longer term. Since communities of displaced persons have adapted to changed situations in different ways, this study attempts to capture learning that can be usefully applied to likely impacts of climate change in a variety of coastal zones.

The study was carried out by a team of five technical specialists with backgrounds in displacement-related relief programs, water and sanitation, public health, architecture and urban planning, economics, disaster risk reduction, and governance. In addition to an extensive literature review, the team visited the Maldives and India during this study to better understand how communities had coped more than five years after the tsunami. Two team members visited Orissa, India, which had been severely impacted by the 1999 super cyclone, to be better able to compare and contrast the situation of tsunami-affected communities with populations that had been affected by a climate-related disaster. To help provide a broader regional perspective on countries that had been affected by the tsunami or whose coastal areas are particularly vulnerable to climate change, desk research was also conducted on Sri Lanka, Bangladesh, Indonesia, and Vietnam.

Climate change adaptation poses particular challenges in coastal areas due to a combination of factors: relatively high population density, fragile ecosystems, limited options for relocating populations, and vulnerability to cyclones and flooding. Hydro-meteorological events account for around two-thirds of natural disasters in the Asia and Pacific region. Modeling and projections for climate change are necessarily based on a "no-risk" model given the uncertainties about future scenarios, impacts and the fact that climate change is but one of the variables that increase vulnerability. At the same time, there is a growing body of evidence that a key challenge that policy-makers will need to address this century is widespread climate and environmentally-induced migration, and one of the main sources of these migration pressures is certain to be coastal regions in Asia.

At first glance, the links between climate change and the 2004 Indian Ocean tsunami disaster are not necessarily self-evident. It took less than an hour for the tsunami to completely transform the lives of coastal communities, while changes in weather patterns and significant increases in temperature and sea level due to climate change are predicted to occur over decades. In terms of scale, the tsunami produced towering waves of up to 30 meters that plowed onto Asian coastlines, whereas most scientific predictions currently suggest that global sea level may rise around a maximum of 60 cm over the course of this century. When viewed through a vulnerability lens however, convergence is evident particularly in comparison to climate-related disasters. Climate change adaptation and disaster risk reduction have very similar aims of seeking to build resilience against hazards. Vulnerability can be reduced by improving early warning and people's awareness to anticipating risk and how to reduce it.

These links are most clearly illustrated by the Maldives context, where the government has been acutely aware of the country's vulnerability to climate change since the late 1980s and had developed a national climate change adaptation strategy prior to the tsunami. The Maldives had never experienced a major disaster like the 2004 Indian Ocean tsunami in recorded history. Although the death toll was much lower in the Maldives than in neighboring countries, it highlighted for policy makers how much was left to be done to mitigate the effects of climate change and the need to improve their understanding of how to manage disaster risk and

deal with displacement and resettlement. The National Disaster Management Center (NDMC), which was set up the day after the tsunami hit, now plays a major role at a national and regional level in promoting disaster risk reduction (DRR) through policies, legislation, and preparedness. The "build back better" approach adopted by the Maldives during the recovery and reconstruction phase was firmly based on their climate change adaptation strategy and thus provided this study with a practical example of adaptation approaches.

The field visit to India was notable since it provided a number of good practice examples of lessons learned during tsunami relief and recovery operations that could potentially be applied to coastal communities in other countries in the region to strengthen disaster preparedness and reduce vulnerabilities to the negative effects of climate change. Prominent amongst these good practice examples are the benefits realized through close collaboration between state and non-state actors in accelerating recovery, boosting livelihoods and reducing vulnerabilities through strengthening of community based disaster risk reduction systems, exemplified by the constructive roles played by government-led district relief committees and the largely NGO-led village resource centers.

The tsunami has opened a window of opportunity to accelerate climate change adaptation. Communities that have recovered from the tsunami are on the whole less vulnerable not only to another tsunami, but also to likely impacts of climate change due both to improved infrastructure and heightened awareness. This has resulted in greater readiness by communities to invest time and money in improved housing designs and environmental protection measures.

At the same time, most Climate Change Action Plans do not appear to adequately acknowledge the critical role played by non-state actors, including coastal communities themselves. Virtually all good practice examples encountered, from owner-driven reconstruction, empowerment of marginal groups, promotion of alternative livelihoods, and the establishment of village-level knowledge centers, were the result of work by NGOs under the guidance and leadership of local government.

Nonetheless, consultations with civil society on Climate Change Action Plans have reportedly been often tokenistic and, in the case of tsunami-affected areas, have not used the opportunity of more open mindsets to mobilize populations behind a common strategy. A notable exception to this is Bangladesh's approach which has apparently been a highly consultative approach, the results of which are reflected in their NAPAs.

A summary of recommendations for USAID is provided at the end of this report.

Below is a list of key findings, conclusions, and recommendations:

FINDINGS

- The tsunami has globally promoted the value of disaster risk reduction, especially in the Maldives and India where interest has grown at the community level.
- During this study, only the action plans of the Maldives and Bangladesh articulated good practice approaches to climate change adaptation.
- Disaster risk reduction and climate change adaptation measures are much more effective if the government guides and regulates participatory approaches with affected communities, NGOs, and the private sector with robust monitoring and oversight systems.
- Quick-onset flooding disasters in coastal areas will be much more difficult to recover from in the absence of more resilient water and sanitation infrastructure.
- Training of community members to monitor water quality was found to work well in improving water quality and raising awareness on risky sanitation practices.

- Government and non-government institutions have made significant strides over the past decade in developing relevant institutional frameworks, notably in "build back better" approaches during recovery operations such as disaster resilient housing.
- GIS analysis of some relocation sites and new settlements suggests vulnerability to flooding and inundation may have increased compared to the old sites.
- There seems to be a lack of common understanding regarding the severity of seacoast erosion between government planners and the research knowledge base.
- Appropriate and timely interventions by national actors significantly reduced the risk of mortality and morbidity from infectious diseases after the tsunami.
- Access to new facilities and improved health care programs has increased through population consolidations and awareness campaigns.
- There is a close correlation between levels of poverty in rural Asian communities and their capacity to adapt to climate change.
- Village Knowledge Centers in Tamil Nadu are potential resources that can promote climate change adaptation awareness and provide a range of services for disaster risk reduction, early warning systems, and e-government.
- Access to finance, insurance, and savings services was quite low prior to the tsunami but is expected to improve SME development and the resilience of local communities.
- Most of the rural economy depends on the primary agriculture sector, so adapting to climate change will require agricultural adaptive research and appropriate technology transfer through services of agricultural extension and training institutions.

CONCLUSIONS

- The tsunami has opened a window of opportunity in the region to accelerate climate change adaptation.
- Climate change adaptation programming does not require drastically different approaches, but rather obliges planners and policymakers to be more thorough when conducting vulnerability analyses.
- Many Climate Change Action Plans do not adequately acknowledge the critical role played by non-state actors, including coastal communities themselves.
- Reconstruction and resettlement under climate change require planning and greater adoption of good practices.
- "Building back better" offers opportunities through meaningful consultations with communities and civil society.
- Specific challenges of climate change adaptation in coastal urban centers should be considered during planning.

OVERALL RECOMMENDATIONS

- Develop a plan to sustainably fund climate change adaptation.
- Assist communities in planning for any social capital and behavioral changes necessary for adaptation, particularly with regards to potential displacement or re-settlement.

- Support risk analysis and planning to prepare for climate change adaptation.
- Develop and support the implementation of climate change action plans via multi-stakeholder consultations.
- Promote appropriate legislative frameworks and policy incentives to support implementation of adaptation measures found in recommendations from national and local climate change action plans.
- Mainstream climate change adaptation within the levels of government.
- Maintain and stabilize ecosystems such as mangroves and corals as bio-shields to sea level rise.

RECOMMENDATIONS FOR ECONOMIC RECOVERY AND LIVELIHOODS

- Develop, fund, and implement livelihoods projects to enable those displaced by climate change to engage in economic development and growth in their new surroundings.

RECOMMENDATIONS FOR HEALTH

- Implement public health interventions as first steps in response to ecological or climate change related disasters.
- Begin to include disaster response adaptation to health conditions under a changing climate within nursing and medical school course curricula and trainings for medical professions.
- Establish an early warning system that is reliable, trusted, and provides quick communication to villages.
- Monitor the displaced for psychological trauma.

RECOMMENDATIONS FOR WATER AND SANITATION

- Improve water resource forecasting by providing medium- and long-term forecasts, as well as flood warnings, to coastal communities.
- Improve water supply management through sustainable utilization of available water resources.

RECOMMENDATIONS FOR SHELTER AND LAND ISSUES

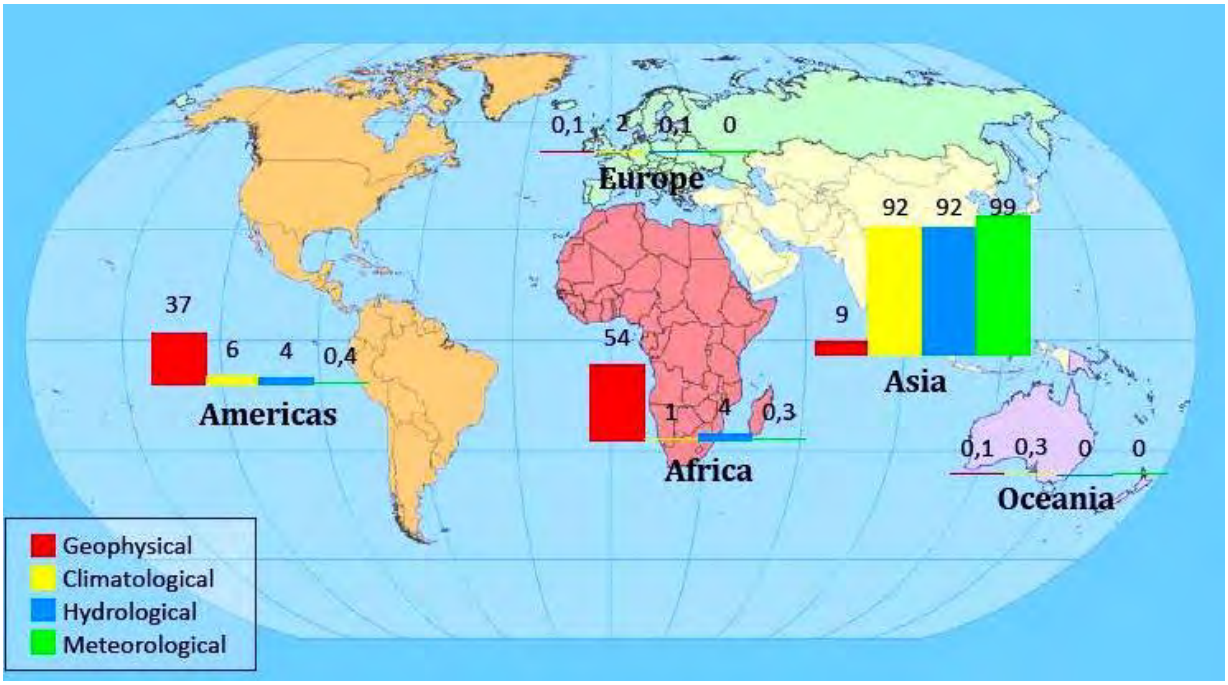
- Renew and sustain attention to "building back better" guidelines, especially integrating close consultation between the government, civil society, local communities, and INGOs.
- Promote settlement planning that uses sound ecological principles.
- Maximize adoptability of relocation efforts by assessing the local conditions of the population.

2. INTRODUCTION

Climate change adaptation poses particular challenges in coastal areas due to a combination of factors; relatively high population density, fragile ecosystems, limited options for relocating populations and vulnerability to cyclones and flooding. In fact, hydro-meteorological events account for around two-thirds of natural disasters in the Asia and Pacific region[1] (see Figure 2-1 below).

Climate change modeling and projections are necessarily based on a "no-risk" model given the uncertainties about future scenarios, impacts and the fact that climate change is but one of the variables that increase vulnerability. At the same time, there is a growing body of evidence that a key challenge that policy-makers will need to address this century is widespread climate and environmentally-induced migration[2], and one of the main sources of these migration pressures are certain to be coastal regions in Asia.

Figure 2-1 Percent Share of Reported Victims by Disaster Type During 2009



Source: Centre for Research on the Epidemiology of Disasters (CRED)

The 2004 Indian Ocean tsunami and other quick-onset flood disasters that result in large-scale displacement of populations put significant strain on local resources. Over time, communities of displaced persons adapt to their new status in different ways. This study attempts to assess what has happened to displaced people as a result of the tsunami and what measures were helpful in enabling them to adapt to their situation.

Priority was given to capturing lessons that can potentially be applied to climate change to inform USAID and other potential donors using the results of this study to better inform their programming approaches towards climate change adaptation (CCA). The study was carried out by a team of five technical specialists with backgrounds in displacement-related relief, water and sanitation, public health, architecture and urban

[1] UNISDR (2009) Regional synthesis report on implementation of the HFA in Asia and Pacific 2007-2008/09 http://www.unisdr.org/publications/v.php?id=11776

[2] Morton et al. (2008) Human Security policy challenges. Forced Migration Review Issue 31

planning, economics, disaster risk reduction, and governance. In addition to an extensive literature review, the team visited two countries during this study the Maldives and India to better understand how communities had coped more than five years after the tsunami. Two team members also visited areas in Orissa that had been severely impacted by the 1999 super cyclone to be better able to compare and contrast the situation of tsunami-affected communities with populations that had been affected by a climate-related disaster.

In the Maldives, the core team of specialists was joined by two Washington-based USAID staff, with backgrounds in social anthropology, environment and natural resources. During the India visit, the team was joined by three national consultants with backgrounds in shelter, land tenure, humanitarian response, disaster risk reduction and social anthropology. All three national consultants, together with the Team Leader, had been involved in assessments and evaluations in tsunami-affected areas in southern India at regular intervals since early 2005 and this provided in-depth perspectives to compensate for the relatively limited time spent in the country. Observations and assessments carried out during these two field visits provide detailed case studies to inform a desktop review of coastal areas focusing on selected countries in the Asia region that are vulnerable to short and long-term impacts of climate change. In addition to providing an overall regional assessment, specific countries that have provided a specific focus in this report are Bangladesh, Indonesia, and Vietnam.

Each of the field visits proved useful in providing a first-hand understanding of what has happened and, to a reasonable extent, why communities have evolved in the way they have since experiencing severe quick-onset disaster events. While there were a number of common elements, each country contributed specific examples of good practice and lessons for improvement in future. The Maldives, for example, lacked a disaster management plan prior to the tsunami, but were able to use their relatively well-developed climate change adaptation plans effectively during the recovery phase. However, the fact that there are hundreds of families still living in temporary shelters more than five years after the tsunami swept away their homes is a stark indicator that serious gaps in policies and approaches with regard to house reconstruction and resettlement still remain.

India was more representative of tsunami-affected countries in the region. There was no climate adaptation strategy in place prior to the tsunami, but India did have well-developed disaster management plans that were based on lessons learned from previous disasters, notably the 2001 earthquake in Gujarat[3]. The authorities were able to put these to good effect and during the visit to Tamil Nadu the study team observed several good practice examples based on close collaboration between state and non-state actors in accelerating recovery, boosting livelihoods and reducing vulnerabilities through strengthening of community based disaster risk reduction systems.

This overview report, plus the attached technical annexes provided in the accompanying CD, is primarily intended for use by the USAID Asia Bureau to support programming in climate change adaptation. The specific objectives of this study are described on the following page.

[3] These lessons, along with those learned following the tsunami, have subsequently been drawn upon to develop India's Disaster Management Act that was approved in 2005.

3. OBJECTIVES OF THE STUDY

The overall objectives of the study were to:

1) Review, analyze, and evaluate the short-term and long-term effects of tsunami-induced displacement in the Maldives and in India to understand processes by which communities were rehabilitated or re-settled;

2) Provide general recommendations based on the above review for strengthening the capacities of countries in the Asia region to adapt to climate-related displacement in coastal areas;

3) Provide a general overview of countries in the Asia Region to manage responses to climate change impacts such as sea level rise, flooding, extreme weather, disaster events, etc., and;

4) Provide specific recommendations on the interventions and programming applicable to India, the Maldives, and other vulnerable coastal regions in south and Southeast Asia to address and prepare for adaptation to increased frequency and intensity of climate-related disasters in coastal areas, sea level rise, and other related climate change impacts.

4. METHODOLOGY

Based on the study objectives, a series of questions were developed to guide investigations in general and to generate data relevant to each sector covered. This research integrates document review, interviews, and on-site visits/observations. Key informant interviews were held with government officials, donor organizations, private sector actors, international organizations, and national NGOs. Interviews with members of the local communities were a primary source of information about adaptive strategies and challenges in settlements where the tsunami created significant displacement. Analysis of these interviews served two purposes: 1) to provide preliminary findings and recommendations, and 2) to serve as a basis for further information gathering. Interviews usually lasted between 30 minutes to one hour. Each interview began with an explanation of the purpose of the study and reasons for undertaking the research. Group interviews with community members were conducted during on-site visits. The interviewers facilitated the answers to specific questions by asking general ones and probed for examples.

During field visits to both the Maldives and India, the team split into two or more groups to facilitate greater coverage and allow more in-depth investigations into sector-specific issues. A total of 12 islands were visited in five different atolls (Raa, Gaaf Alif, Laamu, Thaa, and Meemu). The logistical constraints of the Maldives meant that significant time had to be spent in transit between highly dispersed small islands. The rural economic development component of this study was based on an adapted Participatory Rural Appraisal (PRA) methodology, in which secondary resources were used to obtain a fair understanding of the situation. The PRA tools were used for validation and to gather evidence; these tools included semi-structured interviews (SSI), focused group discussions (FGD), meetings with officials and key informants, direct observation, and transect walks. The PRA tools used allow for a timely, simultaneous cross-checking of information, triangulation, and analysis.

The team was able to meet with government officials at the central level in Malé as well as with regional, atoll, and island officials; international NGOs; and UN agencies. Team members met with farmers groups, fishermen, women, civil servants, workers, and youth on different islands. Not all the islands in the Maldives were impacted by the tsunami nor are they at the same stage of socio-economic or infrastructural development. The team thus visited a selected sample of different types of islands, including different sizes of islands affected by the tsunami, islands hosting displaced households, larger "resilient" islands where the government has supported social and infrastructural development to better withstand the impacts of climate change and smaller islands which were not affected by the tsunami and were more traditional in nature. Observing these different island conditions gave the team the opportunity to assess sectoral issues from different perspectives.

During the visit to India, team members met with key stakeholders both at the central level in New Delhi and also in Tamil Nadu and Orissa. The visit to Orissa, which had not been affected by the tsunami, allowed the team to contrast and compare impacts on communities following, which are regularly impacted by extreme weather events including super cyclones, and also allowed insights into coping strategies by communities who were poorer on average than those in Tamil Nadu. Key informant interviews and focus group discussions were held with government officials, staff from NGOs and UN agencies, and academics. The study also incorporated discussions and meetings with farmers groups, fishermen, women, civil servants, day laborers, members of scheduled castes, and youth representatives. Visits focused on coastal areas, both in villages that existed before the tsunami and relocated communities.

The study team was also able to benefit from prior experience of four of the team members who had been regularly involved in monitoring and evaluation activities in tsunami-affected areas in Tamil Nadu over the past five years. Thus the team was able to acquire a good collective understanding of different phases of the

relief and recovery process. The study team was also able to draw on relevant experience of the shelter specialist who had recent experience with recovery operations following the recent flooding disaster in Bihar that provided some alternative approaches to shelter reconstruction that are relevant to this study. In addition, the study team was able to draw on the vast literature of research on tsunami lessons learned that is available.

Since the time allocated for field visits was relatively limited, the prior knowledge of team members and extensive documentation, including a number of independent evaluations, proved very useful for the analysis. To help better understand relationships between tsunami impacts and likely climate change impacts on displaced populations, the desk research portion of the study for this synthesis study was expanded to include a review of relevant policies and evaluative reports from two other tsunami-affected countries, Indonesia and Sri Lanka, along with two countries in the region whose coastal areas are likely to be severely affected by climate change, Vietnam and Bangladesh.

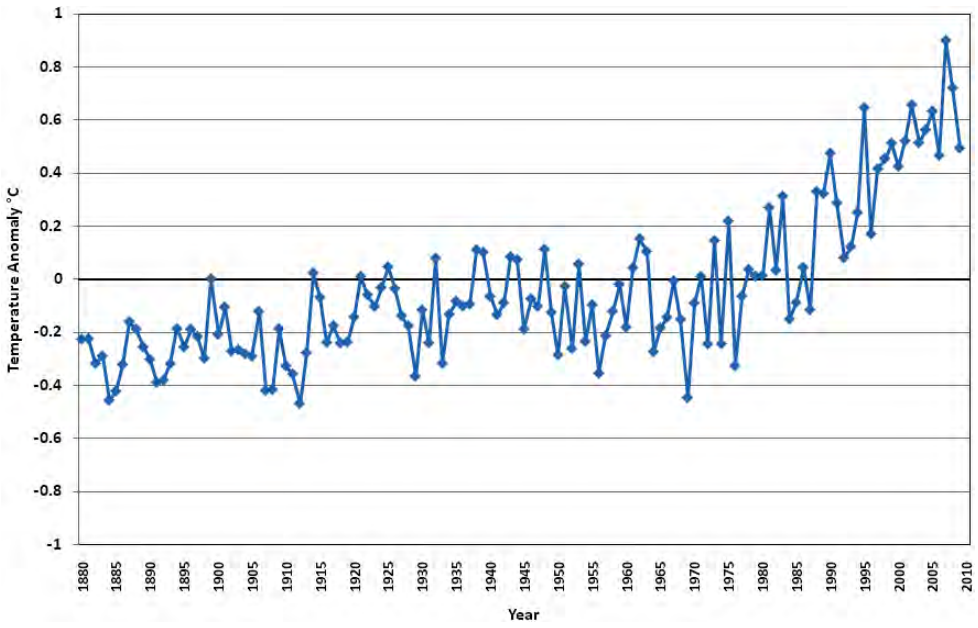
5. TSUNAMI DISPLACEMENT PATTERNS AND CLIMATE CHANGE ADAPTATION

5.1 CLIMATE CHANGE IN THE ASIA REGION

A number of factors render the Asia region particularly vulnerable to climate change. Asia is home to some 60% of the world's population and a progressively increasing proportion of this number live along its extensive coastlines, which include large expanses of low-lying areas. Added to this is the high reliance on the agricultural sector and natural resources for livelihoods.

Climate Change – a definition
The UNFCCC defines climate change as 'a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods'.

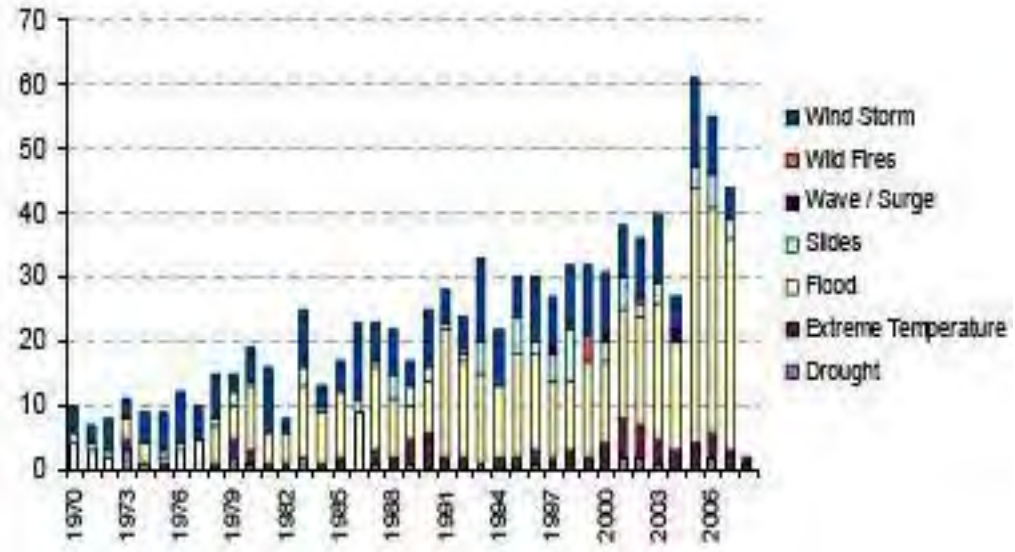
Figure 5-1 Average Temperature Anomaly in the Asia Region (Base Period 1971 – 2000)



Source: National Climatic Data Center

There are a number of longer-term consequences that can induce migration in coastal areas, including sea level rise and negative effects of increase in temperatures on natural resources such as coral reefs. Another predicted effect of particular relevance to this study is the likelihood that climate-related disasters will increase in both frequency and intensity.[4]

Figure 5-2 Number of Reported Disasters by Disaster Type in South Asia (1970 – 2008)



Source: EM-DAT (www.em-dat.net)

5.2 DISPLACEMENT AND MIGRATION

Natural disasters often trigger large migratory flows out of affected areas, leaving widespread social, physical, and economic destruction in their wake.[5] Detailed studies in the United States following major hurricanes (Hurricane Andrew in 1994, Hurricane Katrina in 2005) have found considerable variation in migration patterns. Some populations were displaced only a few days, others a few months. Yet others had relocated permanently. A 2007 study two years after Hurricane Katrina discovered that 60% of residents had not yet returned to places of origin.[6] Similar reports have emerged after cyclone Sidr hit Bangladesh in 2007.[7]

At first glance, links between climate change adaptation and the 2004 Indian Ocean tsunami disaster may not be immediately self-evident. It took less than an hour for the tsunami to transform the lives of millions of people in coastal communities, while changes in weather patterns along with significant increases in temperature and sea level due to climate change are predicted to occur over several decades. The tsunami produced towering waves of up to 30 meters that plowed onto Asian coastlines, whereas the majority of scientific predictions currently suggest that global sea level may rise to a maximum of around 60 cm over the course of this century. To a large extent, survivors of the tsunami relied on coping capacities to survive and recover, which is somewhat different than what will be required for climate change adaptation, as illustrated in Table 5-1 below.

4 2009 IASC Task Force on Climate Change

5 International Office of Migration (2007) Migration, Development and Natural Disasters. IOM Research Series No. 30

6 Reuveny, Rafael (2007) Climate change-induced migration and violent conflict Political Geography 26

7 IOM Press Release (2009) http://www.iom.int/jahia/Jahia/media/press-briefing-notes/pbnAS/cache/offonce?entryId=27443

Table 5-1 How is Adaptation Different from Coping Capacity of Populations?

Coping	Adaptation
Short-term and immediate Oriented towards survival Not continuous Motivated by crisis, reactive Often degrades resource base Prompted by a lack of alternatives	Long-term effects Orientated towards longer term livelihoods security A continuous process Uses resources efficiently and sustainably Involves planning Combines pre-existing knowledge with new strategies Focused on identifying alternatives

When viewed through a vulnerability lens, however, convergence is evident particularly in comparison to climate-related disasters. Climate change adaptation and disaster risk reduction have very similar aims of seeking to build resilience against hazards. Vulnerability can be reduced by improving early warning and people's awareness to anticipating and resisting climate-related disasters. Asia is more at-risk of weather and climate related hazards than any other region and these are increasing in number.

Table 5-2 Common Elements between the Impacts of the Tsunami, Climate-related Disaster Events, and Climate Change Adaptation *

Displacement Caused by the Indian Ocean Tsunami	Large-Scale Climate-Related Quick-Onset Disaster Events (e.g. cyclones, flash floods)	Potential Longer-Term Climate change impacts
Vulnerable groups have the most difficulty in recovery from impacts	Vulnerable groups have the most difficulty in recovery from impacts	Vulnerable groups have the most difficulty in recovery from impacts
Mitigation of impacts by DRR measures	Mitigation of impacts by DRR measures	Mitigation of impacts by longer-term components (e.g. infrastructure) of DRR measures
Shifts in livelihood patterns amongst a portion of the affected population	Shifts in livelihood patterns in a portion of the affected population	Shifts in livelihood patterns in a portion of the affected population
Rapid displacement of populations	Rapid displacement of populations	Longer-term migration
Majority of survivors return to their places of origin	Majority of survivors return to their places of origin	Most migrants do not return to their places of origin
Emergency response and recovery consistent with approaches to flooding and salt-water intrusion	Emergency response and recovery consistent with approaches to flooding and (in the case of cyclones) salt-water intrusion	No emergency response
Displacement mainly caused by disaster event	Displacement mainly caused by disaster event	Migration caused by multiple factors (including disaster events)
Earthquake disaster (not related to climate)	Cyclones, flash flood disaster (climate-related)	Rise in sea levels and ambient temperatures

* Shaded grey cells indicate a lack of commonality

Increased risk of disaster events due to climate change is a call to reinforce and systematize approaches to disaster-risk reduction (DRR). DRR strategies typically aim at reducing vulnerabilities by means of three strategic approaches:

1. Livelihoods protection: safeguarding what is there (safety)
2. Livelihoods strengthening: enhancing existing capitals (resilience)
3. Livelihoods diversification: increasing options (resilience)

During implementation, DRR activities often tend to focus mainly on physical capital (infrastructure, buildings) and human capital (capacity building, trainings). "Natural capital", namely ecosystems, is often overlooked, but increased climate change awareness has effectively highlighted the importance of sustaining and reinforcing ecosystems in DRR approaches.

Definition of Disaster Risk Reduction
UNISDR defines[8] disaster risk reduction as "the conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development."

[8] UNISDR Definitions http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm

6. CONTEXT

When the tsunami struck on December 26, 2004, the Asia region as a whole had a relatively optimistic outlook on the future. During 2004, the economies of developing countries in Asia and the Pacific had achieved their highest growth since the Asian financial crisis with aggregate gross domestic product expanding by an average of 7.3%[9], along with corresponding positive impacts on poverty reduction. The tsunami did not have much of an impact on growth at a national level apart from the Maldives, where the resulting damage amounted to some 60% of GDP.

Along the coastlines struck by the tsunami, it was a decidedly less positive picture. More than 227,000 people had been killed or missing, making it one of worst disasters in history. Almost twice as many women as men were killed and over two million people were displaced. Although the negative economic impact on GDP at a national level in Indonesia was estimated at only 2%, the total damage from the tsunami estimated at $4.5 billion to $5 billion was nearly equal to the entire GDP of Aceh.[10] It was thanks to a significant and rapid mobilization of resources at both national and international levels that the feared "second wave" of deaths from post-disaster epidemics did not eventuate.

While economic impact at a national level was not significant, the tsunami proved to be a wake-up call for the region in many ways. The huge loss of life was due mainly to the absence of tsunami early warning systems and overall lack of awareness amongst the population about such hazards. Most governments initially responded by reinforcing their disaster management policies and structures along with a focus on "building back better" to incorporate disaster risk reduction into recovery planning. Aided by the momentum in the build up to the 2009 Copenhagen conference on climate change, focus subsequently shifted to climate change adaptation.

All countries included in this study are amongst the 191 signatories to the Protocol to the United Nations Framework Convention on Climate Change (UNFCCC)[11] but a comparison of National Adaptation Plan of Actions (NAPAs) shows they are at markedly different stages of development, something which is explored in more detail in the Policy section below.

6.1 TSUNAMI-AFFECTED AREAS

6.1.1 SOUTHERN INDIA

Mainly as a result of the economic reforms initiated in 1991, India's average GDP growth has been more than 9% in recent years and India had established itself as the world's second-fastest growing major economy during 2008. The tsunami occurred in the midst of the 10th Five Year Plan (2002-2007), which combined the objectives of achieving speedy industrialization, human development, full-scale employment, poverty reduction, and self-reliance on domestic resources. GDP growth on a national scale was not really affected by the tsunami. From 7.5% in 2004, India's economy grew to 9.5% in 2005 and continued its upward march to 9.7% during 2006. The current Five Year Plan and associated budget incorporate provisions for both disaster risk reduction capacity building and the integration of relevant climate change adaptive measures. This builds on an already relatively well-developed set of disaster management institutions and policies that India used to good effect in southern states when responding to the tsunami crises.

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[9] Asian Development Bank (2005) Asian Development Outlook 2005

[10] Consultative Group on Indonesia (2005) Indonesia: Preliminary Damage and Loss Assessment

[11] http://unfccc.int/kyoto_protocol/status_of_ratification/items/2613.php

Until recently, there has been a fair amount of resistance at senior political levels in India to engage in global efforts to combat climate change, along with some vocal skepticism about its evidence base. A position paper on climate change in February 2009 stated the government's position thus: "*India is resisting calls by developed countries to take on specific targets for the reduction of its Greenhouse Gas (GHG) emissions despite the fact that its total GHG emissions are the 3rd largest in volume after the US and China. How can an accord be possible if India and other "major emitters" refuse to accept responsibility in this regard?*"[12] There has since been a change in attitude towards issues surrounding climate change as seen in the Prime Minister's speech to launch India's Plan of Action for Climate Change in June 2009. Dialogue with international agencies has reportedly become much more constructive since the global conference in Copenhagen in December 2009.

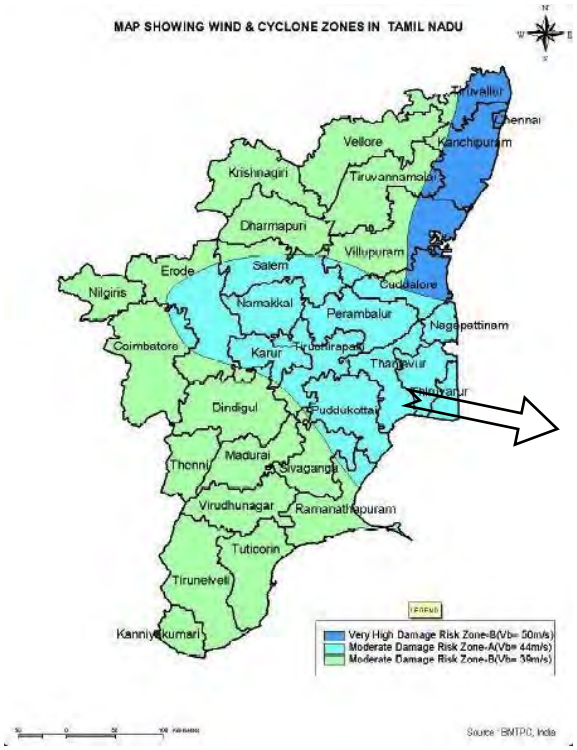
India is currently mobilizing considerable resources across the country to help advance its understanding of potential impacts of climate change[13] and states such as Tamil Nadu, which the study team visited, are in the initial stages of developing strategies adapted to their local contexts. In Tamil Nadu, this is being done with support of international agencies such as the German technical assistance agency GTZ. This heightened awareness of disaster risk reduction and environmental protection that prevails within both government and civil society has opened the doors to a constructive engagement with these processes.

Tamil Nadu & Orissa States – The team made visits to two states: Tamil Nadu, which suffered the worst effects of the tsunami and Orissa, which was not affected by the tsunami, but is highly vulnerable to climate-related disasters such as cyclones and flooding. Tamil Nadu has over 1,000 km of coastline and includes many low-lying flood-prone areas (see Figure 6-1 below). The region is vulnerable to natural hazards including cyclones, heavy rainfall, flooding, shore line erosion, and sea water intrusion.

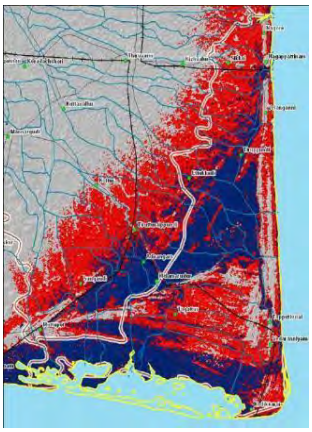
[12] Government of India (2009) "The Road to Copenhagen: India's Position on Climate Change Issues" http://pmindia.nic.in/Climate%20Change_16.03.09.pdf

[13] "India: Taking on Climate Change – 24 Recent Initiatives Related to Climate Change" (2010) Ministry of Environment & Forests, Govt. of India

Figure 6-1 Wind and Cyclone Zones in Tamil Nadu



Red areas are less than five meters above sea level



Source: BNTPC India (map) and COAST tsunami project (inset)

6.1.2 INDONESIA (ACEH)

Climate change was identified by Indonesia as a national priority once vulnerability to multiple climate change hazards was better understood. While Indonesia is likely to experience only modest temperature increases, climate change will probably experience more intense rainfall and sea-level rise. The most vulnerable zones to climate risks are seen to be Java, Bali, parts of Sumatra, and large areas of Papua. The World Bank predicts that economic impacts of climate change will be high in Indonesia and estimates that even without considering non-market impacts and catastrophic risks, average GDP loss is projected to reach 2.5 percent by 2100.

After the tsunami, Indonesia enacted a new law for disaster management and created a new national disaster management agency Indonesia Disaster Board for Disaster Management (BNPB). Indonesia also formulated a 2010-2012 National Action Plan for Disaster Risk Reduction. Implementation remains a major challenge.

6.1.3 THE MALDIVES

The Maldives is among the countries most threatened by climate change. Not only is sea level rise a serious threat in this country where the average elevation barely reaches 1½ meters, but increased temperatures and higher acidity of seawater in many ways present even greater potential hazards given that the vast majority of the economy of The Maldives is highly dependent on its sensitive coral reef system, which underpin both its tourism and fisheries industries. Altered weather patterns increase the risk of cyclones and pose an additional hazard which the country needs to prepare for. Even if the country remains relatively sheltered from severe cyclones due to its location around the equator, non-climate related disasters like tsunamis provide valid reasons for investing in climate-change adaptation measures such as "resilient" islands.

The Maldives has been acutely aware of the country's vulnerability to climate change since the late 1980s and had developed a national climate change adaptation strategy prior to the tsunami, which was most recently revised in 2006. However, the Maldives had never experienced a major disaster similar to the 2004 Indian Ocean tsunami in their recorded history and were understandably unprepared for such an event. Although

the death toll was much lower in the Maldives than in neighboring countries, many policy makers saw the tsunami as a wake-up call. For them, it highlighted how much was left to be done to mitigate the effects of climate change and also highlighted a need for increased understanding about how to deal with displacement and resettlement.

6.1.4 SRI LANKA

The government established a Climate Change Secretariat in order to address environmental challenges caused by climate change and to fulfill commitments under the United Nations Framework Convention on Climate Change (UNFCCC) & Kyoto Protocol, the Ministry of Environment, which is the National Focal Point for the UNFCCC. Of the countries included in this study, Sri Lanka gives the impression of being least advanced in terms of development of policies and relevant guidance to prepare for climate change adaptation.

This is probably partly due to the fact that Sri Lanka is relatively sheltered from natural hazards. Although some 25% of Sri Lanka's population lives in coastal areas, including in low-lying areas, there have been only four severe cyclones during the last century, mainly affecting the eastern coastline. As shown in the table below, the only significant major hazard Sri Lanka has experienced are droughts that have mainly affected the north-west portion of the country.[14] Sri Lanka has had an effective adaptive strategy in place for the past 2,000 years to mitigate drought in the form of an elaborate system of irrigation reservoirs ("tanks") which, although periodically disrupted by conflict, is still in use.

Agencies in Sri Lanka (government, NGOs, and international agencies) had no early warning systems in place and were largely unprepared to deal with the effects of the tsunami. Similar to the Maldives, one of results of the tsunami was a decision by the government to enact a Disaster Management policy in 2005 that, among other things, paved the way for the formation of the National Council for Disaster Management.

Table 6-1 Sri Lanka Disaster Risk Profile[15]

Hazard type	Population exposed	Percentage of population (0 5 10 20 40)
Cyclone	24,123	Minimal
Drought	2,548,310	Moderate (~15%)
Flood	102,902	Minimal (~ 1%)
Landslide	500	Minimal
Earthquake	-	Minimal
Tsunami	203,051	~ 2%

Source: www.preventionweb.net

As in Aceh, the tsunami had a significant influence on a long-running conflict, though the effects were quite different. Whereas in Aceh the tsunami was followed the next month by a lasting peace agreement, in Sri Lanka hopes for renewed efforts to reach a peaceful settlement with Tamil separatists proved to be unfounded. The separatists' main naval base in northeastern Sri Lanka was almost destroyed by the tsunami and over a thousand of their cadres killed. After a brief period of cooperation during the initial relief phase between the government and militant separatists, the situation rapidly deteriorated amidst disputes over foreign aid.[16] The ceasefire that existed before the tsunami was replaced by a resumption of the conflict that only ended in May 2009 after a final battle that killed most of the Tamil separatist leadership.

[14] Sri. Lanka Hazard Maps http://www.recoverlanka.net/background/hazards.html#flood

[15] Modeled number of people present in hazard zones that are thereby subject to potential losses

[16] International Crisis Group (2010) Sri Lanka Conflict History http://www.crisisgroup.org/en/key-issues/research-resources/conflict-histories/sri-lanka.aspx

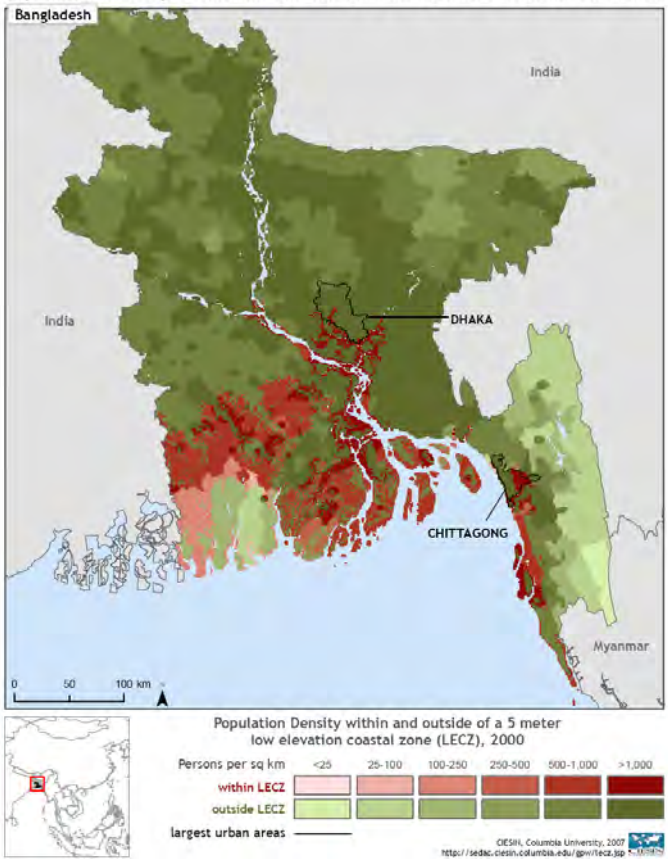
6.2 AREAS UNAFFECTED BY THE TSUNAMI BUT VULNERABLE TO CLIMATE CHANGE

Vietnam, Bangladesh and the state of Orissa in India all possess extensive coastlines that are very vulnerable to climate change impacts. They have been considered during this study to better understand similarities and differences with tsunami-affected areas.

6.2.1 BANGLADESH

Much of the coastal area of Bangladesh is densely populated and is very vulnerable to the impacts of climate change, both in the form of longer-term sea level rise and climate-induced disaster events such as cyclones. It is perhaps not surprising that Bangladesh has probably the most well-developed NAPA of all those reviewed by the team. The Bangladesh Climate Change Strategy and Action Plan (BCCSAP) was finalized in 2008 following extensive consultative processes involving the government, civil society, and development partners. Its main purpose is to articulate a strategy to manage climate change and its impacts in Bangladesh, leading to an action plan of programs addressing the needs for substantive interventions with a definitive timeline for their implementation. The implementation of the BCCSAP will be financed through the government's own resources and external support that may be available from the development partners as well as the specific international funds created for the purpose. A monitoring mechanism will be set up during the implementation process by developing a set of indicators to measure progress.

Figure 6-2 Population Density Within and Outside of a 5m Elevation Coastal Zone, Bangladesh



6.2.2 INDIA – ORISSA STATE

In contrast to Tamil Nadu, Orissa is among the poorest states in India, measured both in terms of per capita GNP and HDI, where it came 11th out of the 15 major states in India during the last state-level study in 2001. The infant mortality rate was 87 per 1,000 births in 2002 and 91 in 2001 (compared to a national average of 61 for India in 2002 and 55 in 2006-07). Similar to Tamil Nadu, the average population density was 236 per sq. km. with significantly higher density in the coastal areas compared to the interior parts. Orissa is prone to tropical cyclones, storm surges, minor earthquakes, and tsunamis. When the super cyclone struck Orissa in 1999, its population numbered around 35.5 million, approximately 3.6% of Indian population.

Figure 6-3 Flood Zones of Orrissa

Source: Orissa State Disaster Management Authority

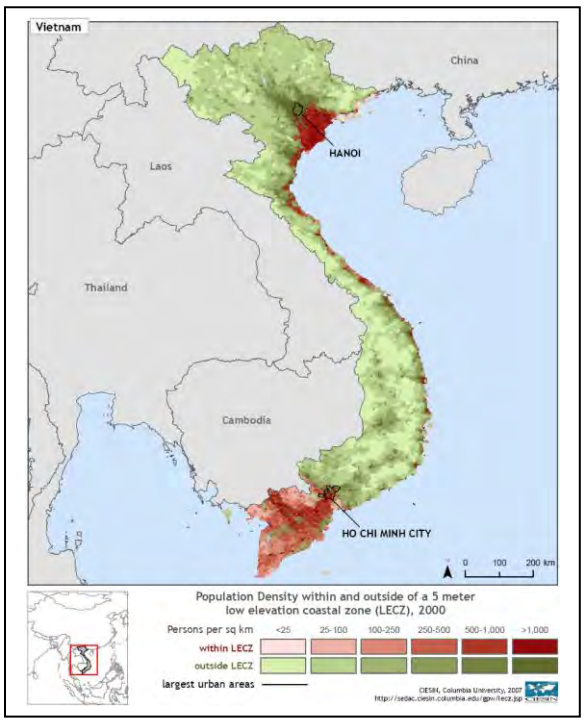
6.2.3 VIETNAM

Due to its low-lying profile and exposure to natural hazards such as cyclones and flooding, Vietnam is vulnerable to climate change related sea level rise. Predictions have suggested that 40,000 km of coastal delta area could be inundated. This includes 90% of the Mekong Delta which has a population of over 18 million people, some 22% of the country's population.[17]

At the end of 2008, Vietnam developed a National Target Program to respond to climate change which has the following objectives to respond to climate change:

- Identify the extent of climate change and assess its impacts in every sector and in each geographical area;
- Identify adaptation measures;
- Promote research to establish the scientific and practical basis for response measures;
- Consolidate and enhance organizational structure and institutional capacities;
- Promote international cooperation and support;
- Mainstream climate change issues into sectoral and local level planning; and

Figure 6-4 Population Density Within and Outside of a 5m Elevation Coastal Zone, Vietnam



Source: CIESIN Columbia University

[17] Mekong River Commission (2009) Adaptation to climate change in the Countries of the Lower Mekong Basin

- Develop and implement action plans and develop pilot projects through ministries, sectors and localities.

Vietnam's National Strategy for Natural Disaster Prevention, Response and Mitigation to 2020 was approved by the government in 2007. Focusing largely on water-related disasters, it is estimated to cost $18 billion, of which $13 billion is dedicated to infrastructure and the remainder for non-structural measures.

6.3 THE IMPACT OF THE 2004 INDIAN OCEAN TSUNAMI

The 2004 Indian Ocean tsunami left almost 230,000 people dead or missing which places it among the ten most deadly disasters in recorded history. Even so, with the exception of the Maldives where the tsunami had nationwide impact, its most devastating effects were relatively localized.

Figure 6-5 Coastlines Severely Hit By the 2004 Tsunami

Source: Tsunami Global Lessons Learned Project

But within these narrow coastal zones, the scale went beyond the tragic loss of life and destruction of infrastructure. Millions were displaced, many of whom have never returned to their original homes. Twice as many women were killed as men. It left children orphaned and created single parents, along with many "invisible" impacts such as lost birth records, property deeds, pawned article receipts, and bank certificates. Court houses and police stations were ravaged by water. In the midst of good will and copious amounts of humanitarian assistance, this disaster opened avenues for abuse, corruption, and legal disputes around land and property ownership, child custody, and inheritance rights.

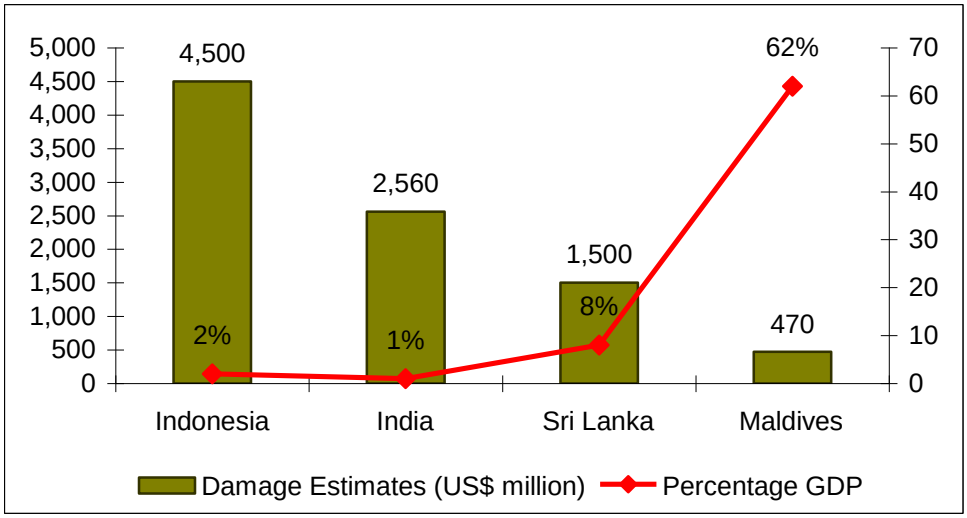
Table 6-2 Dead, Missing, and Displaced Persons from the 2004 Tsunami

Country	Dead and Missing	Maximum number of Displaced People
Indonesia	168,000	889,774
India	12,500	647,599
Sri Lanka	35,322	516,150
Maldives	82	21,000
TOTAL	227,196	2,085,723

6.3.1 ECONOMIC IMPACT

With the notable exception of the Maldives, economic impacts were relatively localized and did not have a nationwide impact. Indeed, the influx of funding after the tsunami has been credited for cushioning countries such as Sri Lanka against the global economic pressures like the rise in oil prices during 2006.[18]

Figure 6-6 Economic Impact of the Tsunami (Based on Estimates of Damage by Each Country)

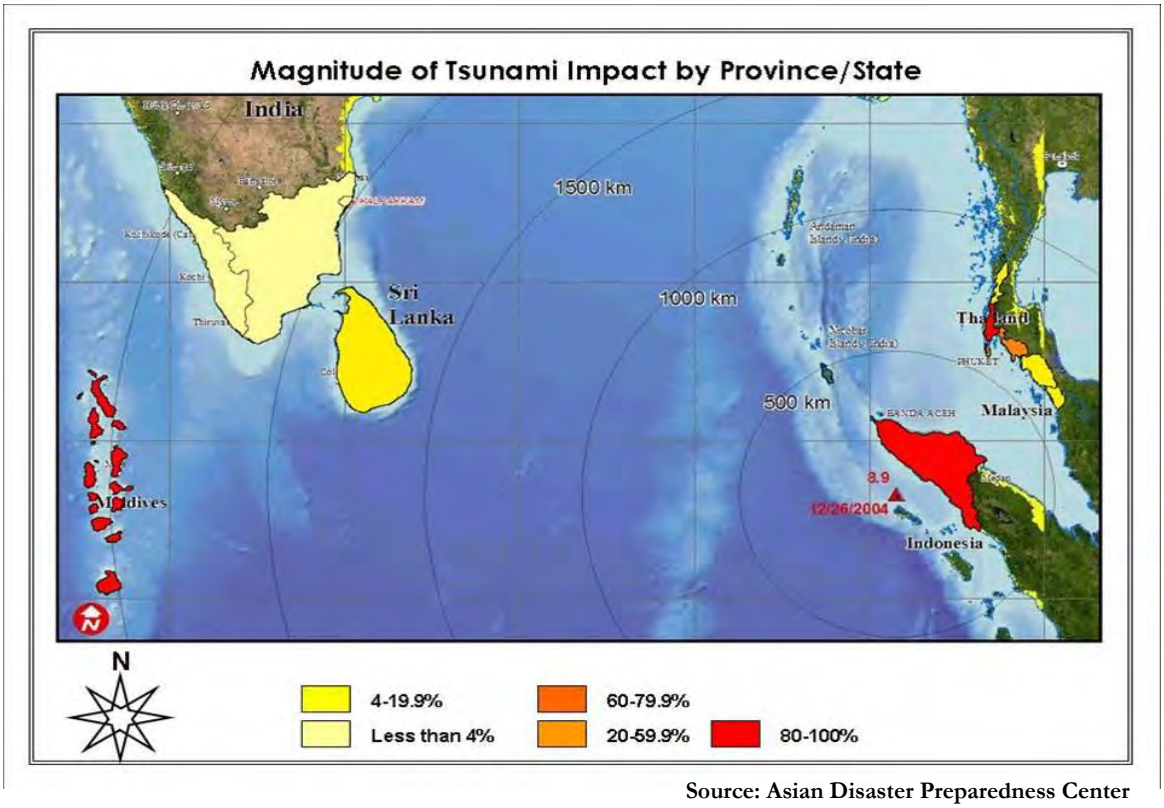


Source: Tsunami Global Lessons Learned Project

Although the Maldives' economy was seriously affected, the relatively smaller sea swells compared to other countries in the region meant that recovery in two most important sectors of the economy, tourism and fisheries, was relatively rapid.

[18] Institute of Policy Studies (2006) "Sri Lanka: State of the Economy 2006"

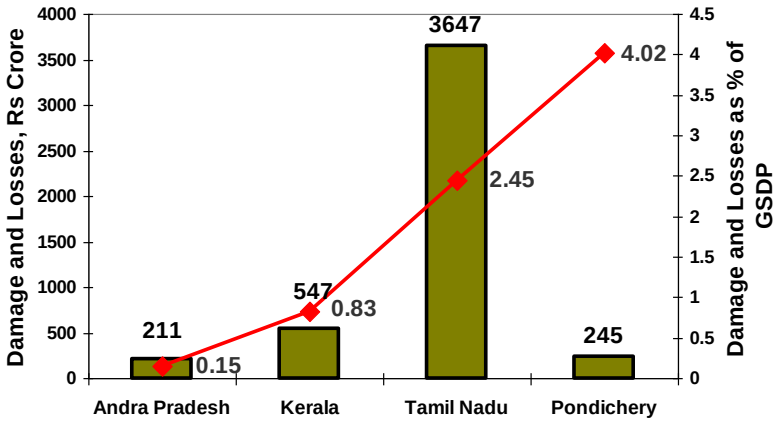
Figure 6-7 Total Economic Impact on the Region at Provincial Level (Total Impact vs. Gross Provincial Product: GPP %)



Source: Asian Disaster Preparedness Center

For example, damages and losses for India as whole due to the tsunami were estimated at $574.5 million and $448.3 million respectively (compared to a national GDP of US$ 669.4 billion in 2004). While the largest proportion of damages was concentrated in the fisheries sector, housing, and infrastructure, there was also significant impact on assets related to coastal fisheries, along with agriculture and micro enterprise. As described above, the tsunami did not have a significant impact on the national GDP of India and even at the state/territory level the impact on Gross State Domestic Product (GSDP) amounted to less than 2.5%.

Figure 6-8 Impact of the Tsunami on Gross State Domestic Product in Southern India

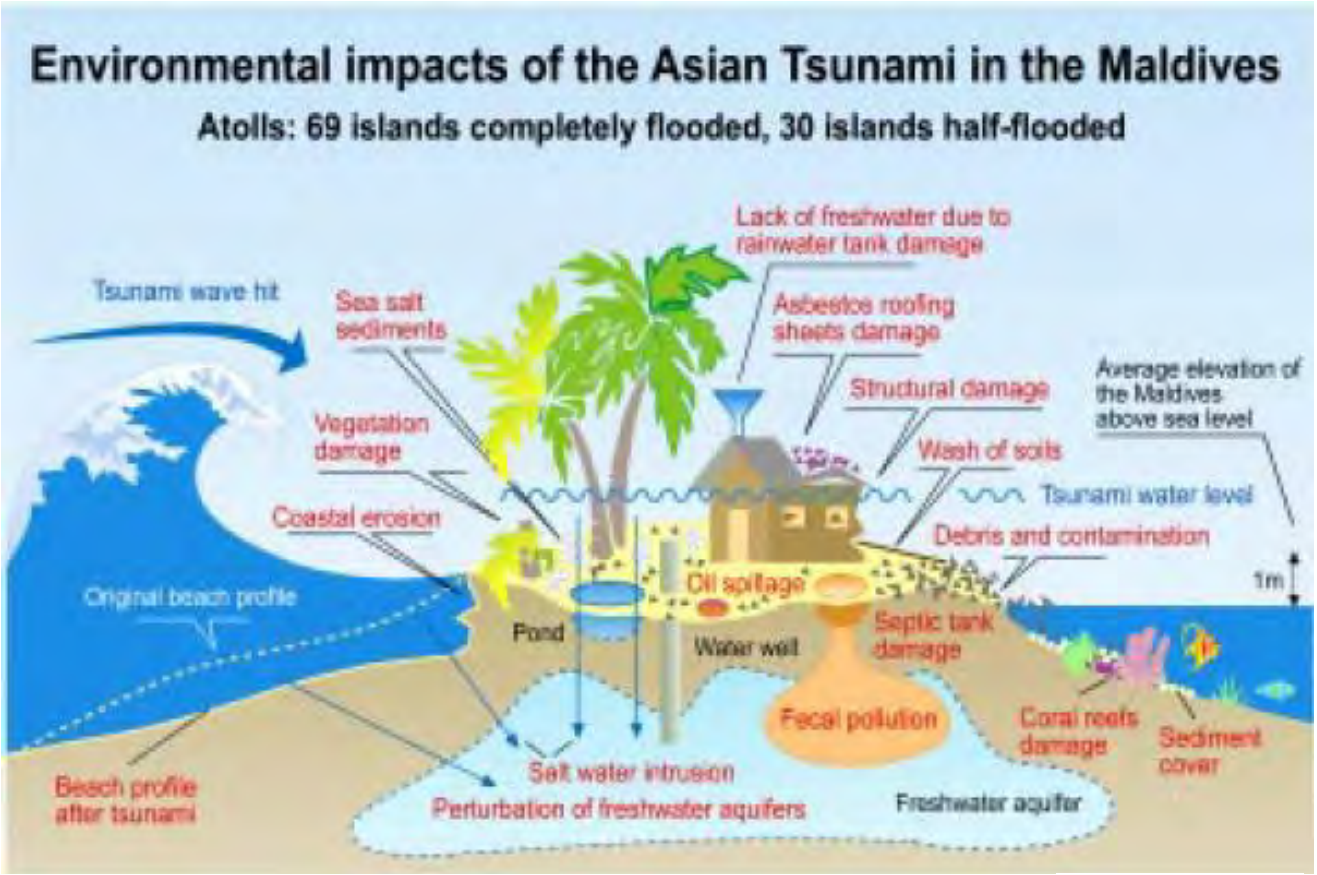


Source: Asian Disaster Preparedness Center

6.3.2 WATER AND SANITATION

Throughout affected parts of Asia, the tsunami ground water was inundated by seawater. Initial activities of many relief organizations including the UN and NGOs prioritized providing safe drinking to families in temporary shelters, schools, and other community centers. However, groundwater contamination for both household consumption and agriculture was still a problem and it was fortunate that monsoon rains arrived in many areas shortly after the tsunami to flush salt from the soil and replenish the groundwater.

Figure 6-9 Environmental Impacts of the Asian Tsunami in the Maldives



6.3.3 SHELTER

Results of psycho-social surveys conducted by the IFRC after the tsunami showed shelter and housing issues tended to be something that displaced populations were most worried about.[19]

Figure 6-10 Number of Houses Damaged or Destroyed by the Tsunami

Source: Tsunami Global Lessons Learned Project

Displacement due to the tsunami required resettlement and reconstruction of houses while trying to take into consideration issues of safety, livelihoods, culture, and socio-economic aspects. Population densities are high in coastal areas of Asia, and land tenure issues along with conflicts between host and displaced populations led to less-than-ideal compromises on sites, investments on infrastructure, etc.

6.3.4 HEALTH

The peak needs for rescue, food, and medical assistance occurred during the first few days and the vast majority of these needs were met by local and then national resources[20] prior to the massive influx of international agencies. In India and Sri Lanka, most of the major health centers near the tsunami affected areas were far enough away from the coast that they were able to move directly into action. It was a similar story in the Maldives, where major health centers were mostly not significantly affected, so first aid was not long in arriving. Aceh was a different story since the administrative center in Banda Aceh was destroyed and, because road access was mainly along the coast, communication routes were cut so the military (both national and international) played a major role during the initial days. Despite fears of a "second wave" of deaths due to epidemics, post-tsunami health status remained relatively good throughout the region. Even in Aceh, where some populations did not receive external relief until up to 14 days after the disaster, health was rarely mentioned by populations during needs assessments. Their primary concerns tended to be food, water, clothing, and shelter.[21]

6.3.5 IMPACT ON LIVELIHOODS

As seen in Figure 6-12 Summary of Damages & Losses in Indonesia on the following page,[22] the major impact of the tsunami fell on the private sector and at the household level. Calculations of environmental damages were also significant (around 12% of total damage and losses) that included monetized estimates of damage to coral reefs and mangrove swamps, loss of land use, and restoration of coastal zones.

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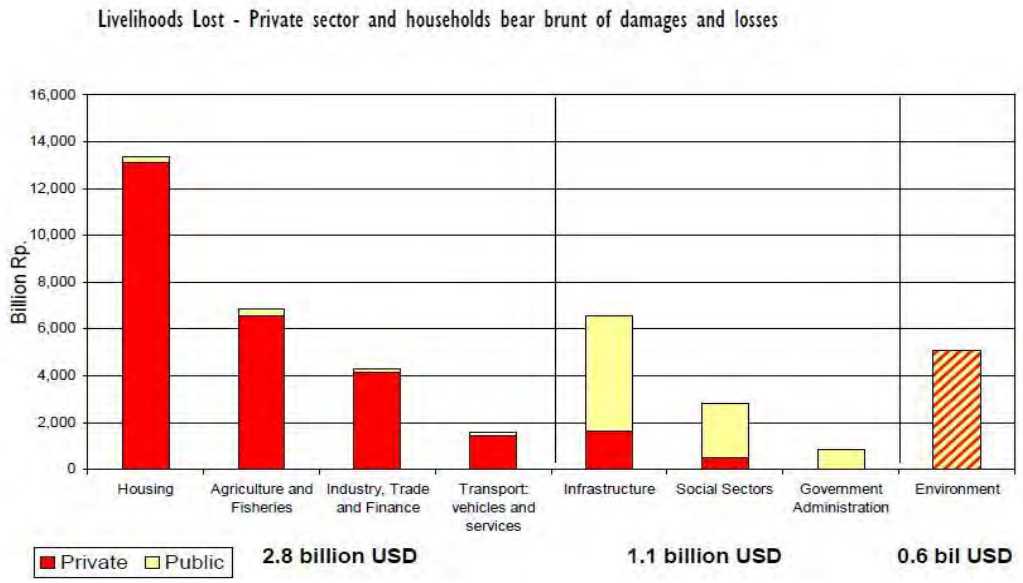
[19] Tsunami Global Lessons Learned Project (2009) The Tsunami Legacy: Innovation, Breakthroughs and Change

[20] Tsunami Evaluation Coalition (2006) Joint Evaluation of the international response to the Indian Ocean tsunami: Synthesis Report

[21] Tsunami Evaluation Coalition (2006) The role of needs assessment in the tsunami response.

[22] Consutative Group on Indonesia (2005) Indonesia: Preliminary Damage and Loss Assessment – The December 26, 2004 Natural Disaster

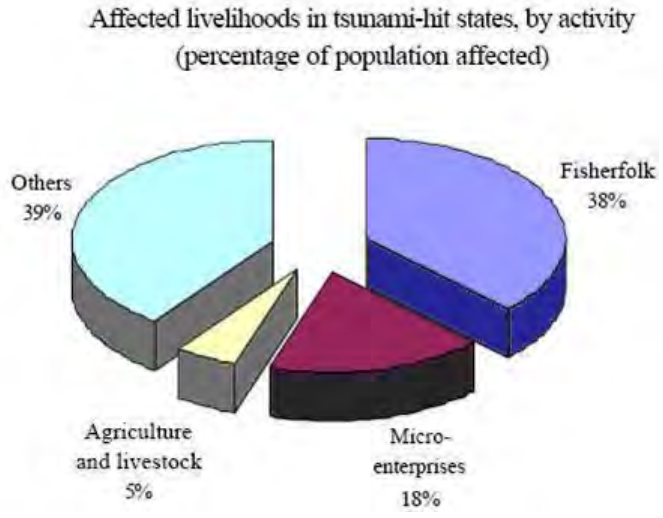
Figure 6-11 Impact of the Tsunami on Livelihoods in India



Source World Bank (2005)

At the same time, the above figure does not consider microenterprises or other forms of informal employment in India represented by the "Others" category seen at right, which includes wage laborers, seasonal workers, and other subsistence activities. This group has a preponderance of scheduled castes, tribes, and other groups with a relatively high poverty incidence. An evaluation of tsunami recovery operations[23] found that international assistance for livelihood recovery focused mainly on fisheries and to a lesser extent agriculture. The evaluation attributed this to a lack of understanding of the need to support diversified livelihoods beyond these sectors.

Figure 6-12 Summary of Damages & Losses in Indonesia



Source: UNDP

[23] Christopolos, I (2006) Links between relief, rehabilitation & development in the tsunami response. Tsunami Evaluation Coalition

6.3.6 IMPACT OF THE TSUNAMI ON GOVERNANCE

In all affected countries, the tsunami sparked efforts at both national and local levels to reinforce disaster risk reduction and disaster management policies and approaches. Most countries that were impacted took their existing disaster management policies and structures as a starting point. The exception was the Maldives, which had no specific disaster management policies or structures in place. Similarly, Sri Lanka put in place a disaster management policy only in 2005, though they were already accustomed to dealing with large-scale conflict-induced displacements.

Responses in Indonesia and the Maldives were largely nationally-led, whereas in India and Sri Lanka responses were more decentralized. The state government of Tamil Nadu showed itself to be particularly pro-active and quick in decision making from the beginning of the tsunami response in terms of providing guidelines and policies related to tsunami relief and rehabilitation. These processes included genuine efforts to consult with and be transparent with both affected communities and NGOs.

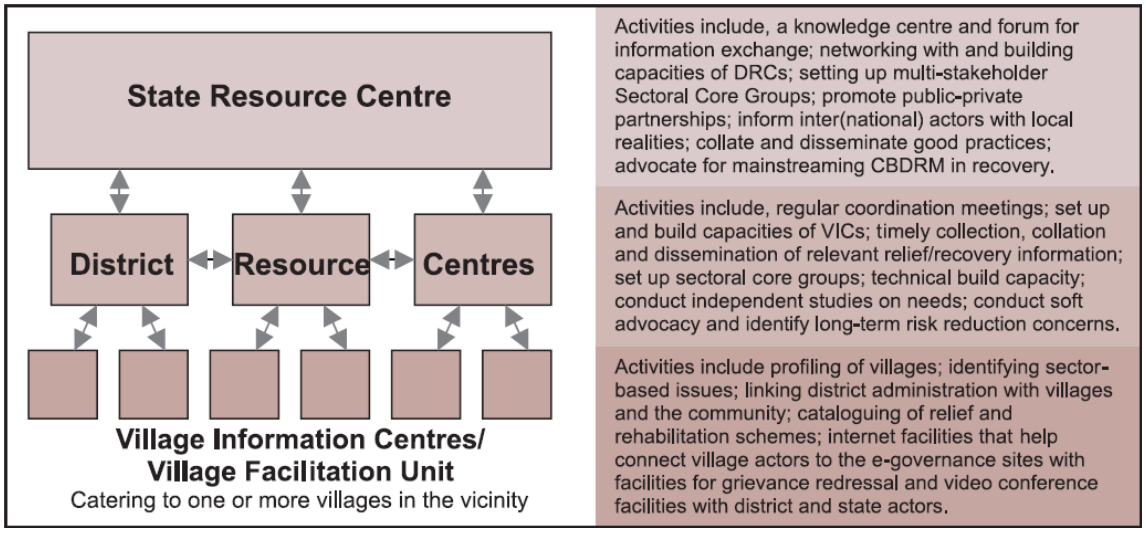
Figure 6-13 India's 10 Successful Strategies

The Government of Tamil Nadu prioritized 10 strategies that particularly helped to ensure equity and comprehensive rehabilitation in the post-tsunami environment

1. Focused leadership at political/administrative levels, along with constant monitoring
2. Complete decentralization of powers to local district officials
3. Comprehensive coverage of all sectors, touching every affected family
4. Needs-based relief activities taken up swiftly, including for fishers, farmers, orphans, and adolescent girls
5. Effective leveraging of resources from all sources
6. Risk mitigation and insurance as part of rehabilitation and reconstruction
7. Strict building standards and supervisory mechanisms to ensure compliance
8. Participation of the community at every level of decision making
9. Extensive use of web technology to enable transparency and communication
10. Focus on the conservation of coastal ecology

The way in which India dealt with this response was informed by previous experience of government-NGO collaboration during large-scale disasters, notably during the Gujarat earthquake response in 2001. NGO-driven District Resource Centers (DRCs) emerged spontaneously in worst-affected districts after the tsunami. These were later expanded and integrated into overall coordination systems (see Figure 6-14 State & District Resource Centers: Structure & Functions). The objectives of these DRCs were to promote community participation in recovery and rehabilitation, promote sustainability, and facilitate interagency coordination by creating a forum for government and civil society actors as shown in the diagram below.

Figure 6-14 State & District Resource Centers: Structure & Functions



Source: UNDP India

6.4 POTENTIAL IMPACTS OF CLIMATE CHANGE

In 2001, the Intergovernmental Panel on Climate Change (IPCC) published a guide aimed at helping policy makers by providing a number of potential scenarios for the end of the 21st century, calculating projected globally averaged surface warming and sea level rise for different model cases.[24] These projections have support by many within the scientific community, but have also been criticized as being too conservative, with other sources predicting global sea level rises of 80-100cm by the end of this century.

Table 6-3 IPCC Projections for Temperatures & Sea Level during the 21st Century

Scenarios	Temp Change (°C at 2090-2099 above 1980-1999 averages)		Sea-Level Rise (meters at 2090-2099 above 1980-1999 levels)
	Best Estimate	Likely Range	Model-based range excluding future rapid dynamical changes in ice flow
Constant 2000 Year concentrations	0.6	0.3 – 0.9	NA
B1 scenario	1.8	1.1 – 2.9	0.18 – 0.38
A1T scenario	2.4	1.4 – 3.8	0.20 – 0.45
B2 scenario	2.4	1.4 – 3.8	0.20 – 0.43
1B scenario	2.8	1.7 – 4.4	0.21 – 0.48
A2 scenario	3.4	2.0 – 5.4	0.23 – 0.51
A1F1 scenario	4.0	2.4 – 6.4	0.26 – 0.59

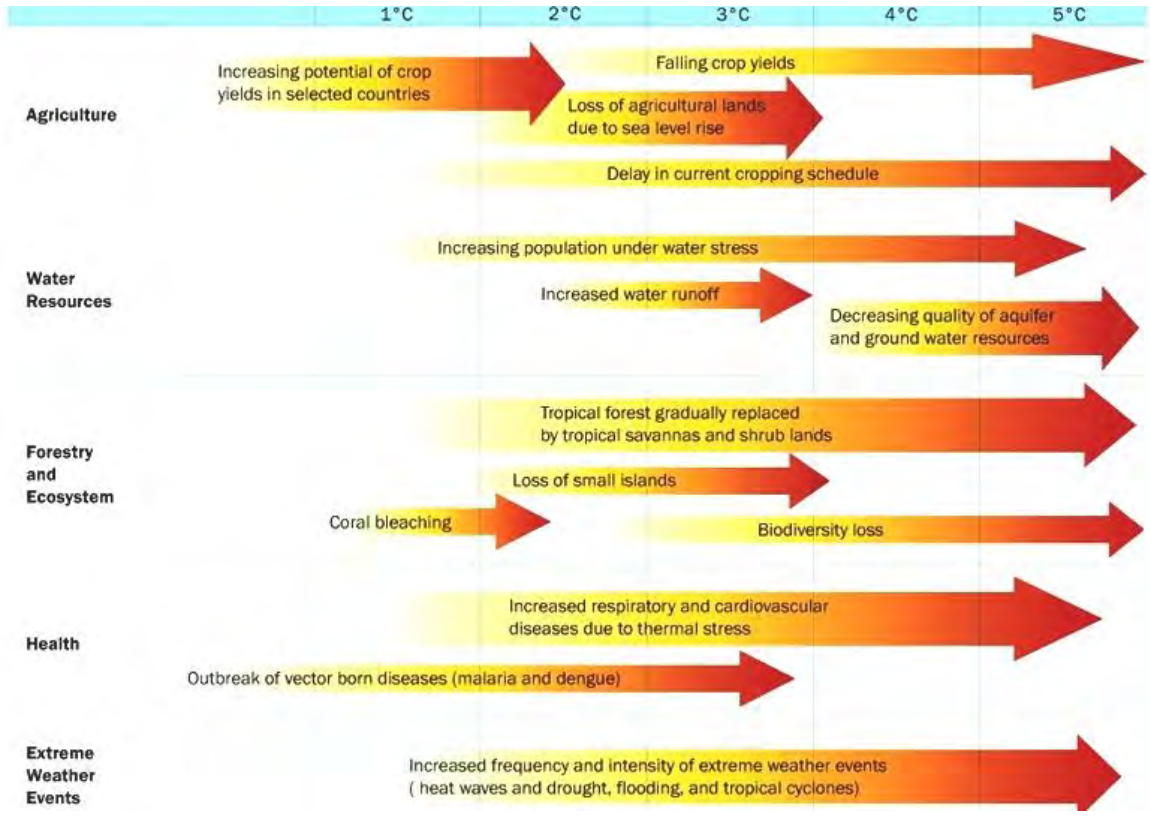
[24] IPCC (2007) Climate Change 2007 – Summary for Policy Makers (extract from pg. 11) http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-spm.pdf

The wide range of the outcomes the model predicts—from a mildly warming global temperature increase of 1.1°C to a substantial rise of 6.4°C—illustrate the uncertainties it attempts to address. Rates of temperature rise witnessed in some respects exceed worse case scenarios. CCA is an uncertain science, but disasters and changes in lifestyles and livelihoods due to environmental factors are certainties. These kinds of uncertainties with the potential for very serious consequences require a "no regrets" approach to policy development and investment. It needs to be done even if it turns out that the underlying environmental assumptions are wrong.

> "Six months to save the planet" is more likely to garner support than "there is a high probability—though not by any means a certainty—that serious climate change could damage the biosphere, depending on levels of economic growth, population growth and innovation." Politics, like journalism, tends to simplify and exaggerate.
>
> **The Economist 2010** [25]

Thinking about CCA is a useful vehicle for doing what we should be doing already.

Figure 6-15 Expected Impacts of Climate Change



Source: Asian Development Bank

[25] http://www.economist.com/printedition/displayStory.cfm?Story_ID=15720419

Table 6-4 Potential Impacts of Climate Change by Sector in India [26]

Climatic Phenomenon and Direction of Trend	Likelihood of trends over the 21st century	Human Health	Water & Sanitation	Shelter & Land Issues	Economic Recovery & Livelihoods
Over most areas, warmer and fewer cold days and nights; warmer and more frequent hot days and nights	Virtually certain	Reduced human mortality from decreased cold exposure in cooler regions	Effect on water resources relying on snowmelt; effects on some water supplies	Increased demand for cooling in tropical countries (South Asian region included); declining air quality particularly in cities	Increased yields in colder environments; decreased yields in warmer environments; increased pest outbreaks
Warm spells/heat waves; frequency increases over most land areas; higher sea temperatures	Very likely	Increased risk of heat related mortality for non-acclimatized individuals, especially for elderly, sick, very young and socially isolated	Increased water demand; water quality problems, e.g. algal blooms	Reduced quality of life for people with inadequate housing; higher risk for elderly, children and the poor.	Reduced yields in warmer regions due to heat stress; heat stress on coral reefs and associated ecosystems
Heavy precipitation events; frequency increases over most areas	Likely	Increased risk of deaths; injuries; and infectious, respiratory, and skin diseases	Adverse effects on quality of surface and groundwater; contamination of water supply; water scarcity may be relieved	Higher risk of inundation, particularly in low-lying areas; displacements for varying durations; disrupted access routes; stress on inadequate existing infrastructure and basic services	Effects on crops due to water logging; effect on supply and demand for consumer goods due to interrupted transport; soil erosion
Area affected by drought increases	Likely	Increased risk of deaths; injuries; and infectious, respiratory, and skin diseases	More widespread water stress	Displacement; social conflicts over water; agriculture-based construction materials may be difficult to find and more expensive to buy; reduced hydro-power generation and supply	Decreased production from agriculture due to crop damage and failure; depleted assets and resources; increased vulnerability and food insecurity; increased livestock deaths; decreased prices for livestock
Increased intensity of tropical cyclone activity increases	Likely	Increased risk of deaths, injuries, water- and food-borne diseases; post-traumatic stress disorder	Power outages causing disruption of public water supply	Damage due to floods and high winds; loss of property; displacement; insurance premiums are increased or coverage withdrawn in at-risk areas	Damage due to floods and high winds; loss of crops and probable damage to fishing boats and other livelihoods infrastructures; displacement; may discourage investments due to increased risk and/or higher insurance premiums

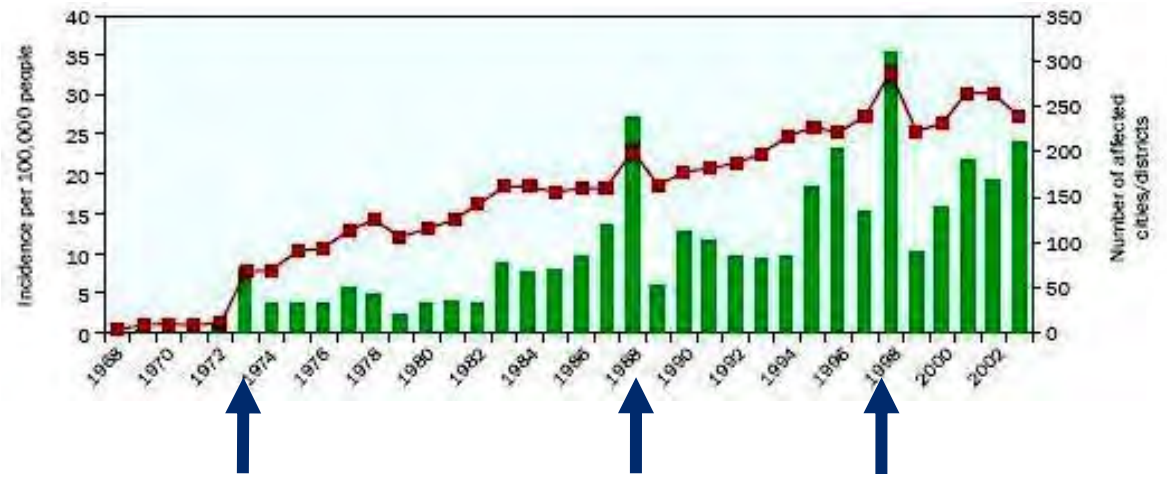
[26] Table adapted from *"Climate Change Adaptation, Disaster Risk Reduction and Social Protection"* (2008) Mark Davies, Katy Oswald and Tom Mitchell, Institute of Development Studies

Climatic Phenomenon and Direction of Trend	Likelihood of trends over the 21st century	Human Health	Water & Sanitation	Shelter & Land Issues	Economic Recovery & Livelihoods
Increased frequency and intensity of sea surges	Likely	Increased risk of deaths; injuries by drowning in floods; migration-related health effects	Decreased fresh water availability due to salt water intrusion	Loss of land due to seacoast erosion; infrastructure damage due to flooding; displacement of populations	Inundation of agricultural land and salt contamination of soil and water tables. High costs of reclamation. Decreased productivity. Increased vulnerability. Displacement or migration. Effect on fishing activities and associated livelihoods.
Sea Level Rise	Likely	Health services access patterns may be disrupted	Decreased fresh water availability due to salt water intrusion	Loss of homestead land and property. Displacement. Conflicts between host population and migrants due to limited resources	Inundation and loss of agricultural land. Decreased productivity. Displacement or migration.

Health

Increased and heavier periods of precipitation, as well as increased cyclonic activity, are likely to lead to deaths and injuries associated with flooding. The combination of increased air temperature and increased ground moisture provides an enhanced environment for mosquito proliferation. If there are more mosquitoes of a certain type, the incidence of malaria, dengue, and chikungunya will likely rise. These effects are illustrated in Figure 6-16 below since "La Nina" weather patterns are characterized by greater rainfall.

Figure 6-16: Incidence of Dengue (histogram) and Affected Areas (line) in Indonesia



Arrows indicate "La Nina" periods of high rainfall

Source: Asian Development Bank

7. POLICY ENVIRONMENT

Tsunamis occur relatively frequently in the Pacific and they are not uncommon in the Indian Ocean, though thankfully those in recorded history have not been nearly the same scale as the 2004 tsunami. It is now clear that the level of destruction wreaked by the 2004 tsunami could have been significantly mitigated with appropriate policies and corresponding capacities. As a result, governments in the region have been busy addressing gaps by establishing early warning systems and protocols and developing or refining disaster management policies, guidance and implementing DRR measures.[27]

All countries in the region actually had coastal management policies in place prior to the tsunami but attempts to enforce coastal buffer zones were largely unsuccessful. There was extensive encroachment of such zones, notably by marginalized populations who mostly depend on coastal resources (fishing, etc.) for their livelihoods. Governments saw the tsunami as an opportunity to enforce coastal exclusion zones, but with few exceptions, these hopes were not realized. In India, for example, Coastal Regulation Zone (CRZ) guidelines introduced in the early 1990s required settlements to be at least 200 meters from the coastline. The exclusion zone was not respected and this increased the death toll in the tsunami. Even with this evidence, the government still had difficulties enforcing these regulations after the tsunami. As described elsewhere, even where families were relocated to sites further inland, many still retain their original house closer to the source of their livelihoods, something that also happened in other countries.

To try and address this, there are currently attempts to devise more practical solutions in the form of integrated coastal management schemes. The Coast Conservation Department (CCD) of Sri Lanka adopted a measure so that a permit is required for any development activity within a 300-meter land buffer at the coastline, but still allows various types of livelihood activities such as fishing, cultivation of crops, planting of trees, and other vegetation within this zone without a permit. Similarly in India, an Integrated Coastal Zone Management (ICZM) Project was approved in March 2010. This World-Bank supported project will begin with a study to map the 7,500 km coastline to assess impact of shoreline change and sea level rise in the country that is home to some 600,000 people.

Various types of policies are relevant to climate change adaptation in coastal areas. Each of the countries studied now has some manner of climate adaptation strategy for which the generic term is National Adaptation Programs of Action (NAPA).[28] With the exception of the Maldives, these were mainly developed after the tsunami as part of the preparations for the 2009 Copenhagen conference.

One challenge with the climate change adaptation plans is they tend to be housed in the respective Ministries of Environment and it has proved challenging to mainstream CCA approaches. Of the countries studied, only the Maldives and Bangladesh showed evidence that CCA was actually being mainstreamed into other ministries and departments (including disaster management units).

A summary of the main policy instruments relevant to climate change adaptation for the themes and sectors covered by this study is illustrated in the table following.

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[27] http://www.scribd.com/doc/20134203/Integrated-Coastal-Planning-and-Management-in-Asian-tsunami-affected-countries-CoastNet-The-Edge-Winter-2007

[28] For further information non National Adaptation Programs of Action see http://unfccc.int/cooperation_support/least_developed_countries_portal/ldc_work_programme_and_napa/items/4722.php

Table 7-1 Policies Related to Climate Change Adaptation in the Asia Region

Country	Climate Change	
	Policies and Plans	Principle Ministries
BANGLADESH	Bangladesh Climate Change Strategy and Action Plan (2009)	Ministry of Environment and Forest National Disaster Management Council Ministry of Food and Disaster Management
INDIA	National Action Plan on Climate Change (NAPCC) Tamil Nadu state action plan for climate change (under development)	Ministry of Environment and Forests Dept. of Environment & Dept. of Forestry (Tamil Nadu State Govt.) with support from GTZ & DFID
INDONESIA	National Adaptation Plan on Climate Change (RANPI) in progress National Development Plan	Ministry of the Environment (MOE)
THE MALDIVES	2006 National Adaptation Plan of Action (NAPA) National Environmental Action Plan (NEAP) National Strategy for Sustainable Development (NSDS)	Presidential Advisory Council on Climate Change Ministry of Fisheries, Agriculture and Marine Resources National Disaster Management Center
SRI LANKA	National Communication under the United Nations Framework Convention on Climate Change (2000) National Climate Change Policy (in progress)	Ministry of Environment and Natural Resources, National Advisory Committee on Climate Change
VIETNAM	Vietnam Initial National Communication to the UNFCCC (2003) Vietnam Second National Communication (2006/2007) National Strategy for Environmental Protection (2005) National Target Program on Responding to Climate Change (NTP) (2008)	Ministry of Natural Resources and Environment (MoNRE)

8. KEY OBSERVATIONS & LITERATURE REVIEW

The timing of this study provided an opportunity to observe many of the challenges to sustainability once international humanitarian funds had dried up and most agencies had left. To supplement firsthand observations in the Maldives and India, the study team also reviewed an extensive range of documentation both relevant to lessons learned from the tsunami and climate change adaptation, looking particularly at Bangladesh, Indonesia, Sri Lanka, and Vietnam in addition to the two countries visited.

These countries have all taken somewhat different approaches to climate change adaptation, reflected both at a governmental and community level. During the two field visits, for example, the team observed much less awareness among a broad range of stakeholders in India regarding climate change and its implications than among their counterparts in the Maldives. This is not so surprising, given the specific context of the Maldives. With an average altitude of 1-2 meters above sea level, acquiring a good understanding and addressing the potential impacts of climate change has been a top national priority for the Maldives since the 1980s. What was strikingly similar to what the study team had found in the Maldives, however, was how perspectives on disaster risk reduction and environmental protection had completely changed after the tsunami had struck coastal areas of Tamil Nadu both within the government and at the community level. The phrase "the tsunami changed things" was often heard in one form or another from a wide variety of stakeholders, and more importantly, this appears to have translated into an increased willingness to invest resources – both time and money – into disaster risk reduction and environmental protection.

8.1 DISPLACEMENT, RESETTLEMENT, AND RECOVERY

A USAID-sponsored regional workshop in Bangkok during 2006[29] identified some key common lessons after the tsunami, including:

- Importance of coordination among donors, NGOs, and government organizations
- Use of mechanisms for local participation and capacity building in recovery and reconstruction efforts
- Tailoring actions to site specific contexts, including decisions on coastal protection structures and recognition of local culture and indigenous knowledge
- Training and capacity building
- Use of natural barriers as a bioshield to protect people
- Adoption of ecosystem-based management measures within an integrated coastal management framework

This study found many of these themes identified have the potential to provide a sound basis for support to climate change adaptation.

Socio-economic changes resulting from large-scale displacement following disaster events can be divided into four phases: 1) existing trends (some of which may be already creating stresses in society) will be accelerated

[29] USAID (2006) Lessons Learned in Recovery Post-Tsunami Relief and Reconstruction for Sustainable Coastal Development http://pdf.usaid.gov/pdf_docs/PNADN456.pdf

by resettlement; 2) significant changes in technologies relating to housing and household employment; 3) intensification of traditional economic strategies to make up for time and income lost as a result of the disaster; and 4) the innovation of new strategies and technologies that eventually take place to cope with a new environment.

Shelter and Reconstruction

Shelter presents a particular challenge during post-disaster recovery. Housing often has a significant impact on people's lives and livelihoods, particularly in rural areas. Unit costs are high, making it impossible to cover all needs with external assistance and mistakes are costly and often difficult to rectify. Complex choices include who receives how much assistance (targeting), what are appropriate roles for house owners and contractors, and whether to promote reconstruction *in situ* or relocation. Observations by the study team indicated that some of the choices made were not always appropriate.

Reconstruction after the tsunami took much longer than planned in all countries and in some cases, as the team observed in Maldives, many families are still waiting for their houses to be reconstructed over five years later. This was not due to a lack of interest or funding and delays could be attributed to different reasons, of which the main ones were:

- Uncertain land tenure: In Sri Lanka, over 250 different international agencies committed themselves to building permanent houses. Although temporary shelters had been constructed by the end of 2006, only 6% of the almost 100,000 permanent houses planned had been built, mainly due to uncertainties over enforcement of a proposed coastal buffer zone.[30]

- Rapidly escalating costs: In the Maldives, unit costs for houses built to a standard design increased by over 150% between 2005 and 2009. Similar price inflation for materials, transportation, and labor were seen in other countries.

- Non-respect of contracts by both NGOs and private sector contractors. There were a number of examples of NGOs making commitments without fully understanding the complexity of house construction and land tenure issues and/or not being able to make up the budgetary shortfalls when costs escalated. In Tamil Nadu, the government ended up assuming responsibility for constructing thousands of houses that NGOs had originally agreed to build. In the Maldives, negotiations were still continuing at the end of 2008 with the donor and private contractor while over 3,000 displaced persons remained in temporary shelters.

- Lack of clarity over land tenure.

Each country and in the case of India, each state, adopted different approaches to reconstruction and resettlement. While Sri Lanka and Indonesia saw extensive use of owner-driven approaches, India and the Maldives both implemented 'agency driven approaches' with a lead role assumed either by the government or NGOs. As described above, after the tsunami the government of the Maldives not only saw the need for disaster planning, but also land-use planning, where vegetative cover was seen as essential and reinforcement of greenbelts was encouraged. Island residents were generally supportive of such efforts since they had witnessed their protective value.

In India, responsibilities for developing standards were largely decentralized to the state level and this resulted in significant variations in terms of unit cost of the houses and approaches used.

[30] INTRAC (2007) Irish Aid's Support to Tsunami Affected Countries: A Value for Money Review

Table 8-1 Cost Comparison Post-Tsunami Reconstruction for Government-Provided Housing in India

State/Territory	Approx. Average Unit Cost	Approx. US$ (2007)
Tamil Nadu	INR 150,000	$3,700
Kerala	INR 300,000	$7,400
Pondicherry	INR 150,000	$3,700
Andhra Pradesh	INR 35,000 - 40,000	$870 - $990
Andaman & Nicobar Is[31]	INR 1,000,000	$24,770

The study team observed that relocation in Tamil Nadu has often resulted in affected families ending up with two houses: a new house at a relocation site and the existing house at the old site. A similar phenomenon was seen in the Maldives where families were relocated to the island of Dhuvaafaru but fishermen tended to stay on their original island which was closer to traditional fishing grounds. Despite a government rule to convert old housing land into paramboke (village common lands), this was resisted by coastal communities who were reluctant to give up their former lands.

At the same time, a number of examples were seen in India where relocation and reconstruction schemes had empowered marginalized communities and reduced their vulnerability either through regrouping landless tribes or in relocating populations who were losing their lands due to severe coastal erosion.

Contractor vs. Owner-Driven Approaches to Housing Reconstruction

Expectations in tsunami-affected countries often were that a contractor-implemented approach using standardized designs would be the most efficient and effective solution. Looking back over the past five years with the benefit of hindsight and the knowledge that there are thousands of families around the region who lost their houses during the tsunami and are still living in temporary shelters, the evidence is unconvincing. In all countries, initial planning timeframes and cost estimates proved to be completely unrealistic. Along with quality control problems, maintenance issues, and unforeseen social and cultural impacts can be added significant levels of corruption.[32] There was considerable political pressure to deliver quick results and create "showcase" model settlements. There was also the prospect of profits (both legal and illegal), a lack of transparency about entitlements, and processes along with either a lack of familiarity with owner-driven approaches (as in the Maldives and Aceh) or disincentives to adopt such approaches (as in Tamil Nadu), which meant that such approaches were barely used.

[31] Pre-fabricated houses

[32] Transparency International (2006)

Case Study: Owner-Driven Approaches During Housing Reconstruction in Bihar state in India Following the 2008 Kosi Floods

Destruction of houses or degradation of housing conditions is a predictable impact of climate change. Adaptation strategies need to not only consider options of "build back better" reconstruction, rehabilitation and relocation, but also sustainability. Although not a coastal area, the approach used during housing reconstruction in Bihar State in India offers a good practice example that could be equally applied in coastal regions.

Five districts in Bihar state were severely affected by the 2008 flooding. More than 150,000 houses were destroyed and over a million people displaced. The state government of Bihar set up a large-scale reconstruction program based on an approach that puts owners in charge of the reconstruction of their own house, supported by a network of NGOs, individuals, government officials with experience in past disasters and external donors such as the UNDP. The network set up a series of 'hubs' at the panchayat level to facilitate reconstruction processes through representation in technical committees, management support to district level and capacity building of government-appointed personnel including master artisans, social workers and engineers.

During the initial phase, nearly 10,000 homeowners were reconstructing their homes under this program. Although not without problems and challenges, in comparison to most of the post-tsunami reconstruction schemes, the results have not only been more cost-effective hazard-safe houses mainly using locally-available materials, but also have had positive psycho-social impacts as the active involvement of homeowners helped them gain confidence. There is also an enhanced sense of ownership; to the government's Rs. 55,000 allocation paid in two installments (around 30% of the average cost of a post-tsunami house) monitoring during the pilot phase discovered that owners were adding on average 20% of their own funds to make additional improvements. The Bihar state government provides pre-defined grants, technical knowhow, monitoring and social facilitation through village, district, and state level institutional mechanisms specifically set up for this purpose. Technical guidelines for local materials and technologies for disaster-resistant construction have been disseminated and these are supported by social and technical facilitation at the community level to ensure that houses are above average annual flood level, have roof terrace or attic spaces for taking shelter during floods, and incorporate seismic and storm safety features.

Owner-driven approaches are not a new concept. These approaches were used in Gujurat after the 2001 earthquake and, although application was relatively ad hoc in comparison to the approach used after the 2008 Bihar floods, studies have shown some of the same positive results were achieved.[33] Owner-driven approaches were also widely used in Sri Lanka[34] and in Aceh. There are examples where similar approaches were applied after the tsunami (see case study below) but these are very much the exception. Otherwise, owner-driven approaches were only observed in cases where houses needed minor repairs and there was little support to encourage owners to "build back better". Reconstruction in situ or construction in relocation sites was usually on the basis of blueprint designs supplied by the government and implemented by contractors.

These findings beg the question why owner-driven approaches were not more widely applied after the tsunami. The scale is comparable – 150,000 houses destroyed in Bihar during the 2008 Kosi floods and over 100,000 in the whole of India during the tsunami. This difference is probably partially linked to the high levels

[33] Duayne Barenstein (2008) "From Gujarat to Tamil Nadu: Owner-driven vs. contractor-driven housing reconstruction in India. Information and Research for Reconstruction" http://www.sheltercentre.org/library/From+Gujarat+Tamil+Nadu+Ownerdriven+vs+contractordriven+housing+reconstruction+India

[34] Aysan, Y. (2008) Final Evaluation Report on the Cash for Repair and Reconstruction (CfRR) Project http://www.sdc-cashprojects.ch/en/Home/Experiences/SDC_Cash_Transfer_Projects/media/Experiences/SCD%20Cash%20Projects/081222%20CfRR%20Final%20Evaluation%20Report.pdf

of external funding along with the large number of families who were relocated to specific sites after the tsunami, which lends itself to a "blueprint" approach. Of the 65,000 new houses constructed in Tamil Nadu, 88% were in relocation sites whereas virtually all of those in Bihar were built on the original plots.

At the same time, even in situ reconstruction was observed to follow similar patterns with pre-selected designs and use of contractors with little owner involvement. Similar approaches were observed in the Maldives and in other tsunami-affected countries. Wherever the team came across examples where owners had been able to occupy their houses without significant delay, it was almost always repairs undertaken by the owner themselves either with a government grant or their own funds.

Figure 8-1 An Example of Post-Disaster Housing in Each Country Included in the Study

India

Vietnam

Sri Lanka

Maldives

Indonesia

Bangladesh

Although this may have provided incentives for a top-down contractor-dependent approach, the issue was not necessarily relocation itself. While there were complaints about houses and some negative impacts on livelihoods (particularly for women), it was clear that this was mainly due to the failure to take livelihoods into account either when designing houses or considering how impacts could be offset. Many families relocated

away from the coast feel safer and understand the reasons for being moved, particularly those who had lost family members. Leaders in villages which were experiencing serious coastal erosion (see Figure 8-3 Erosion on the Tamil Nadu Coastline) said that many of those who had chosen not to move to relocation sites were now having second thoughts.

Case Study: Relocation of Communities in Tamil Nadu in Southern India: An Example of Participatory Resettlement and Reconstruction

The South Indian Federation of Fishermen Societies (SIFFS) worked with the community in Tarangambadi village in Nagapattinam district prior to the tsunami. After the tsunami, some 1,000 families were identified for resettlement by the Government and local panchayat leadership and land was identified adjacent to the existing village on the inland side away from the coast. SIFFS undertook a detailed contour survey to map elevation and drainage patterns. Through consultation and joint analysis of the mapping results with the community, areas were identified for settlement in the new site that would be protected from hazards such as tsunami, storm surges, and floods.

A site plan was prepared and each family identified their neighborhood and homestead plot. This process of identifying the homestead plot proved to be a key step as it encouraged beneficiaries to actively engage in construction, quality monitoring, and customization. SIFFS team included social workers as well as technical members who worked with each family to customize the house as per their needs and preferences within the overall budgetary guidelines. Choosing from seven basic plans developed from traditional houses, each family could make their own customization at the stage of site lay out and construction. Once the houses were completed, owners were supported by training in maintenance and technical guidance for incremental additions and modifications. In this case, relocation was on land adjacent to the existing village so livelihood linkages, including access to the sea and coastal infrastructure, remained largely intact. In fact, SIFFS used the opportunity of an influx of funds to strengthen livelihood infrastructure by constructing an improved fish auction yard and ice plant.

Water and Sanitation

Water and sanitation was a critical sector after the tsunami and, while water supplies were relatively quickly restored in most areas, this sector continues to be a key priority for coastal communities. Relocated villages were not always well planned and water is provided for only two hours a day at many locations. Groundwater in coastal areas was contaminated by saltwater intrusion during the tsunami, but is actually a chronic problem in many areas. Farmers are allowed to pump as much water as they like, with many not being charged for electricity. This unregulated access has had an adverse impact on coastal community water supplies.

In the aftermath of the tsunami, there was a marked increase in demand from communities with information, including about water quality and supply. Programs implemented by NGOs in partnership UNICEF training young people on water quality testing have made considerable progress in understanding this problem. Testing and treating water for villages are done by the local water board, but this is somewhat sporadic in nature and occurs mainly during the monsoon.

As part of the post-tsunami rehabilitation and recovery effort, many NGOs provided drinking water plants based on reverse osmosis technology. The communities were trained on the management of these systems and the water is sold for a nominal price to local consumers. In some cases, plants are being managed by women Self Help Groups. The success stories contrasts with the situation in the Maldives where community-based approaches were not used on the whole and, probably as a result, most of these plants are no longer functioning. Often it was because the trained people often went off and found better jobs. There were a few exceptions. A USAID-funded project managed to support sustainable desalination plants with a capacity of

30,000 litres per day on the islands of Naifaru and Hinnavaru by forming water management committees and partnering with the local water company, who continues to sell the water produced at a profit.

India was not without its challenges in this sector. Sanitation was an area where attempts to change traditional habits were met with difficulties. This problem is particularly visible in relatively densely-populated relocation sites where many of the toilets are not being used. In India, the government pitched in with the Total Sanitation Program but this has still not been fully implemented yet. Ecosan programs are being implemented in some villages and have been successful to some extent. The Ecosan sanitation method (GTZ, 2003) is based on the implementation of reuse and recycling of nutrients and water as a hygienically safe, closed loop system. Ecosan systems enable the recovery of nutrients from human feces and urine for the benefit of agriculture and protection of groundwater. NGOs are supporting with training and capacity building programs.

Health

Because of the limited destruction zone of the tsunami, sufficient health care capacity remained in the non-affected areas to care for the acutely injured within the existing health care system. However, many relief groups arrived with medicines and personnel to provide on-site health care to those in temporary or transit shelter situations. This type of aid was largely uncoordinated but did not last long, and was rapidly replaced by medical care camps on the grounds of the local hospitals and medical schools. These camps provided more appropriate diagnostic, curative, preventive, and referral services in a village friendly environment, adjacent to institutions where a higher level of care was provided when needed.[35]

Although child malnutrition incidence has shown a steady decrease in India, it remains a chronic problem among the marginalized communities. In the tribal community that was visited during the field visit, six of the twelve under-five children examined showed evidence of under-nutrition based on mid upper arm circumference. A main complaint in the community was a lack of access to sufficient quantities of palatable water and lack of appropriate sanitation. These problems may be exacerbated by both drought and flood scenarios.

Economic Recovery and Livelihoods

The subject of livelihood enhancement and diversification among coastal fishing communities has been debated since the early 1990s, when doubts started cropping up about the capacity of marine fisheries to contribute sustainably to livelihoods, especially those of the poor. These doubts sprang from the fact that most fisheries had begun to show signs of distress. In most of the fishing villages visited during this study, fishermen reaffirmed the presence of declining catch trends. A number of factors have contributed to this decline, including over-fishing and destructive fishing; urban, agricultural, and industrial pollution; and destruction of critical coastal habitats and nurseries. As a result, the sector's contribution to national economies has declined or remained static.[36]

In India, initial impact assessments revealed that more than three-fourths of tsunami-affected people belonged to Tamil Nadu's coastal fishing communities. Of the houses damaged or destroyed, 80 percent were fisherfolk.[37] In addition to losing housing and working space, these people also lost livelihoods and economic assets, from boats and nets to markets. Initial relief efforts consequently focused on fishing communities, and compensation was given only to those who could provide proof that they had lost assets in the tsunami.

After the 2004 tsunami, financial support for livelihoods in coastal fishing communities came flooding in, but there was little understanding of the impact on livelihood. Many of the boats and fishing gear purchased was ill-suited to local conditions and when areas were visited by evaluation teams a few years later, they found

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[35] http://www.disasterwatch.net/Best%20Practices/ssp_tsunami.pdf

[36] UNDP Post Tsunami Coastal Livelihoods Report

[37] Regnier, P. (2007) From Post-Tsunami Emergency Assistance to Livelihood Recovery in South India. Terre des Hommes

many abandoned boats.[38] With some notable exceptions, agencies mostly stuck to the conventional notions of equating increased production with wealth creation, despite the evident differences in access to assets by different stakeholders within supply chains. Efforts to bring in social and economic equity – by promoting group ownership of boats where there was no traditional basis for this or providing boats to women's groups failed to take into consideration either the larger resource context or the local cultural and social context.

At the same time, there is increasing recognition of the need to diversify livelihoods, including using techniques that are adapted to sea level rise and increased flooding incidence. Some of these activities, such as integrated sea water farming, often include natural coastal protection.

"Floating garden" on Bangladesh marshes

PHOTO: www.careclimatechange.org

Integrated seawater farming in India

Photo: P. Brown

Youths from the fishermen communities the team spoke to often said they would prefer not to follow in their fathers' footsteps, but would rather train to be semi-skilled laborers, like drivers or electricians. One of the reasons cited was diminishing fish stocks. There was a similar trend noted among farming communities, and the older generation noted with a tinge of regret that it was also an issue of social standing; these days most parents preferred that their daughters married men who had fixed incomes.

Vegetable Plot in the Maldives

Photo: J. Baker

In the Maldives, agriculture has potential to become a limited alternative livelihood option. People are used to maintaining kitchen gardens around their houses (something that was not considered when designing houses in relocation areas), but part of the recovery support to affected populations was to furnish inputs and technical support to expand agricultural plots on the fringes of villages. The team visited one island where a woman's group had set up a hydroponics scheme. However, despite considerable demand for agricultural produce both for resident and tourist populations, it has been difficult to compete with imports from nearby India due to a combination of production costs, water availability, and availability of good quality land.

Microfinance and alternative livelihoods that are built to be economically and environmentally viable and sustainable

[38] Brusset et al (2009) A ripple in development? Long term perspectives on the response to the Indian Ocean tsunami 2004

could greatly help in building the local adaptive capacity and reducing vulnerabilities to the disasters and the climate changes.

Capital, regulation, and microfinance-linked capacity building support to the beneficiaries are still areas that need attention in most of the coastal communities in Asia. Diversification of the microfinance products is also seen as equally important to include micro-insurance, individual farmers' crop insurance, savings, risk sharing, etc.

Most Alternative Income Generation (AIG) programs have been driven by the interests and inclinations of donors or implementers; fishers have been relegated to being 'recipients'. Their participation has been confined to choosing an item or two from a pre-determined menu of options. Invariably, the outcomes of such externally driven initiatives have pleased neither the fishers nor the implementing agencies. The problem with such an approach was that it did not provide for adequate integration of the local knowledge, needs, and fishing context. As a result, it had brought in new problems to the fishing community rather than providing a solution.

This was quite apparent at the village level, where during our visits the fishermen indicated a significant increase in the number of boats, a significant reduction in the catch and incomes, and loss of interest in the upcoming generation to continue undertaking fishing as a major source for livelihoods.

There are few cases of private sector as well as government supported insurance systems in India to compensate for crop and livestock losses. In the Maldives, the insurance system may have some cultural as well as resources barriers to overcome. In general, weather based crop insurance systems are still in rudimentary forms with very limited coverage and scope. More investment is needed to increase the coverage and to develop more individual oriented insurance systems that could be made more accessible to the small holders in the rural areas that are prone to climate change hazards.

Figure 8-3 Erosion on the Tamil Nadu Coastline

Figure 8-2 Coastal Erosion Beyond the Limit of a Sea Wall

Environment and Protection of Ecosystems

That the world's second most populous nation puts considerable pressure on the environment should come as no surprise, even without considering the effects of climate change. Among the coastal communities visited in India, there were two common concerns voiced apart from water resources: fish populations and coastal erosion.

Coastal erosion ravages land, houses, infrastructure, and business opportunities and poses a high risk to human well-being, economic development, and ecological integrity. It diminishes coastal livelihoods, particularly among poor households, and ultimately coastal economies. Every year in India, 400 hectares of land, 75,000 hectares of crop areas, and 34,000 residential houses and industrial establishments are lost or damaged through coastal erosion. The impact is predicted to be more widespread in the coming years as economic development continues to gather pace and due to climate-related phenomena. The rural poor coastal communities are the most vulnerable to the impact of erosion and poor coastal management since they are usually the ones

residing in marginal areas. Yet many of India's rapidly growing urban population are also vulnerable. Mumbai, for example, spends about $2.5 million per km on capital works alone to protect some of its prime waterfront property (ADB, 2010).

Ironically, if not planned carefully, efforts to protect coastlines can have severe negative impacts. Villagers from the community shown in Figure 8-3 Erosion on the Tamil Nadu Coastline claimed that 100 meters of coastline had been eroded during the past six months after a protective wall was installed further to the south (a phenomenon illustrated in Figure 8-2 Coastal Erosion Beyond the Limit of a Sea Wall). Harbor development has also witnessed similar impacts.

Part of the changed mindsets following the tsunami has been a renewed interest, including at the community level, in renewing ecosystems as a form of protection. The protective function of mangroves from the tsunami was particularly noticeable[39] and this has translated into a number of mangrove restoration projects and other related schemes.

Coastal Casuarinas Plantations in Southern India

Sand dune stabilization and use of mangroves has been shown to be effective in protecting inland areas from the tsunami and these natural barriers can also assist protecting areas from sea egress due to climate change (see Figure 8-4 Coastal Profile). However, this natural capital needs to well-managed. For example, sand dunes are extremely vulnerable to wind erosion once anchoring vegetation has been damaged or destroyed. Research has demonstrated that dune vegetation is sensitive to damage by human disturbance and unregulated use of dunes can damage or destroy thousands of years of geologic formation processes in a relatively short period of time.

With coastal erosion taking place at a relatively fast rate, sustainable and alternative solutions for coastal protection are urgently needed as human activities and relative sea levels exert mounting pressure on the coastal zone[40]. Innovative techniques, many of them led by NGOs, for effective and unobtrusive shoreline

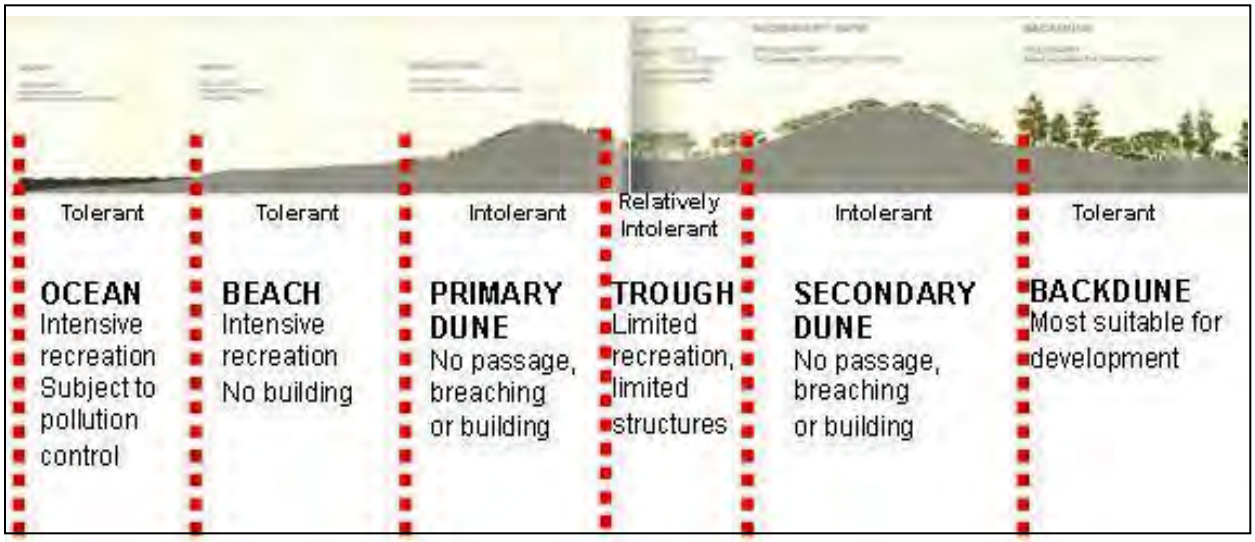
[39] Danielsen, F. et al. (2005) «The Asian Tsunami : A Protective Role for Coastal Vegetation» Science v.30 p 643

[40] MoEF (2009), ADB (2010)

and inshore control such as beach nourishment, dune management, artificial reefs, or replacing or modifying hard rock protection are being piloted.

India is making the transition to softer solutions, but it is not an easy one as it will require relatively significant investments in planning and design to have a significant impact. Under the Coastal Management Zone (CMZ) Notification, planning and design studies must include a comprehensive analysis of the causes and extent of erosion. The designs must be appropriate for the root causes of the erosion and must accommodate coastal processes in the solution rather than simply trying to mitigate the effects. Instead of the current ad hoc approach, this implies a switch to a more comprehensive one based on participatory planning, better-designed and environmentally friendly coastal infrastructure, and accountability, with the long-term goals of minimizing costs and reaping economic benefits.

Figure 8-4 Coastal Profile



Adapted from "Design with Nature" by Ian L. McHarg (1995)

In addition to sand dune stabilization, mangrove and non-mangrove multi-species forests play an important role in the protection of estuaries and other suitable coastal areas. These in essence form a bioshield and protect low lands against flooding. Because mangroves are mainly suitable for estuaries, NGOs have been working with communities to plant non-mangrove bioshields along the coast.

8.2 SOCIAL AND CULTURAL ISSUES

The rehabilitation of coastal communities after the tsunami has in some cases fundamentally changed both the coastal landscape and community life. The predominant inhabitants of coastal villages, the fishing community, had been relatively isolated prior to the tsunami. One of the important impacts of post-tsunami rehabilitation has been exposure and a much greater degree of integration with the wider community.

As the study team had observed in the Maldives, it is clear that relocating the affected population is not only about 'rehousing' displaced people, but primarily about reviving their livelihoods, and rebuilding the social environment and social capital. This was a pattern repeated in Indonesia and Sri Lanka. Most of the relocation sites in Tamil Nadu were relocated close to the original settlement for their access to sea, so the main source of their livelihoods was guaranteed. According to the community members, new disaster-resistant housing was the incentive that encouraged them to relocate to the new settlements.

Where relocation did take place, typically the whole village was relocated first to temporary shelters and later to new houses in relocation settlements. This helped to retain the social environment. The active involvement

of traditional leaders in selecting the place with the local government agency assured the most suitable site for relocation. In India, there were cases where there were budget deficits for the purchase of land by the government, and local communities chipped in to buy preferred sites. Proximity to the old settlement was the most important criterion adopted by the community for selection. In relocation sites, however, diverse traditional designs have been replaced by identical new houses with brick-cement walls and reinforced concrete roofs laid out with monotonous and repetitive concrete blocks.

Traditional house construction in Tamil Nadu

Relocation site in Tamil Nadu

Photos: J. Baker

8.2.1 ROLE OF WOMEN

Twice as many women as men died in the tsunami, but this did not prevent them from playing a central role during the recovery. They carried considerable emotional and economic responsibilities, notably in sustaining their family's food and livelihood security. They tend to be the primary caregivers for those affected by disasters like children, the injured, sick, and the aged population, helping meet these groups' immediate survival needs.

The tsunami created opportunities for empowerment. Newly-constructed houses were mostly a joint title, though this practice was not usually applied to in-situ houses. In India, for example, permission was needed from current owners (usually their husband or father in law) in order to re-register for joint ownership.

Relocation some kilometers from the coast has also altered women's role as fish vendors. Their traditional settlements are on the coast, so it is relatively easy to meet boats as they arrive. This is no longer possible in relocation sites and they are obliged to wait by the coast for the boats to arrive in case they miss the auction. The use of cell phones alleviates this problem to some extent, but even this solution tends to marginalize poorer families.

Mobilization of women, especially from the fishing community, has taken place at a massive scale. Some 600,000 women are currently formed into 61,000 Self Help Groups. Women members have acquired new skills in the areas of entrepreneurship, leadership, and management of micro-enterprises both fishery and non-fishery based.

In the Maldives, women have traditionally played a subordinate role in society but this has changed over the past few years. Women's participation is highest in the education, health, manufacturing, and agriculture sectors. In 2008, some 52 percent of public servants were female, including around 70 percent involved in education. Nearly a thousand women benefited from tsunami livelihood restoration programs.[41] On the other hand, interviews with government officials and women in communities indicated that many women who were formerly active in both fish processing and subsistence gardening found themselves with little to do in new settlements due to a lack of planning that accounted and accommodated for those activities.

[41] Department of National Planning (2009) "Maldives – 4 Years after the tsunami: Progress and remaining gaps".

8.2.2 CHILDREN AND YOUTH

Among the most severely affected victims of the December tsunami were the children, who accounted for around 30% of the causalities. Many of those that survived suddenly became orphans who lost one or both parents. Of the children who lost one parent, most often their mothers died. An initial attempt by the Indian government to facilitate adoption was soon reversed due to concerns about trafficking and replaced by a decision not to allow adoption of children. The government established orphanages in the worst affected districts of Cuddalore, Nagapattinam, and Kanyakumari. A fixed deposit of Rs. 500,000 was created in the bank for each orphan who lost both the parents to be used for studies and self-employment when the child reaches 18 years old. Thanks to the strong social structures of affected communities, very few orphans actually ended up in orphanages.

Schools located in the coastal villages were damaged; class rooms and equipment were destroyed. It was estimated that the tsunami significantly disrupted the education of around 260,000 children. Immediately after the tsunami, many village schools were used as temporary shelters for affected populations. Internal displacement was a major issue. A large number of students in the fishing communities were relocated. Internal displacement contributed to school drop outs, and this trend continued even after the rehabilitation program started implementation. An increased dropout rate due to displacement was also reported in the farming communities also after the tsunami, mainly among agricultural laborer families who migrated to other parts of Tamil Nadu in search of work. In the case of many marginalized groups (such as children from the Irula tribe), relocation has actually improved their access to education. Before the tsunami, these largely nomadic families were living scattered along the coast, constantly on the move, without a consistent community structure. After the tsunami, they are now relocated into settlements and parents are willing sending their children to school.

8.3 ROLE OF NGOS AND THE PRIVATE SECTOR

The tsunami relief and rehabilitation program was treated as a special case by government authorities, due to the nature of the disaster and the scale of the damage. The state of Tamil Nadu appointed an Officer in Special Duty, whose responsibility was to coordinate all 11 line departments in responding to the tsunami. A steering committee consisting of secretaries of the state departments was established, empowered to take major decisions. Devolution and decentralization of power at the district level enabled the local authorities to avoid over bureaucratization and ensure a timely response. District disaster management plans and village level plans were developed immediately after the tsunami with the support of the civil societies. The state government was generally very transparent in its handling of the crisis, uploading updated information on their website on a regular basis. The Tamil Nadu Tsunami Resource Centre (TNTRC) facilitated coordination and collaboration between different humanitarian actors, including NGOs and international agencies (Figure 9-1 Structure of the Tamil Nadu Tsunami Resource Center (TNTRC)).

8.4 COMPARISON WITH CLIMATE-INDUCED DISASTERS

The future timeframe of displacement due to sea level rise is uncertain. However, the large-scale displacement due to climate change, both temporary and permanent, is more likely to occur during climate-induced disaster events, such as cyclones or flooding. Therefore, the team compared the post-tsunami disaster response with an example of a climate-induced disaster, the 1999 Super Cyclone of Orissa.

The visit by the study team to Orissa in India not only provided insights into potential convergence between cyclonic and tsunami-related response and recovery patterns, but also a useful snapshot of how much disaster management approaches have evolved over the past decade in Orissa and in India as a whole.

Loss of life as a result of the 1999 Orissa Super Cyclone was on a similar scale to that seen in Tamil Nadu following the tsunami. Loss of assets and impact on livelihoods in Orissa were also severe, with almost 800,000 houses completely destroyed and a similar number severely damaged, with 1.7 million hectares of agricultural land damaged and some 1.2 million people affected.

In contrast to tsunami recovery operations, there is little evidence of a "build back better" approach in Orissa. There were no resettlement schemes and only minimal support was provided for in-situ reconstruction. Traditional house construction in coastal regions, especially in rural areas, is mainly mud walls and thatched roof. After the 1999 response, the same types of houses were constructed after the cyclone using similar materials, which will not help address the population's vulnerability to withstand the effects of cyclones in the future. This type of construction also requires regular maintenance, and the team heard complaints from inhabitants who reported that thatch was increasingly more difficult to find and is expensive to buy.

Traditional governance systems, including elected village leaders, played a relatively small role in disaster response programs. There did not appear to have been an analysis of how the disaster impacted women's lives. Based on interviews conducted by the team, women were largely marginalized during the response and recovery operations. Some NGOs made efforts to mobilize women and formed Self Help Groups that established microcredit schemes and provided income generation training and support to small businesses. There was no evidence of any systematic attempts to assess vulnerabilities of marginal communities, artisan groups, and other vulnerable groups although some NGOs did target these groups with livelihoods programs. At the same time, it is evident that the government and the population themselves had learned many lessons from the 1999 super cyclone. However, in the absence of disaster-resistant housing and an untested disaster management plan, it is likely that there will still be some lessons to learn during the next cyclone.

As the team observed in Tamil Nadu, there is a relative lack of awareness and understanding of climate change and its likely impacts in Orissa. With support from the World Bank and DFID, the state government of Orissa published a "draft copy" of their Climate Change Action Plan[42] in early June 2010, but gave only three weeks for feedback. The plan largely focuses at a macro level, but includes measures strengthening coastal protection measures, developing of a "techno-legal regime" for construction of disaster resilient housing and public infrastructure, integrating climate change risk in the state's disaster management policy, and raising community awareness about likely impacts of climate chance on livelihoods.

[42] Government of Orissa (2010) Orissa Climate Change Action Plan ("Draft Copy" for consultation)

9. SUMMARY OF FINDINGS

Generous budgets and numerous actors (including hundreds of international agencies) engaged in tsunami response and recovery efforts provided an opportunity to test out different approaches. Given that most actors involved had little experience in dealing with a disaster of such magnitude coupled with a relative lack of oversight, it is hardly surprising that – along with the replicable good practice examples – there are many that fall into the category of practices that need to be improved in future.[43] Climate change poses the same risk of actors with little experience in preparing for adaptation and designing programs for adaptation. Therefore, the lessons learned from these tsunami response and recovery approaches and experiences can be useful in preparing for climate change adaptation, particularly for climate-related extreme weather events, but also preparing for eventual population displacement from sea level rise.

Tsunami funds have all been disbursed, leaving behind governments and coastal communities who have learned many lessons, both about response/recovery and how international agencies operate. Unfortunately, one of the main lessons that has been learned by governments is that there is a wide variation in skills, experience, and capacities of international agencies.

On the positive side, the tsunami has helped to promote global level awareness about the value of disaster risk reduction. The team found during their visits to the Maldives and India that this had translated into an appetite at community level to improving their understanding about climate change.

Based on observations and research during this study it is evident that, amongst tsunami-affected countries, only the government of the Maldives had a good understanding of the links with climate change adaptation when the tsunami hit Asian shores at the end of 2004. The situation is different today. The tsunami recovery operation has stimulated considerable interest across the region in disaster risk reduction and the model of "building back better". The 2009 Copenhagen conference then encouraged a flurry of activity in developing climate change action plans. While this is an encouraging development, the approaches and depth of these action plans varies considerably. Among the action plans reviewed during this study, only those of the Maldives and Bangladesh stood out as clearly articulating good practice approaches to climate change adaptation based on the findings of this study. Bangladesh's action plan in particular acknowledges the importance of building on the community's own adaptation strategies and involves all key stakeholders and lays out several avenues for constructive engagement with civil society.

The Government of Bangladesh recognizes that tackling climate change requires an integrated approach involving many different ministries and agencies, civil society and the business sector. (BCCAP page 18).

Climate change action plans of most other countries in the region tend to place an emphasis on macro-level approaches and technology-based solutions. These are certainly a necessary component of climate change adaptation, but they do not fully recognize the crucial roles that civil society organizations, including NGOs and communities themselves can play. Thus, while the Government of India[44] recognizes the importance of "*effecting implementation* (of the CCA plan) *through unique linkages, including with civil society and local government institutions and through public-private-partnership*" (page 2) their role is mainly seen to be one of assisting the

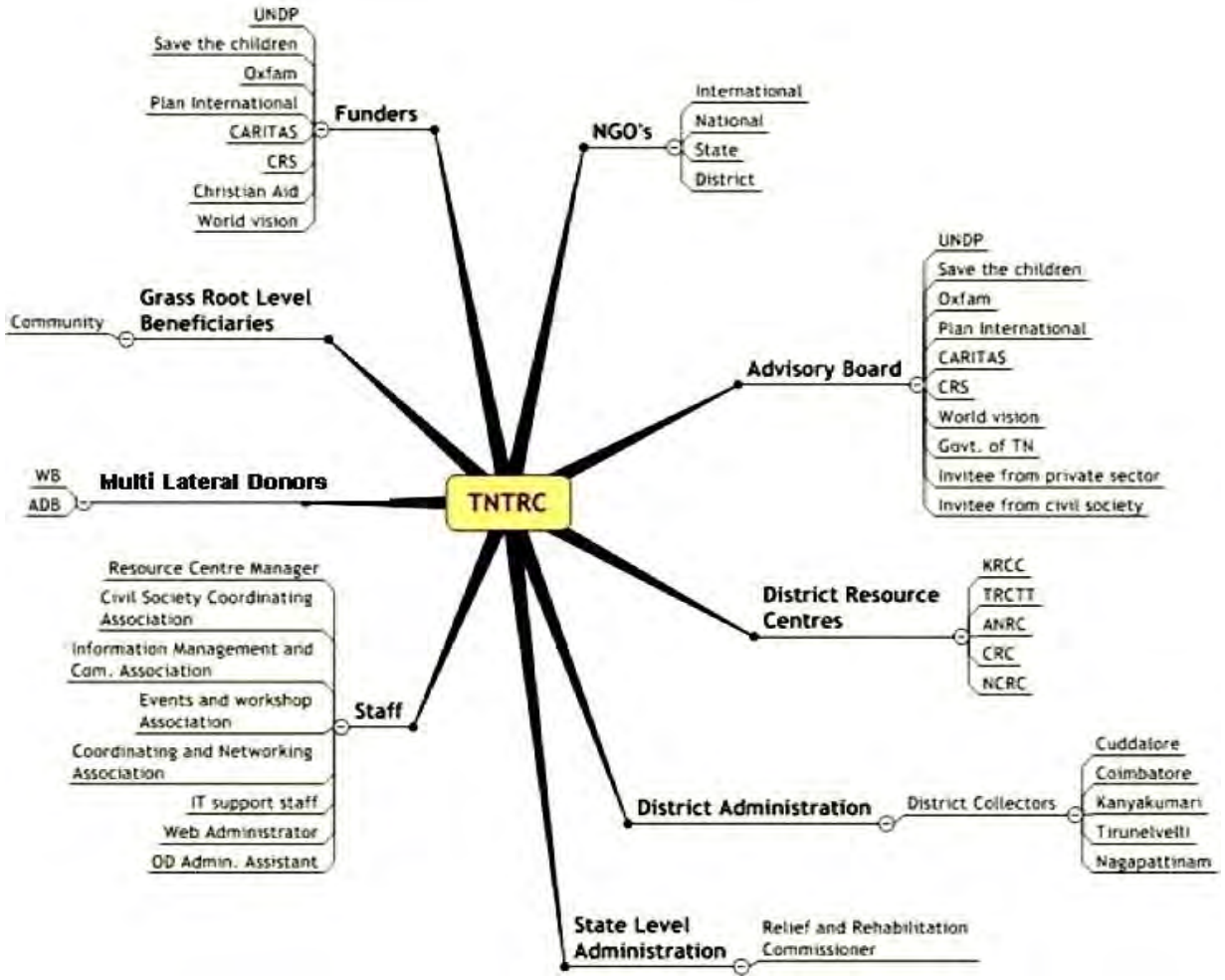
[43] More details are available from the Tsunami Evaluation Coalition website http://www.alnap.org/initiatives/tec.aspx

[44] Government of India (2008)National Plan of Action for Climate Change http://pmindia.nic.in/Pg01-52.pdf

government in "…*promoting understanding of climate change, adaptation and mitigation, energy efficiency and natural resource conservation*" (page 4) rather than drawing systematically on the positive experiences from the tsunami or other constructive partnerships when civil society helped to improve the quality of interventions and access of poor and marginalized populations to assistance programs.

Good practice examples observed during this study typically involved participatory approaches with affected communities, NGOs, and the private sector that were coordinated, guided, and regulated by the government (both national and local) along with robust monitoring and oversight systems. Disaster risk reduction and climate change adaptation measures will be much more effective and sustainable if planning is also participatory, not just during response and recovery operations.

Figure 9-1 Structure of the Tamil Nadu Tsunami Resource Center (TNTRC)



Source: UNDP

The Maldives faces a different kind of challenge. The level of awareness about climate change is relatively high in comparison and CCA planning has been largely mainstreamed into different parts of government and integrated with DRR. There is also significant involvement from the private sector, notably from the tourist sector, but NGO engagement is relatively weak, particularly outside Male. As a result, although their adaptation plan does allow for involvement of NGOs, they lack the capacity to engage in a meaningful way.

As a result, community mobilization is relatively weak compared to other countries in the region. Planned decentralization should open up more opportunities for NGOs to engage constructively with outlying atolls.

Participatory approaches to CCA will be essential not just to encourage ownership and sustainability, but also because the same level of resources will not be available as during the tsunami and success will depend on contributions from all stakeholders. There will be further opportunities to "build back better" after quick onset disasters and resources will be best used if there has been robust preparedness planning by key stakeholders who will be involved in the response and recovery. The main challenge will be to persuade stakeholders at all levels to adopt a "no regrets" approach towards the unpredictable effects of climate change and invest adequately in improved infrastructure, protective ecosystems, early warning systems, disaster preparedness, etc.

The different experiences in southern India and the Maldives illustrate the importance of developing these multi-stakeholder relationships prior to a disaster event. In Tamil Nadu, Village Knowledge Centers and associated networks appeared spontaneously after the tsunami. Many of these efforts were led by NGOs based on lessons learned from the Gujarat earthquake. Overall leadership was assumed by the state government which provided the necessary coordination and supported with information management systems.

In contrast, the Maldives had no system in place or experience in dealing with a major natural disaster. Civil society in the Maldives was – and still is - very underdeveloped in comparison to other countries in the region. The national Red Crescent Society was only recently formed (one of the results of the tsunami) and the few NGOs that existed prior to the tsunami had very limited mandates. Strengthening of the NGO sector will not only be important in mobilizing communities around climate change adaptation strategies, but also in supporting decentralized processes overall.

Responses to major disasters in India will certainly see progressively more effective collaboration between state and non-state actors, notably local NGOs and the private sector. It will be important to try and use the further development of their climate change action plan, both at a national and state level, as a catalyst to mobilize participation by all key stakeholders. Even though the tsunami response in southern India can be considered good practice in terms of collaboration between state and non-state actors, insufficient consultation and participation resulted in avoidable problems in terms of habitats, disruption to livelihoods, environmental impacts, corruption, and cost overruns.

9.1 WATER & SANITATION

Based on observations of displacement in tsunami-affected areas and experiences from other quick-onset flooding disasters in coastal areas will be much more difficult to recover from in the absence of more resilient infrastructure. In tsunami affected areas of the Maldives and India, groundwater was inundated by waves topping over wells and flowing directly into the aquifer. Rooftop rainfall collection systems were found to be effective as a long-term adaptation measure for water supply for drinking and cooking, but many tanks of these tanks were washed away and subsequent water shortages meant that drinking water had to be brought in from outside. More than five years after the tsunami, water supply is still a problem in many areas. Groundwater remains contaminated not only because of the saltwater from the tsunami wave but also due to poorly designed sanitation facilities, high rates of ground water use, a lack of understanding how to use toilets or lack connections with central systems. Training of community members, including children, to monitor water quality was found to work well in some areas. Not only did this result in improved water quality, but also helped raise awareness which may eventually help to change risky sanitation practices.

9.2 SHELTER AND LAND ISSUES

Disaster recovery and reconstruction following a large scale disaster involves complex processes between multiple stakeholders including governments, NGOs, INGOs, local civil society, and the affected families – with an added layer of complexity when it involves relocation to a new site. Based on what was observed during the field visit, it is clear that both government and non-government institutions have made significant strides over the past decade in terms of developing relevant institutional frameworks, notably in developing and investing in "build back better" approaches during recovery operations (such as disaster resilient housing). Many success stories seen were government-led, but initiatives that appeared to have worked best – measured in terms of effectiveness, impact and sustainability – tended to be those which involved close consultation between government, civil society, and disaster-affected communities, with international agencies often playing a supporting role. Where there were significant gaps, these gaps could usually be traced to a weak link with at least one of these stakeholder groups. For example, although it was fairly common in both countries for MoUs or contracts to exist between NGOs and the government for house reconstruction that helped to clarify roles and responsibilities during and after reconstruction, very few documents existed at the beneficiary level. In most cases, the only piece of paper they received was the title (and some house owners are still waiting for those to be handed over).

Examples of such gaps are perhaps most starkly illustrated in the Maldives by the fact that there were still some 3,700 displaced people whose homes were damaged or destroyed in the tsunami who still remained in temporary accommodation at the end of 2008.[45]

Figure 9-2 Temporary Shelters and Uncompleted Houses in 2010

Temporary Shelters – Nilandhoo Island, The Maldives

Unfinished Houses and Temporary Shelters on Maamedhoo Island, The Maldives

The decentralized approach adopted by India towards disaster management and climate change adaptation has a number of strengths within the context of this study, not least of which is its more streamlined and context-appropriate decision-making. However, as illustrated above, not all the differences in approach were necessarily informed by context. For example, just looking at the vastly different approaches used in each state and territory towards housing reconstruction, there are not only significant differences in assistance packages and cost-effectiveness, but also significant variations in levels of community involvement, which is often insufficient.

[45] Department of National Planning – Republic of the Maldives (2009) Statistical Yearbook http://www.planning.gov.mv/publications/tsunami/031209_v1_maldives_4_year%20final_%20IFRC_July2_con_2003.pdf

Compared to examples from non-tsunami disasters, similar variations are seen. Following the 1999 Orissa super cyclone there was little support to the affected population for housing reconstruction. While the Orissa state government has taken a number of lessons on board and made concerted efforts to improve DRR and disaster preparedness,[46] the opportunity to "build back better" was largely lost and the population remains more vulnerable than they should be while waiting for the next cyclone. Recent experience with community-based recovery following the 2008 Kosi floods in Bihar, the poorest state in India by most measures, appears to demonstrate that the ability to build back better is not dependent on large-scale external funding.[47]

Guiding Principles for Reconstruction Approaches after Natural Disasters [48]

- Households begin reconstruction the day of the disaster and governments – guided by its reconstruction policies – may have to play catch-up in order that households and builders conform to, or participate in, any proposed reconstruction approach.
- Communities and households must have a strong voice in determining post-disaster reconstruction approaches and a central role in the reconstruction process.
- The reconstruction policy must address the needs of households in all categories of tenancy: owners, tenants, and those without legal status. More than one reconstruction approach will probably be employed.
- The building approaches adopted after disasters should be as similar as possible to those used in normal times for similar households and should be based on their capacities and aspirations.
- Building codes and standards for reconstruction should improve housing safety and reflect local housing culture, climatic conditions, affordability, and building and maintenance capacities.
- Reconstruction should contribute to economic recovery and the restoration of local livelihoods.
- Good planning principles and environmental practices should be incorporated, whatever the reconstruction approaches.

Gaps are also seen at a technical level. Relocation of settlements has not necessarily resulted in safer coastal settlements. Subsequent GIS analysis of some of the relocation sites and new settlements in low lying areas suggests vulnerability may have actually increased due to susceptibility to flooding and inundation. Again, awareness of such risks seems to be increasing as well capacity in terms of knowledge, skills and tools available using satellite images, topographic information, statistical weather information to undertake detailed analysis and planning. A key gap is knowledge management that should feed into participatory governance systems and subsequent implementation. This is a challenging process, as observed with the largely unsuccessful attempts by the government to enforce the 500m CRZ.

Many coastal villages are facing seacoast erosion at an alarming rate. According to some experts, post-tsunami infrastructure construction interventions like sea-walls and groynes are causing obstruction in littoral drift and are leading to seacoast erosion. However, the government continues to plan and budget for sea walls and groynes. There seems to be a lack of common understanding regarding the severity of seacoast erosion between government planners and the research knowledge base.

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[46] Orissa State Disaster Management Authority (OSDMA) http://www.osdma.org/MenuDemo.aspx

[47] UNDP (2008) Kosi floods: How we coped! What we need? Perception survey on impact and recovery strategies http://reliefweb.int/rw/rwb.nsf/db900SID/JBRN-7USCPM?OpenDocument

[48] GFDRR (2009) Handbook for Reconstructing after Natural Disasters: Chapter 6 Reconstruction Approaches http://www.housingreconstruction.org/housing/hbook

9.3 HEALTH

Appropriate and timely interventions by national actors, supported by international agencies, significantly reduced the risk of mortality and morbidity from infectious diseases after the tsunami. Health care facilities that were damaged or destroyed by the tsunami were reconstructed according to disaster resistant specifications. Training of staff has now improved and, in line with the focus on improving DDR, disaster care is now an integral part of training curricula. Access to the new facilities and improved health care programs has increased through population consolidations and awareness campaigns.

9.4 ECONOMIC RECOVERY AND LIVELIHOODS

The tsunami was a wakeup call for governments who realized that their institutions and policies were inadequate for coping with a disaster of this magnitude. While the tsunami in many cases encouraged governments to strengthen disaster management institutions and policies, the tsunami was also an opportunity to pursue priority development plans. In the Maldives, priority was given to implementing their climate change adaptation agenda. In India, the tsunami helped to advance rural development objectives and – to a limited extent - enforcement of the coastal zone regulatory framework. There is close correlation between levels of poverty in rural communities in Asia and their capacity to adapt to climate change, which increases their vulnerability to climate change hazards. This relation implies a close link between adaption, disaster risk reduction, and sustainable development.

Visiting more remote villages in Tamil Nadu and islands in the Maldives, it was evident that there is a significant variation in access to services and technical support. Some marginalized areas are in need of support to uplift their livelihoods, including access to improved farming technologies, financial services, disaster risk preparedness mechanisms, as well as rural employment and other business establishment support. There is a lack of understanding about the implications of climate change at various levels, which was particularly noticeable in India. The Village Knowledge Centers in Tamil Nadu visited by the team are potential resources that can be useful in promoting climate change adaptation awareness in addition to providing a range of services including disaster risk reduction, early warning systems, health info system, and e-government along with various forms of livelihoods support including real-time satellite imagery for fishermen, agricultural extension advice, and meteorological information for farmers.

Insurance coverage of rural businesses was quite low prior to the tsunami. Most of the savings were kept in the form of cash or assets at home, and were consequently lost during the tsunami. Access to finance, insurance, as well as savings services is not only expected to improve the environment for SME development, but also to improve the resilience of the local communities against extreme climate change hazards and help them to recover faster.

Finally, considering the fact that the bulk of the rural economy depends on the primary agricultural sector, the ability to adapt to climate change will lead to increased demand for agricultural adaptive research and appropriate technology transfer through the services of the agricultural extension and training institutions.

10. CONCLUSION

Reflecting back more than five years after the 2004 Indian Ocean tsunami and reviewing relevant lessons learned through a lens of climate change adaptation; several conclusions can be drawn:

- **The tsunami has opened a window of opportunity in the region to accelerate climate change adaptation:** Lessons from the tsunami (and other quick onset flood disasters) are very relevant when programming for climate change adaptation. Learning is most relevant to climate-induced quick-onset flooding disasters than longer-term impacts of climate change, but there are a number of aspects that can be useful in mitigating longer-term impacts. It was clear that communities that survived the tsunami were generally more likely to be able to resist the longer-term impacts of climate change due to a combination of incorporating disaster risk reduction approaches during recovery and a heightened awareness of the consequences of such hazards. The result is a significant reduction in vulnerability to impacts of climate change in the form of disaster-resistant infrastructure, better early warning systems, more readiness by communities to invest time and money in improved housing designs, and environmental protection measures.

- **Climate Change Adaptation programming does not require drastically different approaches**, but rather obliges planners and policymakers to be more thorough when conducting a vulnerability analysis to also consider the probability that climate-induced disasters may either exceed "normal" intensities or occur in places which are unused to dealing with such events. At a community level, there is heightened interest by community members, NGOs, and the private sector in improving their understanding of how to manage risk. There are a number of good practice examples of collaborative approaches which combine improved access to knowledge along with technical facilitation to put these lessons into practice (e.g. coastal environmental protection). This is perhaps best illustrated by the approach taken by Bangladesh.

- **Many Climate Change Action Plans do not adequately acknowledge the critical role played by non-state actors**, including coastal communities themselves. Consultations, with some notable exceptions, have reportedly been tokenistic. In the case of tsunami-affected areas, consultations have not used the opportunity of more open mindsets to mobilize communities behind a common strategy. The action plan of Bangladesh is one of the exceptions, an extract of which is found in the box below.

Extract from Bangladesh's Climate Change Strategy & Action Plan 2008

"It is essential that Bangladesh prepares now to adapt to climate change and safeguard the future well-being of her people.

Over the last 35 years, the Government of Bangladesh, with the support of development partners, has invested over $10 billion to make the country less vulnerable to natural disasters. These investments include flood management schemes, coastal polders, cyclone and flood shelters, and the raising of roads and highways above flood level. In addition, the Government of Bangladesh has developed state-of-the-art warning systems for floods, cyclones and storm surges, and is expanding community-based disaster preparedness. Climate resilient varieties of rice and other crops have also been developed.

The challenge Bangladesh now faces is to scale up these investments to create a suitable environment for the economic and social development of the country and to secure the well-being of our people, especially the poorest and most vulnerable groups, including women and children."

- **Reconstruction and resettlement under climate change require planning and greater adoption of good practices:** Valuable learning resulting from the tsunami can be useful when designing large-scale reconstruction and resettlement programs for populations displaced due to climate change. Most people who were displaced now have permanent houses and, in some cases, are better off than they were before the tsunami, not only in terms of having a better house, but being part of a community that has been empowered. However, despite considerable investments of energy and resources, many people whose houses were destroyed by the tsunami remain dissatisfied, including thousands of displaced people who still remain in temporary accommodation more than five years later. Agency-driven "one-size-fits-all" approaches widely used in the Maldives and India were relatively costly and resulted in maintenance problems and unintended negative impacts on livelihoods. Indonesia placed more emphasis on community-based approaches, but many of these experienced significant quality control and corruption problems due to inadequate monitoring systems. Almost all tsunami reconstruction and relocation programs were considerably more expensive and took longer than initially planned. Examples of good practice observed suggest adopting a participatory approach involving affected communities, NGOs, and the private sector coordinated, guided, and regulated by the government (at both a national and local level) along with robust quality control systems and technical support staff.

- **"Building back better" offers opportunities through meaningful consultations with communities and civil society**. Such consultations and stakeholder participation both ensure that prioritization is based on vulnerability and potential impacts are reasonably well-understood. Improvement of economic status reinforces community resilience and the ability to adapt to changes in their environment**.** However, likely impacts on livelihoods need to be considered when planning resettlement schemes and, where there is a limited range of livelihood options, it will be important to identify and promote viable alternative livelihoods.

- **Consider the specific challenges of climate change adaptation in coastal urban centers:** With the exception of Banda Aceh in Indonesia, this study has focused on rural areas since this was where the main impact of the tsunami was felt. Capacities of national and state/provincial level command and control systems in each country may have been initially overwhelmed, but were not directly affected by the tsunami and thus played a major role in coordinating and managing subsequent response and recovery operations. The earthquake that struck Haiti in early 2010 starkly illustrates the constraints of undertaking such operations when command and control centers are directly affected. Urban centers like Male and Chennai have been investing in coastal protection measures which helped ensure they were barely affected by the tsunami. Even so, Male's airport was slightly damaged. This airport is the only international airport in the Maldives and a critical link with the outside world that, among other things, underpins the critical tourism sector of the economy. This was another "wake up" call from the tsunami for planners that back-up options are essential and the same sort of investment planning should guide planners to mitigate adverse climate change impacts in coastal urban centers in the region such as Hanoi. Hazards from climate-induced quick-onset disasters arrive not only in the form of sea surges, but also high winds from cyclones and flooding resulting from heavy rains. Services are also subject to disruption. Much of Dhaka was deprived of electricity and potable water for 3-4 days after Cyclone Sidr hit Bangladesh in 2007. While urban centers tend to make significant investments in protective infrastructure and other measures, they have limits and the consequences are profound if these limits are exceeded, as illustrated with Hurricane Katrina in the USA.

11. RECOMMENDATIONS

The phrase "the tsunami changed things" was often heard in one form or another from a wide variety of stakeholders and more importantly this appears to have translated into an increased willingness to invest resources – both time and money – into disaster risk reduction and environmental protection. Investment in disaster risk reduction and environmental protection form key elements for climate change adaptation. There are numerous other lessons from the tsunami, both general and specific that can be applied to adapting to climate change.

The following recommendations are consistent with, and complementary to those published by USAID/Asia in the *Asia-Pacific Regional Climate Change Adaptation Assessment: Final Report: Findings and Recommendations* published in April, 2010 by IRG.

Below are recommendations based on those lessons learned from the tsunami.

11.1 OVERALL RECOMMENDATIONS

Develop a plan to sustainably fund climate change adaptation

USAID should identify and develop mechanisms to benefit vulnerable communities whose viability and development is most affected by climate change. USAID and its partners could effectively channel carbon credit and other sustainable funding sources for this purpose. Priorities for investment could include streamlining and implementing climate change adaptation within national and municipal development plans.

Support risk analysis and planning to prepare for climate change adaptation.

Chapter 8 highlighted many of the deficiencies and delays in sheltering displaced persons and reconstruction of the housing stock. From these observations, the following recommendations can be made that require extensive risk analysis and planning prior to the occurrence of climate-related extreme weather events and eventual displacement from sea level rise.

- Determine and implement policies, risk analysis, and planning protocols for donor coordination, contracting, zoning, financial planning, coastal management, institutional and operational continuity and resilience, technology transfer, as well as stakeholder integration and participation.
- Prepare for the future. Various elements are needed for planning for any future displacement, resettlement and reconstruction. These include thorough analysis on the social and cultural characteristics of at-risk communities; an understanding of current livelihood strategies and opportunities for economic diversification and current status of the environment and ecosystems and approaches to improve ecosystem resilience.
- Assist national and local governments in financial planning, identifying roles and authorities in the event of displacement, establishing appropriate contracting regulations and procurement protocols, zoning regulations and land tenure.
- Analyze risks associated with potential salt-water intrusion, impacts on coastal community water supplies and begin to introduce technologies and approaches to secure future water supplies.

Develop and support the implementation of climate change action plans via multi-stakeholder consultations.

Participation among key stakeholders (government institutions, political leaders, NGOs, academic institutions) will help:

- Offer a platform for stakeholders to agree on the metrics for monitoring and evaluating CCA efforts. The lessons identified during the USAID workshop in Bangkok in 2006 serve as a possible initial base and guide for this process. India's 10 successful strategies also offer potentially adaptable and replicable next steps.
- Dispel common misperceptions about coastal protection and potential climate change impacts which sharing relevant learning which, in the case of tsunami-affected populations, is still relatively fresh in their minds.
- Promote of interdisciplinary research and sharing lessons-learned emerging from such research.
- Develop technical guidance relating to climate change adaptation, which could be in the form of sectoral guidance, on how to mainstream climate change adaptation into plans/strategies, use of traditional technologies, etc.
- Promote the development of national minimum standards and accompanying guidelines for disaster response and recovery that can be adapted to the context local level. Given the levels of experience and learning that already exists as a result of the tsunami, the time is ripe to develop these in a participatory way that empowers local stakeholders and avoids the perception that these are being imposed in a top-down fashion.
- Use peer learning processes, between neighboring districts islands, to share learning related to climate change adaptation and disaster risk reduction in a constructive way, while at the same time monitoring implementation and promoting accountability.
- Link qualifying development partners with Fast Start and other available CCA resources for development
- Build out on sustainable public private partnerships with national and regional partners committed to addressing carbon and/or water challenges within the climate change adaptation and sustainable development arena
- Foster Municipal Mutual Aid networks to facilitate development and deployment of capacities and resources.

Promote appropriate legislative frameworks and policy incentives to support implementation of adaptation measures found in recommendations from national and local climate change action plans.

- Promote use of IFRC's International Disaster Response Laws, Rules and Principles (IDRL) [49]as a useful resource to better align national legislation and policies relevant to disaster risk reduction. As an example, the draft law that was under consideration by the Maldives Parliament during the field visit in 2010 contained language relevant to international disaster assistance, but lacked sufficient detail to ensure consistent implementation.
- Create *Guiding Principles for Reconstruction Approaches after Natural Disasters* frameworks[50] which would put in place building codes and standards for reconstruction, economic recovery, community participation and environmental protection.

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[49] http://www.ifrc.org/what/disasters/idrl

[50] GFDRR (2009) Handbook for Reconstructing after Natural Disasters: Chapter 6 Reconstruction Approaches http://www.housingreconstruction.org/housing/hbook

- Provide technical assistance to countries such as the Maldives whose low-lying, coastal areas facing sea level rise challenges will necessitate consideration of significant relocation and resettlement efforts within the land use planning and other components of the National Development Plan and the National Adaptation Programs of Action.

Mainstream climate change adaptation within the levels of government.

As with DRR, there is a need to mainstream climate change adaptation at various levels. For example, education ministries in each country are involved in disaster operations and provide relief and rehabilitation support. There is room for more structured interventions to promote "build back better" concepts and increase the understanding of the links between disaster risk reduction and climate change adaptation with long-term perspectives.

One of the main lessons learned from the tsunami is that building disaster resistant infrastructure and early warning systems and using natural barriers are critical to managing and mitigating impacts of disasters. Governments in the region, supported by external funding, are already investing considerable amounts of resources to use natural barriers as disaster resistant infrastructure, as well as traditional engineering projects, from constructing coastal protection barriers in southern India, to developing "resistant islands" in the Maldives, to constructing cyclone shelters in Bangladesh. However, with the exception of Bangladesh, there is a tendency by national governments in the region to view such measures mainly as engineering-based solutions and, as a result, interventions are not as appropriate or sustainable as they could be. Environmental impact assessments are often incomplete and are not shared with communities and planning processes do not always make sufficient use of either local knowledge or NGO capacities for facilitation at a community level. Some specific recommendations include:

- Facilitate protection and retrofitting of critical infrastructure in coastal areas vulnerable to climate change.

- Address coastal protection as a priority, not just in terms of physical infrastructure, but by support to vulnerability mapping, use of participatory approaches towards environmental impact assessments and awareness-raising, promoting protection solutions that reinforce ecosystems and/or integrated development (including alternative livelihoods) along with community-based systems for monitoring environmental impacts.

- Promote investment in "natural capital" in the form of sustaining and reinforcing ecosystems in DRR approaches.

- Promote technology where feasible to improve "last mile" reach of early warning systems such as through text messaging to mobile phones.

- Reinforce Village Learning & Communication Centers, most of which were established after the tsunami, and currently fill a multitude of roles and can be powerful learning and advocacy tool for climate change adaptation, early warning and innovation at a community level.

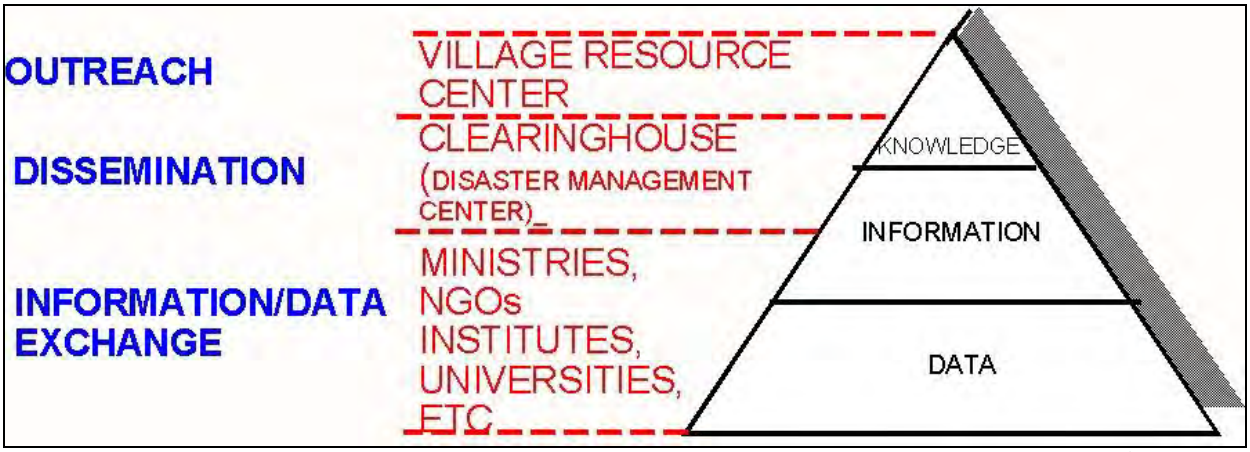
Based on the findings of this study, the most successful examples were characterized by significant involvement from NGOs and civil society. On a larger scale, looking into regional and local learning centers such as those found in India after the tsunami, NGOs have played a key role in making these centers sustainable. Programs on various topic areas (computers, assistance in filling out job applications, etc) and library services are charged at nominal fees, helping the centers survive. Key considerations to take into account when designing interventions will be:

- How to scale up?

- How to ensure sustainability?

As long as these centers provide an array of services that meets community needs, sustainability should not be such a challenge. As described elsewhere, they can potentially play a key role in knowledge-sharing around climate change adaptation.

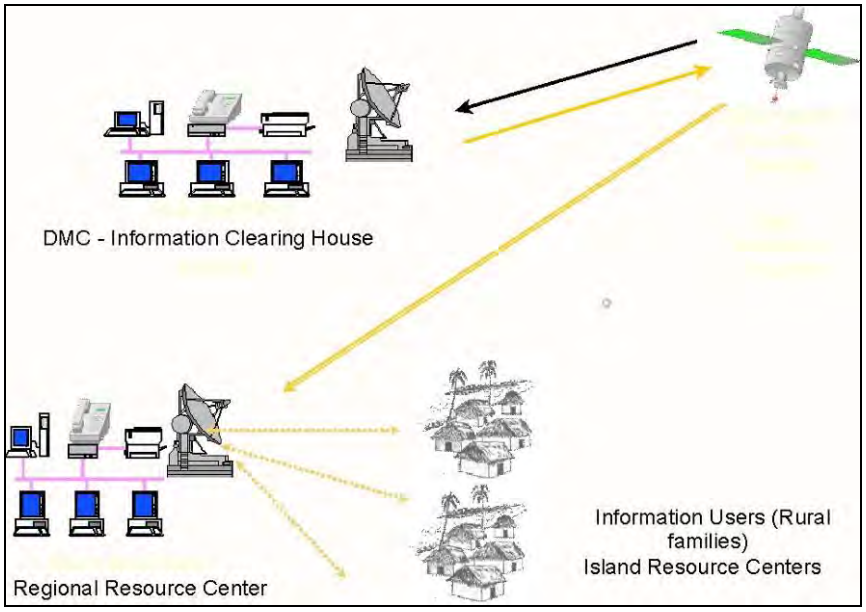
Figure 11-1 The Knowledge Pyramid



Source: UNDP

Internet connectivity in the Asia region, even to rural areas, is increasing rapidly making it an increasingly viable resource. Developing a regional (hub type) communication system linked to DMC Information Clearing House would go a long way towards ensuring that regional and local information is disseminated.

Figure 11-2 "Hub" Communication System (Based on Selvam, 2010)



Source: UNDP

11.2 SECTOR SPECIFIC RECOMMENDATIONS

11.2.1 ECONOMIC RECOVERY AND LIVELIHOODS

Develop, fund, and implement livelihoods projects to enable those displaced by climate change to engage in economic development and growth in their new surroundings.

- Consider the needs of subsistence fishing and women self-help groups when developing risk mitigation principles. The application of hazard risk mitigation principles to the revival of livelihoods requires a sensitive approach. There are indications of a long-term reduction of natural resource based activities not only in fishing, as catch declines, but also in terms of water supply in a semi-arid tropical area with variable and insufficient monsoon cycles adversely affecting agriculture. However, this needs to be balanced by a need to consider short- to medium-term needs for subsistence fishing communities and women self-help groups, which will continue to depend on fishing.

- Promote access to micro-finance services in rural areas for fisheries, agriculture, and alternate livelihoods as a measure of risk reduction. This might include interventions at the policy level for regulation of the microfinance and micro-insurance sectors; building micro-finance institutions; and supporting the start-up and expansion of rural small and medium enterprises, self-help groups/cooperatives, and local community development initiatives. As described above, given the current recognition of environmental protection measures both by governments and communities, it would be a worthwhile investment to develop a cadre of professionals whose job would be to conserve, monitor, and manage coasts and coral reef systems

- Encourage pilot projects and innovative techniques to build the capacity of government fisheries, and agriculture extension and training services in DRR and climate change adaptations.

11.2.2 HEALTH

Implement public health interventions as first steps in response to ecological or climate change related disasters.

It was repeatedly demonstrated that adverse health consequences of the tsunami, and of other natural disasters, are most often related to the lack of sufficient and standard public health responses, including programs in sanitation, hygiene, access to clean water, adequate shelter, and vaccination.

Establish an early warning system that is reliable, trusted, and provides quick communication to villages.

Acute injuries and death associated with acute climate change mediated disasters – storms, floods, and waves – can best be prevented through early warning systems. To be effective, these must rapidly reach the village level, be reliable enough to be trusted, be efficient, and be tested regularly to ensure their functionality. The actual system might vary from country to country, but it needs to be a system where maintenance is assured.

Monitor the displaced for psychological trauma.

Slow onset climate change disasters – sea level rise – may lead to either slow or abrupt displacement. When people are displaced they are invariably traumatized psychologically. This may or may not have long lasting effects. There was a significant amount of psychological trauma immediately after the tsunami, but this should be monitored since it could affect the population's attitude towards climate change adaptation.

11.2.3 WATER AND SANITATION

Improve water supply management through sustainable utilization of available water resources.

Water resources are a critical economic and social asset for communities, yet these finite resources are very vulnerable to the impacts of climate change. As supplies of good quality water become more limited, viable integrated water resource management will depend on sound community-level management, with women

playing a key role in management of this resource. This study has reaffirmed the importance of improving management and longer-term sustainability of water supplies as a primary climate change adaptation strategy. Most adaptation measures of good water management practice should include the following:

- Improve water management systems, demand-side management, water conservation, and efficiency in water utilization.
- Implement sustainable management of groundwater resources; protection of water quality; water reuse; and climate-proofing of water supplies against salinity, floods, and storm surges
- Develop redundant/emergency water supplies, integrated water resource management and disaster risk management.

Improve water resource forecasting by providing medium- and long-term forecasts, as well as flood warnings to coastal communities.

Most national action plans for climate change involve better management of surface and groundwater. In the United States, the United States Geological Survey (USGS) and the National Oceanic and Atmospheric Administration (NOAA) play key roles in flood forecasting and water management. Currently, both of these agencies are involved in projects in India. NOAA is working on meteorological analyses and forecasts, regional forecasts of surface temperature and precipitation, and climatic outlooks as well as environmental satellite imagery. However, more progress is needed.

- Expand the forecasts to low-lying coastal areas in Asia to provide better medium- to long-range weather forecasts as well as flood warning and management. Coastal management and protection technology transfer could also be included in their role.

11.2.4 SHELTER AND LAND ISSUES

Renew and sustain attention to "building back better" guidelines, especially integrating close consultation between the government, civil society, local communities, and INGOs.

In comparison with experiences in past year with the response to the super cyclone in Orissa over a decade ago, there was a considerable emphasis on "building back better" following the tsunami to ensure that reconstruction programs were guided by multi-hazard safe technical guidance. However, in the five intervening years there are signs that these guidelines do not necessarily receive the attention they deserve. As a result, housing stock, aside from what was reconstructed as part of the disaster recovery operations, continues to be vulnerable. It is recommended that policymakers:

- Integrate close consultation between government, civil society, disaster affected communities, and international agencies – in a supporting role – for successful "Build Back Better" investments and initiatives. An example could be the development of a "Local Housing Delivery Mechanism."
- Include housing construction as a climate change adaptation and disaster risk mitigation measure rather than just during a post-disaster response.
- Promote technical guidelines for multi hazard safe house construction as much as possible in the incorporation of low-carbon footprint sustainable technologies that are appropriate for socio-cultural set up of individual communities.
- Promote awareness and development of policies that create incentives (e.g. subsidies, tax incentives for construction contractors) to build or retrofit improved housing and community infrastructure.
- Support the digitization of land and other records to prevent data loss during a quick-onset disaster event. To ensure equitable access and appropriate land planning and management, GIS based land records will become increasingly useful.

- Promote joint ownership of reconstructed and repaired houses in accordance with principles of gender equity.

Promote settlement planning using sound ecological principles.

On one hand, promotion requires combining traditional and expert knowledge about land; natural water drainage patterns; and coastal eco-systems including mangroves and sand dunes, GIS mapping, etc. On the other, appropriate techno-legal framework for implementation in sync with the knowledge systems is also required. These requirements are essential components of a disaster risk reduction strategy, but apply equally to climate change adaptation.

- Address land tenure, non-compliant contractors, price inflation, challenges to enforcing Coastal Regulation Zones, and other obstacles to shelter and reconstruction efforts

Maximize adoptability of relocation efforts by assessing the local conditions of the population

Relocation is often not necessarily the best solution, since it entails numerous risks. Finding appropriate sites for relocating disaster-affected communities can be enormously challenging. Unsuitable new sites can lead to lost livelihoods, increased vulnerability, disruption of communities and social capital, cultural alienation, poverty, and in some case, people abandoning the sites and returning to their places of origin. Economic, social, and environmental costs of relocation should be carefully assessed before the decision to relocate is finalized, and other mitigation options should be considered. For instance, sometimes relocating only a portion of an at-risk community may be sufficient. Improved land use planning on existing sites is also a way of reducing vulnerability without dealing with all the complexities that accompany relocation.

12. ANNEXES

- List of Interviewees
- Technical Annexes:
  - Economic Recovery and Livelihoods
  - Public Health
  - Water and Sanitation
  - Shelter and Land Issues

TSUNAMI DISPLACEMENT: LESSONS FOR CLIMATE CHANGE ADAPTATION PROGRAMMING

LIST OF INTERVIEWS

December 2010
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December 2010

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1. LIST OF INTERVIEWS

1.1. MALDIVES

USAID

Name	Title	Agency
Rebecca Cohn	Mission Director	USAID Sri Lanka
Gerard Andersen	Director, Office of Economic Growth	USAID Sri Lanka

Maldives Government

Name	Title	Agency
Abdulla Shahid	Chief Minister/Chief Coordinator	NDMC
Ahmed Zaki	Deputy Minister	NDMC
Mohamed Shahad	Director General	NDMC
Ahmed Solin	Project Manager	NDMC
Hissan Hassan	Manager IDPU	NDMC
Aishath Afreen (Appi)	Environment Officer	NDMC
Aminath Afiah (Bambo)	Environment Officer	NDMC
Mohamed Faiz	Deputy Minister	NDMC
Moosa Ali Kaleyfaan	Deputy Director General	NDMC
Ilham Atho Mohamed	Environment Analyst	NDMC
Hussain Naeem	Climate Change	NDMC
Zammath Khaled	Energy	NDMC
Ahmed Ali	Energy	NDMC
Ilham Atho Mohamed	Environmental Dept.	NDMC
Mohammed Zuhair	EPA	NDMC
Aishath Reetho	Housing	NDMC
Amgad Abdulla	DG Climate Change/Energy Dept	NDMC
Mohammed Sharif	Dept. Minister	NDMC
Umar Jamaal	Minister of State for Home Affairs	Upper South Province
Abdulla Nazeer	Deputy Minister	Min. of Education
Dr Mohamed Waheed	Vice President	
Ibrahim Hood	Under Secretary	President's Office
Adam Manik	Director - Fisheries	Ministry of Agriculture and Fisheries
Hussein Rasheed	Director - Agriculure	Ministry of Agriculture and Fisheries
Ahmed Mujthaba	Minister of State - South Central Province	Ministry of Home Affairs
Abdul Bari Abdulla	Minister of State for Health and Family	Ministry of Health and Family

United Nations

Name	Title	Agency
Ranjith George	Consultant	UNISDR Maldives
Ameena Mohamed Didi	Education Specialist	UNICEF
Zindu Salih	Asst. Resident Representative – Democratic Governance	UNDP
Aminath Shooza	Prog. Associate – Environment	UNDP
Hussain Jinan	Prog. Associate - Poverty Reduction	UNDP
Mr. Winston Rudder	Ex-Representative - Currently Adviser to the Minister, Agriculture & Fishery	FAO

NGOs and Private Companies

Name	Title	Agency
Daniel Curtiss	Head of Office, Tsunami Recovery Program	American Red Cross Maldives
Azzam Ibrahim	Senior Engineer	STELCO - State Electric Company
Ibrahim Athif	Senior Engineer	STELCO
Mohamed Rasheed	Engineering Managerm	Male Water & Sewerage Company
Rasheeda Ali	Secretary General	Maldivian Red Crescent

1.2. INDIA

USAID

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Erin Soto	Mission Director	USAID India
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Name	Title	Agency
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Anbuchozhan	Information officer	OSD office, GoTN, Chennai
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Mr. J. Venkata Ramanon	Agricultural Officer - Extension	Dept. of Agriculture - Chenna
Niranjan Dev Pandey Project Director	Project Director	Irrigation and Water Resource Management Project
V. Mathivanan	Environmental Director	TWAD Board - Tamil Nadu Water and Drainage Board
S. Mahabooth Subkani	Joint Chief Engineer	TWAD Board
T.S. Srinivasamurthy	Director	Directorate of Environment - Tamil Nadu

Academia

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United Nations

Name	Title	Agency
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NGOs & Red Cross

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