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The Place of a Village Within a Tsunami Early Warning System

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1. Introduction

As the 2004 tsunami demonstrated, south- and southeast-Asia countries contain many villages with no history of a tsunami in this generation. Also, in many villages the people were not connected to modern communications technologies, they had little or no local disaster preparedness, and they lived in high risk locales next to the sea. Therefore, even the best tsunami detection and notification technology need not have the desired impact in these villages.

The content of this chapter is defined by first-hand experience in monitoring the recovery, reconstruction and livelihood rehabilitation in twelve villages in coastal southeast India, which had been devastated by the 2004 tsunami. The vulnerability of the people that led to destruction, loss of life and erosion of community livelihoods are identified. The accumulated evidence forms the basis for an outline of the essential role of a village in an effective tsunami early warning system.

2. A vulnerable people

Along coastal southeast India numerous fishing villages are located next to the shoreline. Per capita income of less than a dollar per day, evidence of malnutrition among some of the children and limited literacy, especially for women, is still the order of the day (Rempel, 2010, p. 109). *The Economist* (2005, p. 18) described the people affected by the tsunami in India as "...subsistence farmers and fishing people eking out precarious living in, or at the edge of, a fickle ocean."

Given the poverty of the area the purchase of insurance as a way to mitigating risk was not an option. Even if property and life insurance was available in the local market, the majority of the families would not be able to afford the insurance premiums required.

A community-based approach to reducing the vulnerability of the people would be a defined, enforced exclusion zone along the shoreline for all village dwellings. In theory, a 500 metre exclusion zone was in place in the state of Tamil Nadu, but it had not been enforced in these villages. The churches and temples, plus some of the more substantial homes were located back from the shore on higher ground. Many of the low income families lived next to the shore. In part this was a preferred location as it enabled the fishing families to store boats, nets and fish-vending utensils next to their homes. These homes had no protection from the destructive power of a tsunami.

A proven form of protection is the presence of a mangrove forest along the shore. Dubinsky, Chomsky and Brenner (2011), demonstrate there is scientific basis for the anecdotal evidence that mangrove forests absorbed a significant portion of the tsunami destructive force in selected communities in south- and south-east Asia. With a combination of a coral reef and a mangrove forest most of the destruction caused by the 2004 tsunami could have been avoided.

Mangrove forests require specific environmental conditions. The locale needs to be low lying with relatively high tidal wave action and protected from high-energy waves. It is a wetland ecosystem. Where there are some mangrove forests in coastal districts of northern Tamil Nadu state, the southern districts are identified as tropical dry deciduous. With high, unprotected sand beaches and with limited rainfall conditions, the potential for establishing a viable mangrove forest to protect these twelve villages was not an option.

Without protective vegetation cover within the exclusion zone it is important to construct affordable, low maintenance cost houses that can resist the destructive intrusion of the ocean. The project houses built in the twelve villages were designed and built by Methodist Engineering Company. Noel Vaghela (2008), Managing Director, designed a "tin box" model, with a semi-flexible and semi-rigid structure, utilizing local construction materials. These houses may not withstand the force of a major tsunami but they should be able to stand against the more common threat in the area, storm surges during cyclones.

In addition, several storm shelters, designed to withstand a tsunami, were constructed in the region. These were three-story buildings with the lower level made up of stilts. There were separate facilities for males and females. A water tank was located on the roof and the shelter was stocked with emergency food rations. On a day-to-day basis the buildings were used extensively for community meetings and activities.

The combination of actions under taken during the reconstruction phase reduced significantly the risk of death and loss of habitat. The actions, though, did not address the vulnerability of loss of the primary livelihood. The boats and nets were too bulky to be hauled twice daily a distance of at least 500 metres. A tsunami or a major storm surge would still wreck havoc among all things located on the seashore.

3. An early warning system

The technology to detect tsunamis is evolving. The challenge is early detection of a tsunami, to provide warning on a timely basis, and minimizing the incidence of false positives. Warnings that cause people to move to safer areas but prove to be false will reduce faith in the system, reducing compliance in the future.

Existing technology is expensive to implement and has limitations. The expectation is that both hardware and methodologies will advance significantly in the near future (Beltrami et al., 2011; Curtis, 2011; Hamlington et al., 2011). Therefore, the existence of an early warning system is likely in south- and south-east Asia, as exists now in the Pacific Ocean.

The success of this emerging technology in the region will become an early warning system only if the information provided by the technology is transmitted on a timely basis to the village level. The challenges involved in realizing this final stage of a comprehensive, effective early warning system are demonstrated by experience with cyclones in the Bay of Bengal region. The existence of a cyclone and its likely path is known several days in advance. This enables warnings to be delivered in days, versus in hours or minutes for a typical tsunami.

In 1970 there was a major cyclone in Bangladesh that resulted in 500,000 deaths. This tragedy caused Bangladesh to establish an early warning system and to build shelters designed to withstand cyclones. Nonetheless, Cyclone Sidr, with winds estimated at 240 km/h and a five metre tidal surge, caused extensive casualties in 2007. With an estimated 10 million people in the path of the storm, the early warning was not received by many rural people who had neither radio nor television (Foster, 2007). Police and local volunteers travelled to a number of villages and used megaphones to alert people. Not all people received the message; others were unable or unwilling to act on the early warning received. Where the authorities ordered all boats to return to the shore, an estimated 150 fishing boats did not receive that message (BBC News, 2007).

Building disaster management capacity into foreign assistance forms part of contemporary literature on natural disasters. For example, protective – ability to withstand external shocks – forms one of the elements in DAC's list of conditions for effective foreign assistance.[1] As of 2007, the United Nations Development Programme (2007) initiated action designed to link the drive to achieve the nine Millennium Development Goals to reduced disaster risk. Action Aid International (2006, p. 3) has declared disaster preparedness and disaster response as an essential right "... to reduce the loss of life, human suffering and homelessness resulting from disasters in the future."

In response to the 2004 tsunami disaster management national policy in India shifted from responding to disasters to disaster preparedness. During the inauguration of a Disaster Management Congress Prime Minister Manmohan Singh pronounced: "I do believe that the time has come for a paradigm shift in disaster management from a 'relief-centric' and 'post-event' response, to a regime that lays a greater emphasis on preparedness, prevention and mitigation."[2] This suggests a process of establishing the requisite good governance for risk reduction may be beginning. Completing such a process needs to encompass national, state, district and village levels of government.

Within an effective disaster preparedness program the village level government, *Panchayat Raj*, would carry specific responsibilities. These range from fostering community organisation, provision and maintenance of village infrastructure, setting and enforcing local codes and by-laws, and delivery of services such as water, sewage and garbage collection. The Indian and international non-governmental organisations assembled at a tsunami end-of project meeting concluded the *Panchayats* in project villages had been marginalized as active participants in the response to the disaster.[3] The *Panchayats* were dependent on other levels of government for funding so they were not free to pursue community-based initiatives. The *Panchayats* were responsible for zoning and building codes, but they lacked the technical expertise to define and implement village changes that would address the hazards and risks within each village. In the twelve project villages, the respective *Panchayats* did not have an early warning system in place.

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[1] For example, note Table 1, Tackling the Poverty Complex, in OECD (2001), p. 52. The DAC Model is formulated by the Development Co-operation Directorate of the Paris-based Organisation for Economic Co-operation and Development (OECD).

[2] As quoted in the Hindustan Times, "PM Talks of Robust Disaster Plan," *Hindustan Times.* (November 30, 2006): 8.

[3] CASA organized an End-of-Project Symposium, at the Saaral Resort, Courtallam, (18 – 19 September, 2008), which included the non-governmental organizations that received project funding from the Canadian International Development Agency for tsunami relief and reconstruction in India.

To fill this gap the Indian project partner, Church's Auxiliary for Social Action (CASA), organized and trained volunteer Disaster Mitigation Task Forces.[4] The decision to build and promote Disaster Mitigation Task Forces flowed from a paradigm shift from relief programming to building a culture of preparedness (CASA, 2008a: p. 22). This new paradigm is defined as:

- People are not victims but responders where in individual, family, community and especially vulnerable people such as women, children, elderly, the otherwise abled are well taken care of.
- The approach is no longer reactive but pro-active.
- People move from dependency to self-reliance.
- Community moves from a vantage point of powerlessness to inclusive empowerment.
- Sustainability mechanisms are in place with local governance playing an important role.

To make this paradigm shift operational CASA developed training curriculum and organized training workshops in the following subject areas:

- awareness building;
- hazard, risk and resource mapping;
- shelter management;
- appointment of Disaster Mitigation Task Force members consisting of local volunteers;
- warning systems and restoration of lifeline;
- search, rescue and evacuation;
- first aid and primary health;
- relief, counselling and filling of claims; and
- workshops and consultations of local representatives and village captains; region level disaster management consultations for all important actors (CASA, 2005b, p. 12).

CASA's response to the 2004 tsunami in the state of Tamil Nadu put in place a Task Force in each village with a total of more than 200 persons (mostly young people), trained in five disaster-mitigation activities. One of these activities is "early warning". This activity within the Task Force intervention has two essential provisions: 1) a point of contact within the village that will receive the warning when it is transmitted from the national, state and district levels; and 2) a means of notifying the residents of their village of an impending disaster such as a cyclone or tsunami.

The Task Force members are relatively young and, in general, without direct access to authority personnel and institutions within the village. Therefore, the means to notifying village residents of an impending disaster proved to be a challenge. As most of the villages had a Catholic church, the initial response from Task Force members was to call on the Priest to ring the church bells. The solution adopted was a portable, crank-driven siren that could be operated throughout the village.

The Task Forces have conducted safe guarding and mock drills in the event of a disaster in ten *Panchayat* schools. This has covered a minimum of 500 children in each school. Children were trained to respond to warning sirens and signals that would be used by the school managements and by the community during disasters. In addition, a second Task Force

[4] CASA first organized Disaster Mitigation Task Forces in the state of Orissa in response to a 1999 cyclone. The effectiveness of these Task Forces during the 2003 flood in Orissa was noted and commended by the International Federation of Red Cross and Red Crescent (2004, Box 3.1).

activity, "search and rescue", has a list and map location of persons in the village requiring assistance to evacuate. These persons will be warned directly by designated village volunteers.

4. Disaster action plan

An early warning system becomes operational only if the residents know the appropriate action needed and a willingness on their part to act accordingly. These aspects of an early warning system require a disaster action plan at the village level.

An effective disaster action plan needs to address the vulnerability – a combination of measure of risk and a level of social and economic capability to cope with a disaster – specific to each village. At a generic level CASA (2005b, p. 14) identified three forms of vulnerability: physical, social and economic. Physical vulnerability involves the structures, houses infrastructure and various means to livelihood generation that can be destroyed, damaged or disrupted during a disaster. Where this occurs people are traumatised if homes are destroyed plus the capability to cope with the disaster is impaired, if not destroyed.

Social vulnerability refers to social marginalised groups within the village. Primary groups involved are women,[5] children, the elderly and the physically challenged. By virtue of some degree of being socially ostracised they tend to face the brunt of a disaster. Further, they tend to have special needs at the same time that their support mechanisms are eroded, reducing their capabilities to cope with a disaster.

Economic vulnerability refers to the lower-income groups within a community, especially the members of Scheduled Castes and Scheduled Tribes within Indian society. By virtue of their poverty they are less likely to carry any form of insurance and they are more likely to be excluded from livelihood rehabilitation and reconstruction assistance. After all, if they had few, legitimate possessions before a disaster struck they have less need for assistance to recover from the disaster. These forms of discrimination, combined with initial poverty, limit severely their capabilities to cope whenever a disaster strikes.

Direct action programs to address vulnerability require an awareness of the benefits presented by disaster preparedness. Only if villager recognized their respective forms of vulnerability and they sensed they had the ability and means to reduce such vulnerability could a program become successful. To generate awareness CASA (2008a, p. 27): "...commenced with a series of mass-awareness campaigns in the villages. All the members of the village were gathered together in the common area such as a school compound, community hall or temple. The campaign generated awareness about natural calamities and benefits of community-preparedness to combat such disasters. Concepts of DMTF, village contingency plans, grain banks, seed banks, etc were explained in detail to the villagers."

It is reported these campaigns generated both curiosity and interest among villagers to initiate planning direct action plans. Communities began to discuss the concept of community-based disaster preparedness, including means required to obtain the claimed benefits of being prepared.

[5] During the end-of-project symposium it was reported many women had never learned to swim. Their clothing, full-length saris, and their long hair increased their vulnerability as the sea water surged inward during the 2004 tsunami and then carried back into the sea what had been torn loose. In communities where fatalities were tabulated the number of women exceeded that of men, in some cases by a considerable margin (OXFAM International, 2005).

The means to a disaster action plan at the village level was the creation of Disaster Mitigation Task Forces (DMTF's). The DMTF structure had two (in some cases three) levels with five tasks at each level (see Figure 1). The 1st Line members from the various villages were trained by CASA at a central location. These five Task Force members then trained the 2nd Line members, four in each of the five tasks shown. A 3rd Line Task Force was chosen in some villages. Given the relatively young age of the volunteers it was expected that some volunteers will move on to attend school or pursue employment elsewhere. Other members might lose interest. With a 3rd line trained volunteers could be promoted upward whenever vacancies occurred.

The 1st and 2nd Line Task Force members were selected through a process of voting within the village. To be eligible for selection the criteria set were:

- age group between 18 to 36 years;
- healthy body and sound mind;
- commitment and attitude;
- selected on the approval of the community members; and
- approval by the elected *Panchayat* members (CASA, 2008a, p. 29).

There was an effort made to obtain some semblance of gender balance plus representation from within the various castes in the community.

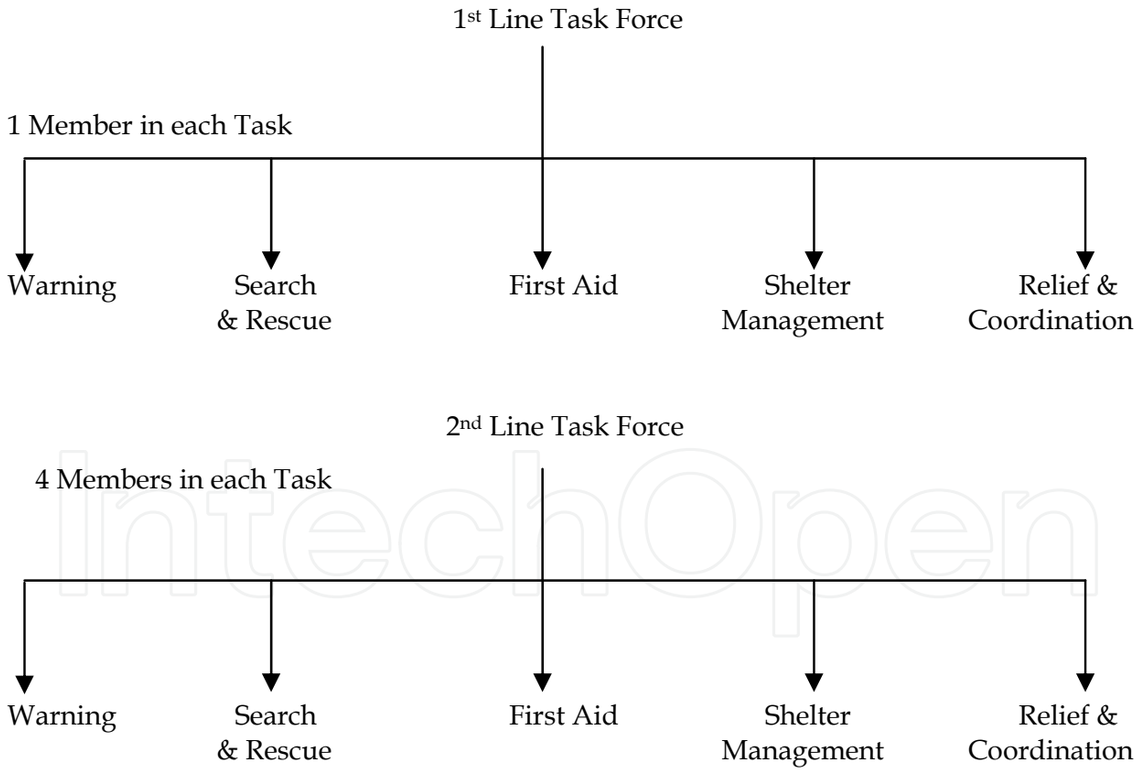

Fig. 1. DMTF Structure

The job description for the first task, warning, was provided in the previous section. The other four tasks cover actions in preparation for and subsequent to an early warning received in the village. Their respective job descriptions are drawn from CASA (2008a, pp. 32 – 33).

Search and Rescue Task – The members of this group are provided training on evacuation and rescue methods. They are trained to identify safe routes, ensure that transportation is ready and conduct periodic inspections of the safe routes. They are provided with rescue kits: a paddle, ropes, rafts, containers to bail out water, torches, transistor, anchors and first-aid kits. They also have to keep tools in a handy location, such as cutting saw, blades, crowbar, hammer, nails etc.

First Aid and Medical Task – Villagers with some knowledge of nursing are preferred for this group. Intensive training is provided to this group on first-aid and immediate medical relief. This group has to maintain a list of pregnant women, infants, differently abled, old and sick in the village. It is the responsibility of this group to ensure that the medical needs of these people are met immediately. A first-aid box with disinfectants, water-purifying tablets, vaccines, antiseptics and medicines is provided to this group.

Shelter Management Task – The members of this group look after the shelters and arrange for the evacuee's food, water, and medication requirements. They check the shelters and safe houses that have been identified to house people. They have to ensure that the shelters are intact and necessary repairs are made to make them safe and liveable. They have to ensure that sufficient supplies of food, water, medicines, milk powder, candles, matchboxes, are available for at least a week to be used by the evacuees. They should also ensure that sanitation facilities are available and usable.

Relief and Coordination Task – The members of this group collect and distribute relief materials such as food supplies, utensils, clothes, kerosene, etc., and coordinate all the relief requirements of the other tasks. During a disaster, this group mobilizes stocks from the government to be stocked in cyclone shelters in advance. In the event of disasters, they move the stocks to the respective shelters, monitor the relief stocks and ensure that no one leaves the shelter during the disaster.

Effective operation of Disaster Mitigation Task Forces requires acceptance throughout the village of its Task Force's mandate and capability. To promote this acceptance the project organized meeting of all villagers, including especially the groups identified as being more vulnerable, to formulate a village contingency plan. This planning process requires community members to assess the situation within their village and to agree on a list of activities to minimize death and destruction should a disaster occur. To facilitate plan implementation houses were allotted serial numbers as well as house numbers. The plan agreed to at these village meetings had to be accepted formally by the village residents. Once approved, the Disaster Mitigation Task Force carried responsibility for implementing the village's contingency plan.

Details common to contingency plans developed in project villages included:

- a village profile;
- review and analysis of the most recent disaster;
- resource mapping;
- risk mapping;
- reduction of opportunity mapping;
- list of Disaster Mitigation Task Force members with their house number, their contact number and the Task Force to which each member belonged;
- coping mechanisms at the local level; and
- roles and responsibilities of Disaster Mitigation Task Forces (CASA, 2008a, p. 35).

Project reports indicated initial response to this planning process lacked enthusiasm with villagers not convinced of either the need for or the importance of a contingency plan.

During the process, though, the villagers realized the importance of being prepared better to meet future hazards. As the villagers analysed the most recent disaster and as the observed Task Forces demonstrate what they were trained to do they became convinced that a contingency plan would be a desirable. They recognized that in the panic of an impending disaster people were not in a condition to make sound decisions.

Finally, a good disaster preparedness action plan requires resources. The advantage of establishing Disaster Mitigation Task Forces as part of a response to a disaster typically provides funds to purchase the requisite resources. As noted, specific Task Forces required equipment to rescue people, to move the most vulnerable and to provide first aid and primary health care. This included both equipment and supplies for training purposes as well as held in store for use during a disaster. Another major expense is creation of storage facilities for strategic food reserves and filling these with basic food stuffs needed to cover the first response to a disaster. CASA enabled villagers to store rice in 500 kilogram drums where each drum was estimated to contain basic food for forty families during an emergency.

In addition, CASA (2008a, p. 42) decided to provide project funds to enable clusters of Disaster Mitigation Task Force to set up a Capital Generation Fund. Rupees 20,000 was provided for each village in the cluster. The intent was for clusters to invest these funds to generate a stream of income over time. Each village-level Task Force had a bank account to receive their share of this investment income. This income then served to cover the day-to-day expenses involved in maintaining Task Force facilities, records, maps, equipment and supplies. This action was designed to motivate volunteers to remain active in assuring the village contingency plan was being implemented well.

End-of project interviews in the CASA – PUMA project villages provided evidence that residents now felt more secure as well as better prepared to meet disasters in the future. This perception by villagers of being safer and better prepared is warranted. The organization of DMTFs, with requisite training and basic equipment, has advanced significantly the ability of the people in the project villages to minimize the disaster effects of a natural hazard whenever it occurs. Also, the capacity within 12 villages to mobilize access to government departments responsible for maintaining basic services such as schooling, roads, water, sanitation and electricity has been advanced.

5. Developing requisite institutions, systems and knowledge

In 2008, at the conclusion of the 2004 tsunami disaster project, CASA hosted an end-of-project symposium. It included the Indian and international non-governmental organization that had financial support from the Canadian International Development Agency. The participants included personnel from these organizations, selected villagers from the project areas, Indian disaster specialists and representation from the Canadian International Development Agency.

This forum devoted considerable time to evaluating their cumulative experience gained during their projects in preparing local people to meet disasters in the future. A dominant theme within this discussion was the limits of what non-governmental organizations can do with projects with merely a local scope. Without extensive, effective coordination among projects regional policy is not an option. Second, non-governmental projects lack the authority to require evacuation or to undertake major rescue operations. Third, the disaster preparedness is dependent on volunteers. In contrast, in countries with major emergency

measures and with disaster preparedness plans, there are personnel employed to maintain and implement such programs. At the local level there still may be a strong reliance on volunteers during an emergency, but initiating action and coordinating the response is located with trained persons employed for this purpose.

To realize this in India, it was the conclusion of the symposium that disaster risk reduction needs to become a government priority from the national to the local level, complete with an institutional basis for implementation. It was observed that India did not have a national disaster policy. The legislation brought to bear in time of a disaster is the National Policy for Resettlement and Rehabilitation.[6]

This National Policy covers: "Compulsory acquisition of land for public purpose including infrastructure projects displaces people, forcing them to give up their home, assets and means of livelihood." The stated objectives are:

- to minimize displacement and to identify non-displacing or least-displacing alternatives;
- to plan the resettlement and rehabilitation of Project Affected Families, including special needs of Tribals and vulnerable sections;
- to provide better standard of living to Project Affected Families; and
- to facilitate harmonious relationship between the Requiring Body and Project Affected Families through mutual cooperation.

The implementation of this National Policy was located with an Administrator for Resettlement and Rehabilitation who shall perform the following functions/duties:

- minimize displacement of persons and identify non-displacing or least displacing alternatives in consultation with the requiring body;
- hold consultation with the project affected families while preparing a resettlement and rehabilitation scheme/ plan;
- ensure that interest of the adversely project affected families of Scheduled Tribes and weaker sections are protected.
- prepare a draft plan/ scheme of resettlement and rehabilitation as required under Chapter V of this Policy;
- prepare a budget including estimated expenditure of various components of acquisition of land, resettlement and rehabilitation activities or programmes in consultation with representatives of the project affected families and requiring body for whom the land is acquired;
- acquire adequate land for the project and also for settling the project affected families;
- allot land and sanction benefits to project affected families; and
- perform such other functions as the appropriate Government may, from time to time, by order in writing, assign.

The intent of this legislation was to deal with displacement of people in large industrial projects. Moving people up to three kilometres, as is typical in risk-reduction strategy for cyclones and tsunamis, does not constitute displacement under the National Policy for Resettlement and Rehabilitation. Therefore this National Policy is not particularly relevant for vulnerable communities, at the coast or away from the coast.

[6] The Department of Land Resources, Ministry of Rural Development authored the National Policy on Resettlement and Rehabilitation for Projected Affected Families – 2003. It was published in the Gazette of India, dated 17th February, 2004. Quotes related to this legislation are taken from this Act as presented on the web site: *rural.nic.in/Rrpolicy.Doc.*

This conclusion gave rise to two symposium recommendations:

- non-governmental organisations to be active in a mediating role between people and the government plus advocacy intended to influence government; and
- advocacy for national policy for disaster management.

During the 2004 to 2008 tsunami projects there were a range of issues between the people affected and their District and State governments that needed to be resolved. An important role of non-governmental organizations, such as CASA, was to give these people a voice in addressing politicians and government officials. The first recommendation identified this mediating and facilitating role as a continuing responsibility for Indian and international non-governmental organizations. The second recommendation gives specific content to the first recommendation: lobby the Government of India to put in place legislation, with reach from the national to village-level governments, which addresses the disaster risk reduction and emergency planning needs of India.

The symposium's call for a national policy related to disasters had three important elements. First, the policy should clarify the roles of stakeholders involved: various levels of government, the private sector, non-governmental organisations and the people in communities at risk. As part of this recommendation there was included a call for a focus on gender issues, vulnerable groups and marginalized peoples.

The call for greater inclusion is illustrated with the special problems CASA (2005a, pp. 12 – 13) encountered in efforts to include *Dalits*, given project conditions set by the State of Tamil Nadu:

> The poverty of the *Dalits* is proving to be a special challenge for CASA. 'The *Dalits* … have come to terms with their fate of being discriminated by the fisherfolks, who themselves belong to some of the backward castes.' CASA reports claims made by *Dalits* that at tsunami relief camps: 'The government says we will not be given anything as we are not affected much.' Also, the condition set by the Government of Tamil Nadu that a family had to surrender a deed to a house to be eligible for a replacement or re-location house (beyond 500 meters from the seashore), excluded virtually all the *Dalits* resident in the area at the time of the tsunami. In an interview with CASA, Mr. Sredhar, a *Dalit* leader, said: 'You people will come and go. But we have to live here with these (fishermen) people. We do not want any tension here. There was discrimination before the Tsunami and now after Tsunami. Hence it does not matter to us. We are used to it.' (Rempel, 2010, p. 111).

A second example of exclusion was the place of women within various responses to the tsunami disaster. First, women were excluded from the primary local decision making units, the *Panchayats* and the Parish Councils of the Catholic Church. Second, women and girls were especially at risk in the relief camps and group shelters established by the Government and some non-governmental organisations (OXFAM International, 2005). Third, initial livelihood rehabilitation initiatives focused almost exclusively on re-establishing the men in their fishing activities. The place of women and the needs of the women in the processing and sale of fish within these communities were overlooked by Government and by some non-governmental organisations.

In response to these observed affects of the aid response to the tsunami the symposium recommended: more focus be placed on educating women as leaders, for example, to be effective if elected to a *Panchayat Raj*; and women's groups should be strengthened to enable them to play their part in disaster management.

The second element focused on the place of the *Panchayat Raj*. As noted in the previous section, the village-level *Panchayat Raj* were marginalized during the tsunami as they lacked financial and technical capacity to respond. A national policy should promote empowering the *Panchayat Raj* and hold each one responsible for disaster mitigation and risk reduction within their respective villages. This recommendation was based on a conclusion that unless empowered and made efficient to function well during normal times, *Panchayats* could not deliver during disasters. A symposium conclusion assumed village-level disaster preparedness undertaken by non-governmental organisations opened the door for *Panchayats* to become active players in the drive to reduce and mitigate risk. It was recognized that incorporating this into a national disaster preparedness program remained a major challenge. This challenge called for non-governmental organisations to sharpen the extent and content of their advocacy to assure a national policy, operational at the local community level, is devised and implemented.[7]

The third element of the recommended national policy was a call for flexibility for individual states, allowing states to modify disaster management. Also policy at the state level should place greater emphasis on mitigation and risk reduction. This aspect of a proposed national policy recognised traditional disaster response knowledge has been lost. As a result, the symposium participants called for the use of knowledge, innovation and education to build a culture of safety and resilience at all levels.

The call for flexibility, in part, was a plea for non-governmental organisations to have a say in defining a response to the disaster. For example, in the area of providing shelter for people affected by the 2004 tsunami, the symposium concluded:

- There were no uniform state-wide policies; discretion was left to District Collectors.
- Participants were not consulted in the selection of housing sites; selection was done by government. Some sites selected were deemed to be unsafe by the residents and the non-governmental organisation involved.
- More time would be needed in the construction phase of disaster reconstruction to maximize community involvement.
- The tsunami was a unique experience with more money committed for reconstruction and rehabilitation of communities than in disasters more generally.
- Some argued for government exercising stringent selection procedures in registering non-government organisations for relief, rehabilitation and reconstruction.
- Joint husband-wife ownership of houses built empowers women.
- Preferred approach is to allocate specific houses to beneficiaries at the outset so families can participate in the process of their house being built.

To follow up on these conclusions it was recommended:

- People should be consulted in selection of the relocation site.
- Ownership titles and other legal documents should be issued to people before the beginning of reconstruction.

[7] A national policy with *Panchayats* responsible for reducing risk and mitigating the effects of disasters is not on the immediate horizon. It is a major challenge to maintain a system of volunteers for disasters that occur occasionally, such as tsunamis. CASA is trying to meet this challenge by incorporating a *Panchayat* ward member as a member in each of the Disaster Mitigation Task Forces. Also, *Panchayats* are requested to issue identity cards to all Task Force volunteers. Third, CASA has engaged in additional fund raising from its Canadian project partners to finance continued project activities with the Task Forces now operational.

- Land acquisition should be near existing livelihood areas.
- Training be provided during the construction phase on maintenance of houses and infrastructure to increase a sense of ownership.
- Non-governmental organisations and Government should implement a common policy for all affected communities.
- Provide space for advocacy by non-governmental organisations for defined rules and policies related to reconstruction.
- Strengthen community organizations for advocacy.

A second aspect of this call for flexibility recognized the diverse nature of disasters in the region. In addition for preparing for cyclones and tsunamis the symposium recognized the need to for awareness within communities of indicators of change in coastal conditions affecting their livelihoods. For example a large nuclear plant was being built along the shore upwind and within ten kilometres of three of the twelve CASA project villages. These residents needed awareness of the risks associated with possible nuclear disasters. Both expansion of port facilities and mining in the sand for rare minerals was likely to affect the primary livelihood of the villagers, fishing. Disaster could take the form of fish stocks seriously decimated as well as fish contaminated from the effects of such industrial developments. In recognition of these impending risks, the symposium recommended the promotion of diversification of activities in income generation projects.

It was also an assessment of the symposium that there was a need to create awareness of climate change and its implications for coastal villages. CASA's commitment on this issue is evident in the one-day National Consultation on climate change incorporated into the November 2007 Diamond Jubilee of CASA as a relief and development organization. For CASA (2008b, p. 8): "Climate change is not an environmental issue any longer. It undermines the achievement of the Millennium Development Goals and generates new questions regarding security."

Within the project villages a visible sign related to climate change was rising sea levels. In one village the foundation of Catholic Church could be observed in the water some metres from the shore. There is mixed evidence on whether or not fish stocks are declining. In most of the villages the fishermen claimed their fish catches were down. Once the men had left the women informed us that the tsunami had changed the sea from being their friend, their source for food and income, to something to be feared. They claimed the men were hesitant to venture forth to fish whenever the sea was rough. Fish catches were down because the men were fishing on fewer days than before the tsunami. It was also their perception that the sea was rough more frequently than had been the case in the past. This would be consistent with climate change predictions, but more definite data are required to confirm whether this impression is correct.

As a result of these and other contemporary drought and flood disasters CASA (2008b. p. 11), sees a need to expand the scope of disaster awareness campaigns. "CASA needs to strengthen local communities in developing adoption strategies to deal with the adverse impacts of climate change ensuring community participation in the mitigation plans."

These conclusions and recommendations of the end-of-project symposium assessment of disaster preparedness carry credibility given what these non-governmental organisations have accomplished in their respective responses to the tsunami of 2004. They have constructed new houses designed to withstand natural hazards, constructed multi-purpose disaster shelters in selected villages, assembled basic rescue equipment and stores of staple

food, organized Disaster Mitigation Task Forces at the village level and provided extensive training of Task Force members in disaster preparation and rescue techniques. A base has been created to move forward both at political levels and at local institutions for emergency planning and action.

6. Acknowledgment

The author extends appreciation to Church's Auxiliary for Social Action (CASA), and PUMA, a consortium of four church denominations in Canada, for permission to use project documents and personal on-site observations as project monitor to inform the content of this chapter. The observations and conclusions are the sole responsibility of the author and should not be seen as the policies of positions held by the Canadian International Development Agency (CIDA), CASA or PUMA.

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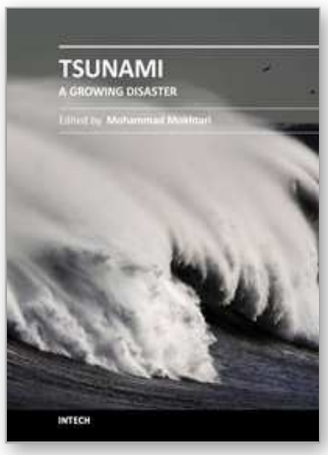

Tsunami - A Growing Disaster
Edited by Prof. Mohammad Mokhtari

ISBN 978-953-307-431-3
Hard cover, 232 pages
Publisher InTech
Published online 16, December, 2011
Published in print edition December, 2011

The objective of this multi-disciplinary book is to provide a collection of expert writing on different aspects of pre- and post- tsunami developments and management techniques. It is intended to be distributed within the scientific community and among the decision makers for tsunami risk reduction. The presented chapters have been thoroughly reviewed and accepted for publication. It presents advanced methods for tsunami measurement using Ocean-bottom pressure sensor, kinematic GPS buoy, satellite altimetry, Paleotsunami, Ionospheric sounding, early warning system, and scenario based numerical modeling. It continues to present case studies from the Northern Caribbean, Makran region and Tamil Nadu coast in India. Furthermore, classifying tsunamis into local, regional and global, their possible impact on the region and its immediate vicinity is highlighted. It also includes the effects of tsunami hazard on the coastal environment and infrastructure (structures, lifelines, water resources, bridges, dykes, etc.); and finally the need for emergency medical response preparedness and the prevention of psychological consequences of the affected survivors has been discussed.

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