



# Tsunami 2004, India and International Impacts, International Disaster Management

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**ABSTRACT** This article studies the international impacts of the 2004 tsunami event in India. Among the four main phases of emergency management, what are the local and international impacts of the 2004 tsunami event focusing on India? The study is divided into two main categories: Natural Aspect; and Cultural and Administrative Aspect. Within the Natural Aspect are the natural cascading events leading up to and following the event and the requirements/intensity levels for qualifying to compare with the actual data of the event. Within the Cultural and Administrative Aspect are the man-made international impacts such as economic, cultural, and political. India was of continued interest in the affected region due to its unique response to international aid attempts and cultural impacts. The methodology of data collection was primarily based upon case studies but also broken down into a pre- and post-event administrative restructure of the national Emergency Operations Plan. The conclusion will discuss the classification of the event as a whole in the eye of emergency, disaster, catastrophe, or complex humanitarian crisis.

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## Overview

On 26 December 2004, an earthquake 155 miles off the coast of Sumatra, Indonesia, caused one of the worst natural disasters in modern history. More than 1,000 times as powerful as the 1995 quake in Kobe, Japan, it registered 9.0 points on the Richter scale and lasted four minutes. The

resulting tsunami that spread across the Indian Ocean caused widespread devastation and left more than 298,000 dead. (Reuters 2005).

## TSUNAMI 2004

A *tsunami* (pronounced "soo-nah-mee") is a series of waves generated by an undersea disturbance such as an earthquake. Tsunamis are often mislabeled as "tidal waves" although the height that a tsunami attains before striking a coastal area is influenced by the local tides at the time of impact. (Coppola 2015:61).

On December 26, 2004, a magnitude 9.1 earthquake occurred off the west coast of northern Sumatra in the Indian Ocean triggering a tsunami (ISDR 2006; Williams 2005). The tsunami affected 12 countries in south and southeast Asia as well as the northeast African coastal regions (Williams 2005). It was completely unexpected and caused massive devastation across the Asia Pacific region wiping away homes, buildings, infrastructure, water and electricity supplies, crops, irrigation, fishery infrastructure, valuable assets, and small businesses (ISDR 2006; Mulligan et al. 2012). The five most affected countries include Indonesia, Sri Lanka, Thailand, India, and Maldives (ISDR 2006).

The tsunami killed over 280,000 people (ISDR 2006) destroying close to 1,500 villages in the coastal areas. The tsunami also left 1.7 million people homeless, 14,100 missing (USGS National Earthquake Information Center), and approximately 6 million people in need of emergency medical, water, and food aid. In the aftermath of the disaster, the affected areas faced public health challenges due to contamination of freshwater with sewage and salt water (ISDR 2006).

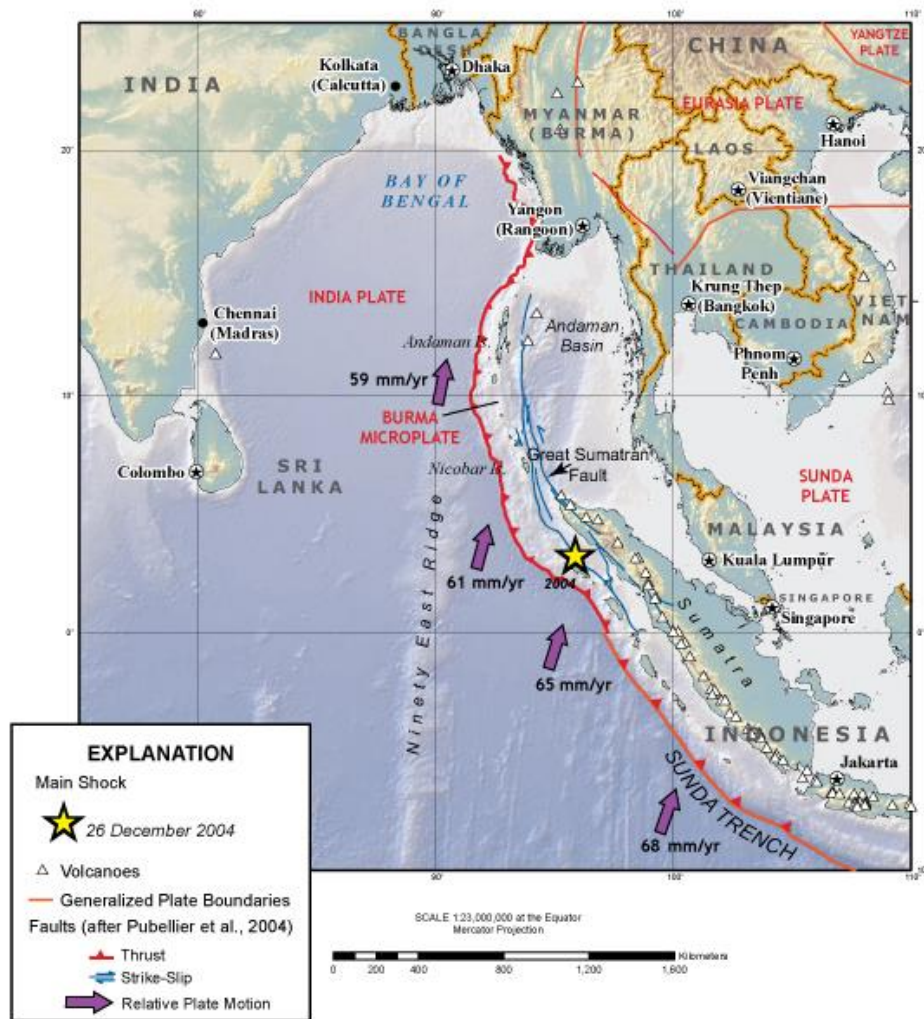
## EARTHQUAKE

Tsunamis are most commonly produced by earthquakes; a "rapid uplift or subsidence of the seafloor" caused by an earthquake or an underwater landslide caused by an earthquake (Keller and DeVecchio 2016:102). Usually, a magnitude 7.5 or higher earthquake is needed to produce a damaging tsunami. The upward or downward movement of the seafloor displaces the mass water from the sea bottom to the sea surface (Keller and DeVecchio 2016).

India's pre-2004 preparedness was notably low in all departments. A great deal of preparedness planning has gone into volcanic preparedness around the world, most notably in the area of the world called the Pacific Ocean's "Ring of Fire" an area surrounded by many subduction volcanoes. India, however, is not in this ring and, therefore, has not benefited from the same preparedness measures as nations in this ring. India, however, does have a coastline facing the Indian

Ocean it is exposed to the potential hazards of the large number of fault lines and rift valleys that crisscross the ocean floor. These features of the ocean floor can often indicate plate activity that could create, under the proper circumstances, a devastating thrust much like the one the world saw in 2004 off the coast of the Indonesian peninsula which generated the large tsunami traveling at the speed of sound that raced towards the island of Sri Lanka and the main coast of India.

**Figure 1: Map of India's plate tectonic activity.**



USGS. Pacific Coastal and Marine Science Center, "Tsunamis and Earthquakes"

The wave generated by the 2004 event was generated had a low speed (900 km/hr) but a high amplitude (~30-50 m) resulting in great damage to the surrounding area.

## IMPACTS ON INDIA

India is vulnerable to natural disasters such as floods, droughts, cyclones, earthquakes, and landslides killing approximately 4,000 people and affecting about 30 million people annually (Government of India Ministry of Home Affairs 2004). Although tsunami is not a frequently encountered disaster in India, the 2004 tsunami had significant impacts on certain parts of India and its habitants. The tsunami affected mainland coastal states such as Kerala, Pondicherry, Tamil Nadu, Andhra Pradesh, and the Andaman and Nicobar (A & N) Islands in the Bay of Bengal (Murty et al. 2006; ADPC 2015). The height of the wave ranged between 4 to 12 meters (10<sup>th</sup> anniversary update 2014) and affected about 2,260 km of the coastline (Murty et al. 2006).

The devastation killed around 11,000 people, displaced 112,500, and over 5,600 are still missing (Bahadur, Lovell, & Pichon 2016; USGS Earthquake Hazards Program; Murty et al. 2006). Seventy-five percent of the deaths occurred in the Tamil Nadu area. Additionally, over 500 children were orphaned (Murty et al. 2006).

The tsunami destroyed approximately 1,089 villages and 172,000 houses (Murty et al. 2006). In the port of Chennai, the fishing fleet was affected, and some boats were overturned and some washed ashore within the harbor. Overall, about 63,000 boats were damaged (Murty et al. 2006). Additionally, 200 square kilometers of agricultural land was affected by salt water (Murty et al. 2006). The affected population was mostly from the lower economic classes and in fishing villages. Therefore, they had no insurance coverage or had only limited life and personal accident insurance coverage. The total damage in the affected areas was \$575 million with a total loss of \$649 million (ADPC 2015). Out of that, the total impact in Andhra Pradesh, Kerala, Tamil Nadu, and Pondicherry was \$45 million, \$101 million, \$815 million, and \$52 million respectively (ADPC 2015).

## RESPONSE TO NATURAL DISASTERS

Response is defined as the activities that follow an emergency or disaster (Johnson 2000). "The following three types of response actions may take place during the pre-disaster period: warning and evacuation; pre-positioning of resources and supplies; and last-minute mitigation and preparedness measures." (Coppola 2015). Post-disaster activities are prioritized: "Once disaster response begins, the priority is saving lives. This activity may continue for days or weeks depending on the disaster's type and severity" (Coppola 2015), often leading into the recovery phase. These activities include searching and rescuing casualties, providing shelter, medical care, and food for the victims, attempting to alleviate the situation, reducing secondary damages, and working towards speedy recovery (Johnson 2000). Thus, active emergency assistance is critical to minimize the

impacts to human life, their health and safety, and the functioning and integrity of physical structures (Lindell et al. 2006). However, to send immediate response teams to minimize the impacts local and international communities depend on agencies such as U.S. Geological Survey (USGS). USGS's responsibility of natural hazard response entails providing timely access to accurate and relevant geospatial products, services, and imagery. The latter are necessary to record and analyze the severity of the event, distribute timely information about the event, and to facilitate immediate and proper response to a hazardous situation (U.S. Department of the Interior 2012).

## CLASSIFICATION OF NATURAL DISASTERS

There are three levels of hazard events: disasters, catastrophes, and complex humanitarian crises. Response-generated needs are a major factor in defining an event's classification. Detecting a hazard is fundamentally a sociological risk perception that is deeply rooted in the immediate culture. An international disaster, as defined by the United Nations is "a serious disruption of the functioning of society involving widespread human, material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources" (United Nations International Strategy for Disaster Reduction 2007). As discussed in the preparedness level pre/post event section, tsunami-affected areas in India were not able to manage the consequences of the tsunami on state or provincial level response units. Rather, the affected areas had to rely on national governments to manage the consequences. Since the national government was able to manage the consequences of the tsunami without depending on international response entities, the 2004 tsunami can be categorized as a national disaster. Catastrophes in general have much larger impact zones than disasters because of cascading events. Convergence of resources during catastrophes is less concentrated than in disasters because the impact is broader. Response in disasters, however, is much faster than in catastrophes. A Complex Humanitarian Crisis (CHC) differs further from either a disaster or a catastrophe. In a CHC, the impacts emerge slowly and erratically. Long-lived impacts are persistent and, therefore, the needs are prolonged. These needs do not end until societal intervention to relieve the needs and impacts occurs. Impacts of CHCs are incremental as they spread and linger. Response tends to meet fewer human needs and thus a delayed implementation related to cultural issues from related to international cooperation. A generic style of emergency management is best for both disasters and catastrophes but not for CHC's, however, an all-hazards approach should streamline response. This is why we chose to categorize the Indian tsunami of 2004 event as a disaster.

## PREPAREDNESS LEVEL PRE AND POST EVENT

The 2004 tsunami caused massive destruction across the Asia Pacific area. As a result, many affected countries depended heavily on local and international aid in an unprecedented manner (ISDR 2006). In the immediate aftermath of the calamity, local governments worked with local sectors (general public, militaries, private sector, civil society organizations), the World Bank, the United Nations, the Asian Development Bank, the International Federation of the Red Cross and Red Crescent Societies, non-governmental organizations (NGOs), foreign militaries, foreign countries, and other stakeholders (Williams 2005; Margesson 2005). The aforementioned groups collaboratively assisted by donating money, resources, time, energy, and expertise (Williams 2005; ISDR 2006). However, India refused to accept aid from foreign countries (Bhaskar 2005; East Asian Strategic Review 2006) because it felt it was in a position to handle the disaster on its own compared to other countries in the region that were affected on a larger scale. Furthermore, India also had immediate and generous support on the national level (Bhaskar 2005).

In India, the Central Relief Commissioner (CRC) in the Ministry of Home Affairs is responsible for coordinating relief operations for natural disasters ("Disaster Management in India" 2004); Murty et al. 2006). Each ministry, department, and organization in India nominates a nodal officer (senior officer) to the crisis management group headed by Central Relief Commissioner. Each nodal officer prepares emergency support and relief plans to manage disaster situations pertaining to their own sectors. The group meets regularly to reevaluate the preparedness and relief plans to improve efficiency in hazardous instances ("Disaster Management in India" 2004).

The Indian Ministry of Home Affairs hosts an emergency operations center to assist the Central Relief Commissioner. The emergency operations center collects and disseminates information pertaining to natural disasters and relief and it closely works with local governments of the affected states. The center also interacts with other state ministries, departments, and organizations involved in relief and keep an updated record of disaster-related concerns at all levels ("Disaster Management in India" 2004). As a result, during the 2004 tsunami, the Ministry of Home Affairs was prepared to coordinate responsibilities, mobilization of resources, and logistics (Murty et al. 2006).

The nodal institutions monitor and carry out surveillance for natural disasters. The National Disaster Management Authority has identified the importance of upgrading the early warning systems for tsunami as well as other disasters. The authority also highlights that the nodal institutions responsibility in identifying the existing technological gaps and developing methods to upgrading the systems in a timely manner (National Disaster Management Authority 2009).

RESPONSE

National militaries play a critical role during disasters, including the 2004 tsunami. Militaries possess the resources and logistical expertise necessary to maintain communication, they provide security, and they distribute relief supplies to the victims of natural disasters (Williams 2005). The Indian army, air force, and navy (Indian Tri-Services) played a significant role immediately after the 2004 tsunami disaster (Murty et al. 2006). The duties of the Tri-Services included rescue and evacuation of victims, creation of temporary shelters, disposal of the dead, transportation, water, food, medical supplies, and ensuring the safety of the tribal people in the Andaman and Nicobar Islands (Murty et al. 2006; Bhaskar 2005). Approximately 5,500 army personnel were involved in the relief efforts. The air force also transported over 10,000 tons of relief supplies by air to the affected areas. The Indian military services also assisted neighboring countries such as Sri Lanka, the Maldives, and Indonesia by transporting relief supplies to them (Bhaskar, 2005; East Asian Strategic Review 2006). Sixteen naval vessels, 21 helicopters, and 1,800 troops were used in these efforts (East Asian Strategic Review 2006). Additionally, India also joined the international military assistance core groups led by the United States (East Asian Strategic Review 2006).

The government of India released \$156 million from the National Calamity Contingency Fund providing Tamil Nadu with \$56 million in aid, Andhra Pradesh and Kerala with \$22.2 million, the Andaman and Nicobar Islands with \$44.4 million, and Pondicherry with \$7.8 million. The chief minister of Tamil Nadu announced a compensation of 100,000 rupees, approximately \$2,200, to the family of every deceased person. The government also established two regional logistic coordination centers and eight relief supply hubs in different areas of the country. Out of the 881 relief camps, most of the campsites were government and public buildings and tents. The campsites housed about 604,000 displaced people. In some cases, the local residents refused to have medical facilities housed in buildings because they feared that the buildings might collapse. However, these problems had existed prior to the earthquake. At the time of the 2004 tsunami, the government had neither a policy for how temporary shelters would be assigned to the affected persons nor the designs, material, or infrastructure for constructing those (Murty et al. 2006).

The government also deployed medical teams immediately after the event. These teams treated approximately 27,000 people and included physicians, psychiatrists, general medical officers, health specialists, nurses, paramedics, and medical personnel from the Indian army and navy. The affected areas received medical supplies worth \$444,000. (Murty et al. 2006).

In any disaster situation, individual communities are the first responders who manage the aftermath of a disaster and develop relief processes before

outside assistance arrives ("Disaster Management in India" 2004). Similarly, in India local community members supported search and rescue efforts as well as relief efforts. Television broadcasts disseminated information about affected areas. Such awareness brought large numbers of volunteers and organizations into the affected areas. Most of the NGOs and other groups were formed after the disaster, but some of the NGOs that were involved were formed after the 2001 Bhuj earthquake. Civil organizations provided food and shelter in a well-organized manner, especially in the Pondicherry and Tamil Nadu areas. In Kerala, where the government response was slow, the community members took the initiative in providing relief to the needy (Murty et al. 2006). Inmates of a correctional facility in Tihar Jail, New Delhi, donated \$1,675 to the national relief fund. Additionally, the staff of the jail also donated one day's wages to the fund (Goodman, Ramgopal, and Holloway 2015).

Although India seemed to have developed a good response system for disaster management that impressed the international community, its responses to the 2004 tsunami still were somewhat chaotic. In the Andaman and Nicobar Islands, the central government completely handled response efforts (Margesson 2005; Murty et al. 2006) and evacuated people to a relief campsite in Port Blair. The slow evacuation process placed victims in considerable difficulty. As a result, the government attracted harsh criticism for interfering with other relief efforts (Margesson 2005). The national authorities were also accused of interfering with the work of trained relief workers in other parts of the country, and the relief workers themselves have been accused of stealing relief supplies (Williams 2005). Although there were reported instances of looting in Sri Lanka and Indonesia, there were no formal reports in India.

India only accepted help from international organizations (East Asian Strategic Review 2006). International organizations provided relief supplies as well as helped local communities rebuild roads and public places. These organizations also assisted locals to restart farming and small businesses (MercyCorps 2014).

## CULTURAL ASPECT

Unlike in the affected mainland coastal states of India, indigenous people in the Nicobar and Andaman Islands were aware of pre-signs of the 2004 tsunami. The islanders had the traditional knowledge to interpret birdcalls and the behavior of marine animals. At the first indication of these signs, the natives fled to higher grounds seeking safety (Rego undated; Grassroots organizations 2005).

Gender also played a role in the disaster. In India, deaths of women outnumbered men. Data indicate that only 1,883 men died while 2,406 women did.



In the Cuddalore district of Tamil Nadu, out of the total 537 deaths, 391 were women and only 146 were men. In Pachaankuppam, a village of Tamil Nadu, the only people to die were women. This imbalance between the number of deaths among the two genders had several causes. Usually, women are not socialized to swim or climb trees, both methods for possibly surviving a tsunami. Also, as traditional housewives, women stay at home to look after their children while men go out to work. Moreover, at the time of the tsunami, women were waiting on the shore for fishermen to bring in the catch. Some women died while trying to save their children and elderly relatives (Rego undated; Grassroots Organizations 2005).

The death of men also affected women in a variety of ways. Women experienced threats to their personal safety in resettlement camps. Tamil Nadu and Kerala stationed women fire and police officers as well as women doctors in relief camps to provide security for female victims (Grassroots Organizations 2005). Women also were burdened with more household responsibilities, and young orphaned women were sometimes forced to marry widowers and extended family members. Orphaned school-attending girls had to stay home to take care of their siblings, and in addition to domestic work, elderly women in Nagercoil of Tamil Nadu had to start collecting firewood to earn a living as most of their caregivers died in the tsunami (Rego undated; Grassroots Organizations, 2005).

## SOCIAL RESPONSIBILITIES

Post-disaster response actions included providing immediate medical treatment to the victims, but according to Ashra (2005), regardless of physical injuries, a majority of victims would suffer from some form of trauma or anxiety after the disaster. After a tsunami, 50% of survivors suffer from mental health issues and 5% to 10% may suffer from serious mental health issues. Therefore, providing suitable psychological assistance is necessary to stabilize the victims. According to Rajkumar, Premkumar, and Tharyan (2008), Indian tsunami survivors preferred social and cultural coping strategies such as displaying grief and sorrow publicly, and seeking comfort in religious beliefs and practices rather than formal mental health services. This study suggests that responses to tsunami trauma should be based on socio-cultural beliefs and practices of the communities and focus more on existing community coping mechanisms. In addition, the involved mental health professionals should possess a cultural understanding about the affected community (Rajkumar, Premkumar, and Tharyan 2008). Furthermore, the study suggests that professional treatment might not be necessary until the grieving period is over. Identifying and treating victims with acute mental stress issues should be a focus after the grieving period.

## TOURISM AND BUSINESS CONTINUITY

In our contemporary world, tourism and travel have become more available to a greater number of people because of the globalization of goods, technologies, and ideas. The overall global standard of living is ever increasing, and to maintain this standard of living, a stable level of safety and security must exist to maintain a growth environment. Business entities will be anxious about investing in areas or resources that have a tendency to suffer from volatility, instability, and/or unrest. At any point in the business model or supply chain, these issues can spell disaster in the profit-driven business world. Even at the local business level, interruptions caused by events like these can be long lasting and devastating to livelihoods thus affecting the local economy and socioeconomic structure of the area.

Thousands of western tourists were also victims of the tsunami, transforming the event into a truly global disaster. Noting that the tsunami served to highlight the dependency of many of the affected regions on tourism and, hence, the vital importance of attracting tourists back to those regions, it suggests that, although attention will undoubtedly be focused on the management of the crisis, tourism played a positive role in that it united the world in its response to the needs of the communities devastated by the tsunami (Sharpley 2005).

To a hotel business, prestige is everything. The immediate impact of the tsunami to a local hotel owner is apparent with the obvious physical damage; however, it is usually the un-seen aftermath that is much worse than the initial destruction. For example, even after the physical damages have been repaired, people will remember the tsunami when planning their next vacation and rethink staying in an affected area out of fear of reoccurrence. "Any crisis that almost or actually involves substantial loss of life creates a panic or demonstrates an industry weakness or trend will take longer to recover" (Fink 1986). This has considerable implications for tourism, which depends so heavily on the creation of a sense of safety and security as well as confidence in the tourism industry players. However, in the aftermath of a crisis or disaster, destinations also can turn the media exposure to good effect and capitalize on the free publicity. The media and the Internet can be used by tourism authorities to provide balanced and up-to-date information about the situation." (Sausmarez 2005). More commonly, often locally owned businesses will rebuild only to fail later due to lack of business traffic. This in turn will cause them to close up and attempt to recover costs by selling out. Unfortunately, those who are interested in buying businesses in these kinds of situations typically will pay only a fraction of what the owner has invested because

of the perceived higher risk area. Many times these businesses will end up abandoned leaving the owner financially destitute and the surrounding area properties devalued. These compounding factors at the local level describe the possible origins of disaster-based slums and impoverished areas that have come from once flourishing districts.

While damage to infrastructure or tourist facilities and loss of life may have an impact on tourism, it is the intangible aspects of a disaster or crisis that are the most serious. Negative media coverage, a tarnished destination image and loss of visitor confidence will result in a fall in tourist arrivals and the consequent loss of business, revenue and market share (Sonmez et al. 1994).

Businesses may pull their investments and relocate to safer regions or sectors to ensure a quicker return on investment. One positive is that this may remove some larger competition for the local businesses; however, this relocation also includes removal of the business infrastructure that helps support local businesses through a larger provider pool to the market. This localized downsizing creates large groups of unemployed people in short amount of time, thus flooding the job seeking market. Those who can find work typically do so in an underemployed and underpaid state. These shifts in resource allocation and business placement greatly affect the global economy. Businesses must find new market venues and maintain their operating levels of profit margin while acclimating and optimizing to their new business environment, which may include a new geographic area, a new political climate, or new codes placed on their own businesses and or on businesses that feed their own.

Trade routes between centers of commerce often become relief supply lines for affected areas, putting on hold normal operations to make room for more essential needs and efforts. This "pause" in international and regional trade also has magnified effects on the economy and local markets of both the directly affected areas and the region in which the trade is conducted.

## COLLABORATION ATTEMPTS

India is a member of the Regional Consultative Committee (RCC), a committee that was established in 2000 to promote consultation and cooperation on reducing disaster risk. RCC brings 26 countries in the Asian region together to attain common goals related to disaster risk reduction, to identify ways to put policies into practice, and to promote regional collaboration. The 12th committee meeting held in 2015 was about implementing actions outlined in the *Sendai Framework for Disaster Risk Reduction* (SFDRR). The members were in agreement that RCC is capable of providing technical support to implement actions highlighted in SFDRR. The committee would also facilitate information sharing among the member countries. RCC emphasizes "improving business resilience against disasters and protecting livelihoods and productive assets by safeguarding supply chains" (Asian Disaster Preparedness Center 2015). In the period in-between, the member countries would work towards improving their disaster management strategies at the local and community level, and they would focus on integrating the needs of vulnerable groups (Asian Disaster Preparedness Center 2015).

All Indian states are responsible to assist the Meteorological Department of India to provide the necessary infrastructure to establish and upgrade meteorological monitoring systems. In this effort, collaborating with the World Meteorological Organization (WMO), the Pacific Tsunami Warning System, and other regional and global institutions is suggested for favorable outcomes (National Disaster Management Authority 2009).

Non-Governmental Organizations (NGOs) also play a significant role in disaster response and mitigation. In India NGOs focus mainly on specific issues such as "livelihood, community organization, community asset creation, women group formation" in order to expedite social and economic resilience (Behera 2002, p.3). NGO focused initiatives help the Indian government with large-scale infrastructure reconstruction projects. As a nationalist government India plays a critical role in the response and recovery process. Such interventions exert pressure on the government and increase tension between the government and the public. In such instances, NGOs covers the existing resource and capacity gap in the recovery process. However, there is still room for NGOs to reform their policies to take a community-oriented approach. NGOs should also address the need of vulnerable groups who often struggle to cope and recover from disaster impacts (Behera, 2002).

## RECOMMENDATIONS

Bahadur, Lovell, & Pichon (2016) conducted a study to understand the effectiveness of India's preparedness for disasters. According to the report by Bahadur, Lovell, and Pichon (2016), India's disaster risk reduction plan should be changed to align closely with *Sendai Framework for Disaster Risk Reduction*. Moreover, they also propose that the responsibilities of nodal institutions that are in charge of managing disaster reduction should be clarified. They should focus on all phases of disaster management as opposed to their present emphasis on response and relief efforts, develop innovative strategies to fund risk management efforts, and when conducting risk assessments they should consider different socio-economic groups such as the poor and women. They also should conduct assessments and gather data to track the progress of disaster risk reduction and identify additional risks that can result from climate changes.

National Disaster Management Authority (2010) identifies the importance of establishing State Disaster Response Forces (SDRF) for every Indian state. Such groups will enable individual states to improve their state-level coping capacities and capabilities to respond to emergency situations without completely relying on assistance from the Central Government. The SDRF can be set up involving the existing police forces in each state. These state level forces can be trained by the experts in the National Disaster Response Forces (NDRF) (National Disaster Management Authority 2010).

Allocating sufficient funding for mitigations and preparedness efforts is another recommendation. Even by 2016, there was still a lack of funding for putting the disaster-risk reduction plans into operation in India. Although there are funds available for response efforts, those funds are not to be used for disaster mitigation efforts. Additionally, the state disaster management entities and authorities do not have adequate funding to conduct demonstration projects, risk-awareness programs, and training programs (Bahadur, Lovell, & Pichon 2016). Therefore, different states of India should be given enough decision-making powers to invest available funding based on their local requirements, while also working to maintain and improve infrastructure necessary for effective response and recovery. Infrastructure that needs monitoring includes bridges, docks, emergency housing, and airport runways. The government should provide adequate funding to conduct projects and programs to educate people on disaster risk management.

In order to increase the effectiveness of tsunami education in India, focus should be given to capacity building and professional training. Capacity building at all levels is recommended, especially in areas of research and development (National Disaster Management Authority 2010).

Faculty members who are involved in earthquake and tsunami-related research and education, architecture, and engineering from different universities and institutes should be brought together to develop comprehensive modules to develop mitigation methods (National Disaster Management Authority 2010). These modules can be used to train a target group who can train other personnel at state levels. It is also important to train masons, plumbers, carpenters, and electricians based on local requirements. Technical training institutes should revise their curriculums to incorporate global practices of mitigation and include better hands-on experiences (National Disaster Management Authority 2010). Educating these workforces with different types of materials and certification models would enable them to increase the quality of their work and successfully contribute to any construction project undertaken by the government.

## CONCLUSION

India is currently more prepared than in 2004 for tsunami events. New agencies were formed, both foreign and domestic that did not exist prior to the event. At present there is better involvement from NGOs and local communities. India is maintaining international disaster management strategies and resources. Early warning systems are being implemented. New structure and zoning codes are being enforced. However, there are areas that need improvement. Resource management on a needs-based priority must be addressed. Infrastructure and pre-existing maintenance should be an ongoing method of reconstruction. Emergency management resources and awareness fundraising needs more local and international support. India's emergency management administration could be improved with representation of special needs groups and vulnerable populations.

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