

Disaster Management “A Case Study on 26 Dec’04 Indian Ocean Tsunami”

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Abstract— A disaster can be defined as a sudden occurrence of such magnitude as to affect the normal pattern of life in the vicinity of and establishment causing extensive damage to life and property. Disasters are unforeseen. Any disaster can be divided into different phases. The first phase is the warning phase where we can predict the disaster to certain extent. Next is the impact phase where the disaster actually strikes and when we can do almost nothing. Then come the rescue phase, the relief phase and the restoration phase. The losses can be minimized if the work during the last three phases is well coordinated. Disaster management has a different emphasis in every different discipline. From the management science point of view, use of administrative data systems, resource utility techniques, project management and planning are integral parts of disaster management. From the planning point of view, overall preparedness includes town and regional planning, infrastructural inventory management, distribution of population and economic activities, land use, disaster architecture and planning. From a geoscience point of view, it will cover subjects such as geographical information systems about regional planning and on estimations, space technology and topography. Infact, Disaster Management includes adequate planning, efficient management and proper implementation.

Keywords: Disaster Management, Tsunami

I. INTRODUCTION

The high density of cities and human settlements make them particularly vulnerable to disasters and hazards. Not a week goes by without news of a disaster, natural or man-made, effecting huge losses on humans and the environment as a whole.

The well-known saying on health, of "Prevention is better than cure", can very much be applied to disaster management as well. It is increasingly becoming apparent that planning and preparedness, prevention, mitigation, response and relief, and recovery, to tackle disasters are critical in order to reduce the negative impacts and effects of such events. The role of communities and individual families in taking appropriate action to mitigate the impacts of disasters has been emphasized, as local governments and emergency services realize that response to an emergency situation can be hampered by the disaster itself, and relief can best be delivered by those closest at hand. Community-based disaster management is now becoming an integral part of any local or national disaster management planning

II. DISASTER

A disaster is an unexpected accident resulting from natural or man-made factors (or a combination of both) that has a

negative impact on the daily lives and living conditions of humans and flora/fauna.

A. different types of disasters :-

Disasters are of two types, Natural Disasters and Manmade Disasters.

Natural Disasters include:

- 1) Earthquakes
- 2) Tsunami
- 3) Famines
- 4) Epidemic
- 5) Thunderstorm
- 6) Fire
- 7) Draught etc.

Manmade Disasters include:

- 1) Bomb blasting
- 2) Industrial disasters, which include events such as Bhopal, gas tragedy etc.
- 3) Collapsing of the building due to weak construction etc.

B. Different Phases of Disaster

- 1) Warning phase: Many disasters are preceded by sort of warning, e.g. with the aid of satellite and network of weather stations. Many meteorological disasters like cyclones and Hurricanes can be predicted and actions can be taken to counteract them.
- 2) Impact Phase: This is the period when the disaster actually strikes and very little can be done to lessen the effects of Disaster. The period of impact may last for a few seconds (like fire, explosion, gas leak) or may prolong for days (like fire, gas leaks, water pollution, floods, etc).
- 3) Rescue Phase: The rescue phase starts immediately after the impact and continues until necessary measures are taken to rush help to combat the situation and to evacuate people to safer places. Needless to emphasize that prompt and well-organized rescue operations can save many valuable lives.
- 4) Relief Phase: In this phase apart from organizing relief measures internally, depending on severity of the disaster, external help should also be summoned to provide relief measures (such as food, medical help, clothing, shelter etc). This phase will continue till normalcy is restored.
- 5) Restoration Phase: This is the final and the longest phase, It includes rebuilding damaged equipments.

C. Problems Faced Today and Remedies

India is the country where disasters are in tremendous but management is missing. Government is lacking in proper strategy. There is no efficient ground control when the disaster outbreaks. It was only because of poor ground control that 23 people died at Chennai last year, who went for the

relief works. Manpower is the most important factor in the rescue phase. This is because, the ordinary people residing in the nearby regions can reach the victims sooner for the relief purpose. I am suggesting some remedial measures to raise the man-power:-

- 1) Introduction of an additional subject at tenth and twelfth level with practical approach.

- 2) Compulsory training to all the government employees at all levels.
- 3) Providence of paid leave to government employees willing to work for the victims of the disasters.
- 4) Taxation rebate to the private sector as per their contribution in case of disasters.
- 5) Compulsion for the doctors to join disaster management groups.

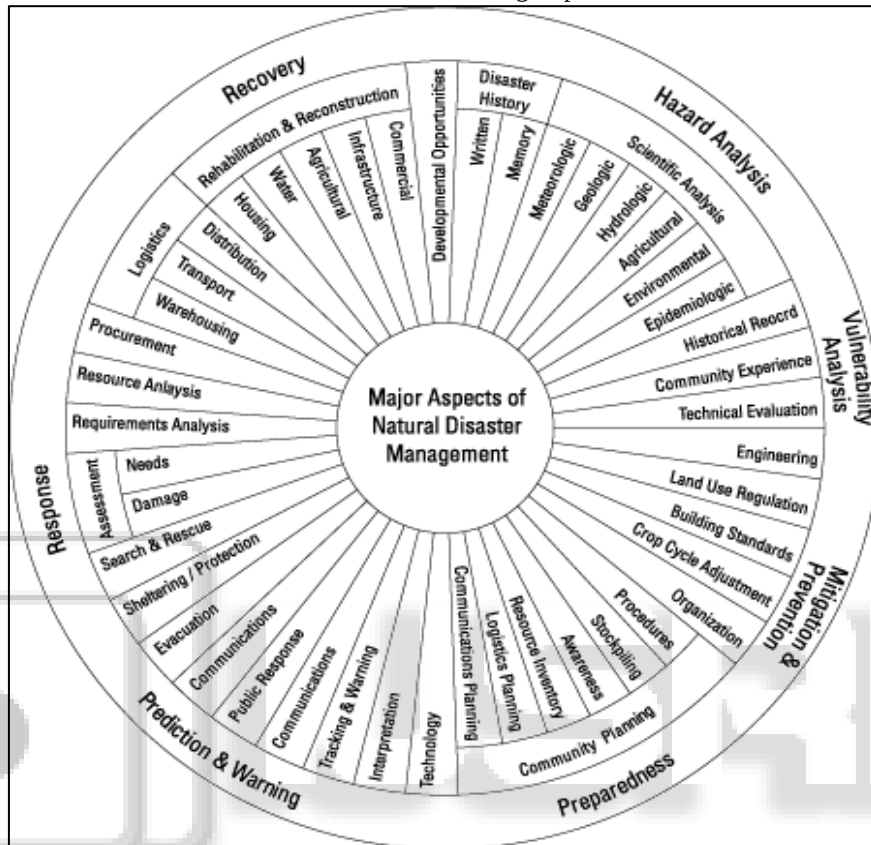


Fig. 1.1: Diametric Representation of Major Aspects of Disaster Management
(Source -Scope of Disaster management)

III. DISASTER MANAGEMENT PLAN

Absolute elimination of disaster is impossible. Hence it is necessary to have a preparedness plan to meet the eventualities in case it takes place due to unforeseen reasons.

Disaster management plan is an organized multi-disciplinary approach to mitigate the effect of disaster by involving many agencies viz., Govt. Authorities, fire services, police, medical, neighboring industries etc. The Disaster Management Plan (DMP) or Emergency Preparedness Plan (EPP) consist of:

- On-site Emergency Plan
- Off-site Emergency Plan

Preparation of Disaster Management Plan is under the headlines of On-site Emergency Plan and Off-site emergency Plan is in consonance with the guidelines laid by the Ministry of Environment and Forests (MOEF), Govt. of India.

As per the guidelines given by the Government, the "Occupier" of the facility is responsible for the development of the On-site Emergency Plan. The Off-site Emergency Plan should be developed by the Government (District Authorities).

A. Format of Disaster Management Plan

There is no rigid or standard format of disaster management plans. In fact, the reverse applies, in that the format needs to fit the circumstances in which the plan is being made and the requirements which it is designed to meet. However, certain common features tend to apply to most plans. These include:

- 1) Clarity of Aim: The aim needs to be carefully and accurately selected, because it requires the entire thrust and scope of the plan.
- 2) REALISM: The plan must be realistic in the sense that it relates to an accurate assessment of the disaster threat and that it takes into account the scale and the capability of counter-resources that are available.
- 3) Level of The Plan: The plan must be accurately related to the level with which it is concerned, i.e. whether it is at the community level, state level or national level.
- 4) Flexibility: This is required because disaster circumstances do not follow set patterns. Planned decentralization, where appropriate, is a useful adjunct towards achieving flexibility.

- 5) Co-Ordination: This is a key factor in counter- disaster activities. All arrangements concerned by the plan should be made, keeping in mind the co-ordination factor.
- 6) Definition of Responsibility: Clear and unambiguous definition of responsibilities at the planning stage is of critical importance. This reduces the possibility of misunderstandings and duplication when it comes to execution of the plan.
- 7) Ease of Execution: The plan should be formulated in a manner that facilitates ease in execution. References within the plan should be clear and readily identifiable.

B. Disaster Management Equipment's



Fig. 2.1: Disaster management equipment's

The equipment is of paramount importance to demolish the damaged buildings which are hanging precariously at a faster rate so that new buildings are built, with which the people are rehabilitated at the earliest occasion.

- 1) Combi-Cutter: The Combi-Cutter results in saving costs and reduces time for replacement of individual attachments.
- 2) Crusher: The crusher catches the centre of the target to be crushed without applying any excessive force to the arm and the boom.
- 3) Shearer: This is a heavy-duty jaw-type attachment capable of cutting steel frames/girders, reinforcing rods at disaster sites. Its blade edge is well shaped to hold an object firmly whether round, square or of any irregular shape.
- 4) Breaker: This is suited for breaking rocks, heavy concrete blocks in disaster-hit sites. The hydraulic rock breaker has got enormous breaking power with which even very hard rocks and concrete blocks could be broken into pieces and cleared from site.
- 5) Grapppler: It is used for safe handling of massive and irregular shaped rocks, debris, scraps from quake-hit areas.

IV. RELIEF MEASURES FROM DISASTER MANAGEMENT

- 1) Search & Rescue: The first priority in the aftermath of a disaster is to minimize loss of lives by undertaking rescue efforts for the affected people and providing medical treatment. People who are trapped under destroyed buildings or are isolated due to floods or cyclones need immediate assistance.
- 2) Subsistence, shelter, health and sanitation: Disasters can disrupt food supply, water supply and sanitation mechanisms. They may also force people to abandon their houses, either temporarily or permanently. Such situations typically result in an immediate need for shelter and protection against an incidence of epidemic
- 3) Infrastructure and essential services: Disasters can cripple the infrastructure of the state in terms of roads, public buildings, airfields, ports, communication network etc. An immediate priority after a disaster is to bring the basic infrastructure into operating condition and deal with fires and other hazardous conditions.
- 4) Security: Usually, in a disaster situation, the police and security personnel are preoccupied with conducting search and rescue missions. Some people could take advantage of the situation and resort to looting and other anti-social activities. Consequently, it is necessary that security agencies functioning under the administrative control of the district authorities be geared to prevent this and provide a sense of security to citizens.
- 5) Fund generation: Fund may be available through the calamity relief fund however these fund some times may not be adequate to meet the disaster management requirements in the after match of a large scale disaster at that time govt. of different states also helps.
- 6) Finalizing relief payouts and packages: Relief packages shall be customized, if required, Relief packages would include details relating to collection, allocation and disbursal of funds to the affected people. Relief would be provided all the affected families without any discrimination of caste, creed, religion, community or sex whatsoever.

V. CASE STUDY: 26 DEC' 04 INDIAN OCEAN TSUNAMI

A. What Is A Tsunami?

The phenomenon we call tsunami is a series of large waves of extremely long wavelength and period usually generated by a violent, impulsive undersea disturbance or activity near the coast or in the ocean. When a sudden displacement of a large volume of water occurs, or if the sea floor is suddenly raised or dropped by an earthquake, big tsunami waves can be formed by forces of gravity.

B. Causes of 26 December'2004 Tsunami:

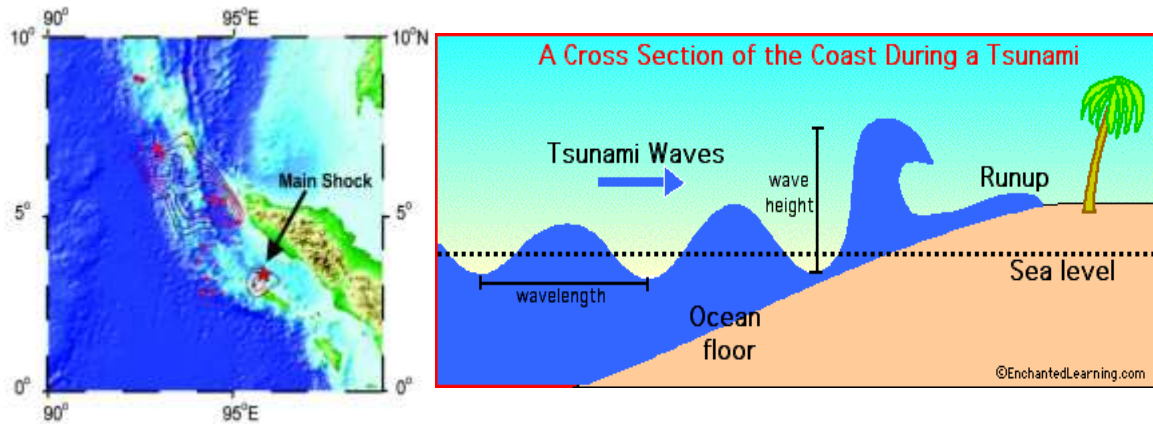
The reason for the 26 December '2004 Indian Ocean tsunami was the relative motion between Indian and Burma plate. As an average, the Indian plate shows relative motion of 6 cm with respect to the Burma plate. But on Boxing Day tsunami the relative motion was found to be almost 15m that created such a huge earthquake.

The epicenter of which was almost 160km west of Sumatra island, with magnitude of 9.15. The focus of the

earthquake was 30km below sea level and time duration was almost 2000 seconds.

As a result of such huge earthquake a large amount of water was displaced from the normal positioning the form of waves due to raised bed ocean. these waves were nothing

but what we call as tsunami waves. The Sumatra tsunami moved with a speed of 800 km/hr and giant waves with a curved path traveled to about 4500km within 7 hours touching far countries like Somalia.



Countries Affected



Fig. 4.1: (Source: Enchantedlearning.com)

Country where deaths occurred	Deaths		Injured	Missing	Displaced
	Confirmed	Estimated ¹			
Indonesia	126,915	126,915+	~100,000	37,063	400,000- 700,000
Sri Lanka	30,957	38,195	15,686	5,637 ²	~573,000
India	10,749	16,413	—	5,640	380,000
Thailand	5,395 ³	11,000	8,457	2,932	—
Somalia	298	298	—	—	5,000
Myanmar (Burma)	61	290– 600	45	200	3,200 confirmed
Malaysia	68– 74	74	299	—	—
Maldives	82	108	—	26	12,000– 22,000
Seychelles	1– 3	3	—	—	—
Tanzania	10	10+	—	—	—
Bangladesh	2	2	—	—	—
South Africa	2 ⁴	2	—	—	—
Kenya	1	2	2	—	—
Yemen	1	1	—	—	—
Madagascar	—	—	—	—	1,000+
Total	174,542	~193,623	~125,000	~51,598	~1.5 million

Table 4.1: A GLANCE AT HUMAN DAMAGE

Source: The International Recovery Platform (IRP) was established following the Second UN World Conference on Disaster Reduction in Kobe, Hyogo, Japan, in 2005 to support the implementation of the Hyogo Framework for Action (HFA) by addressing the gaps and constraints experienced in the context of post-disaster recovery.

C. Detecting a tsunami

Seismic gauges can detect the earthquakes or volcanic eruptions which may cause a tsunami. But as only a small proportion of strong earthquakes produce a tsunami, a warning system based solely on seismic data is prone to producing false alarms.

Other sea-based instruments are needed to help scientists decide if a tsunami has been triggered. These fall into two main types: pressure recorders in the deep ocean and tide gauges monitoring sea-level at the coast.

The Deep-ocean Assessment and Reporting of Tsunami (Dart) system uses buoys and sensors stationed far out to sea.

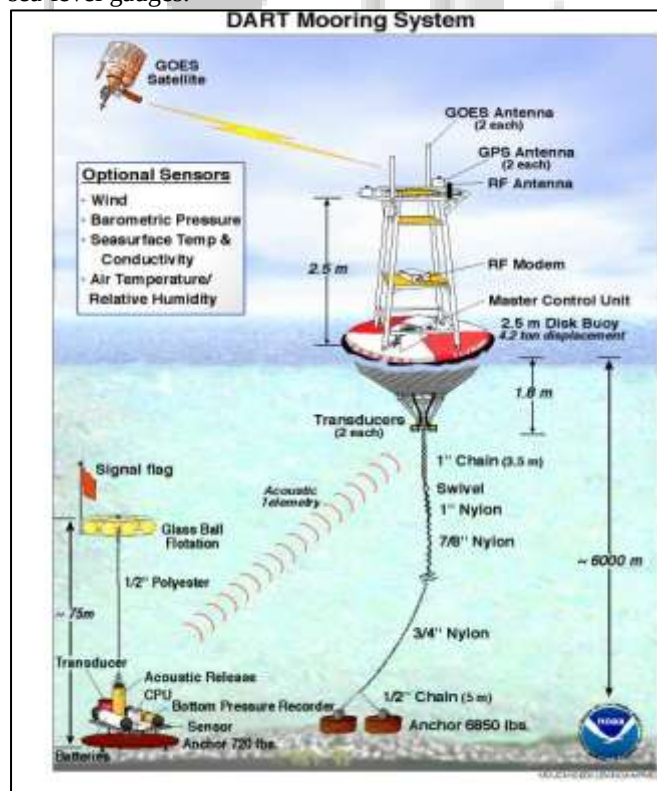
A pressure recorder on the sea bed measures the weight of the water above it - which varies according to wave height - and sends its findings to a buoy on the surface. The buoy monitors the surface conditions and sends this, plus the data from the sea bed, to a satellite which relays it back to a receiving station.

Germany is working on a joint project with Indonesia to put in place 10 of these buoys, the first two of which were installed in November 2005.

India, Thailand and Australia are also planning to install Dart buoys along the Sunda Trench, the site of the earthquake that triggered the tsunami.

The advantage of the Dart system is that it can detect tsunami far out to sea and give enough time to warn countries in the region. However, the buoys are expensive to install and maintain.

UNESCO's Intergovernmental Oceanographic Commission (IOC) is also focusing on a network of tide or sea-level gauges.



VI. PROPER DISASTER MANAGEMENT FOR TSUNAMI PRONE AREAS

A. Warning Phase:

This is the pre disaster phase in which the people are taught what to do and what not to do in case of tsunami boards and hoardings are used to make people aware of tsunami alarming system. Establishment of DART System in deep ocean and siren towers in coastal areas is the part of warning system.

B. Rescue Phase:

The first and foremost step for this phase is to rescuing people from the affected areas and moving them to safer places and injured to the nearest hospitals. For this purpose, some social service groups may be formed for the community help in case of disaster. It also includes identification of safer areas and providence of for victims



Fig. 6.1: Warning Phase & Rescue Phase

C. Impact Phase:

Some important instructions are to be followed in impact phase. Following are the important guidelines:

- 1) A tsunami consists of a series of waves. Often the first wave may not be the largest. The danger from a tsunami can last for several hours after the arrival of the first wave.
- 2) Sometimes a tsunami causes the water near the shore to recede, exposing the ocean floor.
- 3) Tsunamis can travel up rivers and streams that lead to the ocean.
- 4) If you are at the beach or near the ocean and you feel the earth shake, move immediately to higher ground, DO NOT wait for a tsunami warning to be announced. Stay away from rivers and streams that lead to the ocean as you would stay away from the beach and ocean if there is a tsunami.
- 5) Since tsunami wave activity is imperceptible in the open ocean, do not return to port if you are at sea and a tsunami warning has been issued for your area. Tsunamis can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.

D. Relief Phase:

In relief phase, the basic needs of the victims are given foremost importance. In case of tsunami since a larger part of costal areas is logged with salty sea water the victims have to face the problems of drinking water. For this, small water purifying system vehicles may be used which will serve the urgent needs along with that a providence of at least two-time meals must be made from the government authorities.

E. Restoration phase:

This is the final and the longest phase. It includes rebuilding and reestablishing the damage from the donations. As it is evident from the fact that in case of 26 December '2004 tsunami, a record amount of donations was raised as prime minister relief funds since its start in 1950. the restoration phase includes reconstruction of damaged buildings, reestablishments of transportation system and providence of easy loans to the victim with easy pay back facilities and raising employment opportunities.

VII. CONCLUSION

Disasters are unforeseen and cannot be predicted. Where, how and when it will occur, nobody knows. The only thing we can do is to lessen the effects after it has occurred. For that we need to have proper relief plans. These disaster management plans help co-ordinate the various relief teams at the site of disaster, which in turn minimizes the losses.

In short, it can be said that although the disasters are unforeseen, unpredicted and not under control of human beings, adequate planning efficient management and proper implementation of disaster management can reduce the human loss to the minimum possible level.

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