

An Appraisal of Disaster Management Initiatives in the Multi Hazard Prone State of Kerala, India

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ABSTRACT

Kerala, a multi hazard prone state in India, is susceptible to various natural hazards mainly floods, droughts, landslides, lightning, earth quake and coastal hazards. To deal the challenges emanating of its unique hazard profile, the state has developed an elaborate framework on disaster management in various contexts. The evolution of disaster management spectrum in the state can be generally categorized into two periods, pre tsunami and post tsunami. In the pre tsunami phase, traditional approaches were followed in the state whereas post tsunami phase witnessed emergence of holistic modalities. In this context this study makes overall evaluation of the whole framework of disaster management in the state. It also discusses comprehensive and pragmatic measures to be adopted in the disaster management arena, particularly with regard to institutional development, policy drafting and disaster risk management initiatives. Thus many challenges as well as opportunities can be identified in the statusquo of the disaster management framework in the state. For a sustainable disaster risk planning and management, integration of grassroots well institution would be most crucial

Keywords

Multi-Hazards, Disaster Management, Pre and Post Tsunami, holistic approach, grass root level planning

1. INTRODUCTION

Kerala, south western coastal state of India, is considered as a multi hazard prone geography in the country. Flood, landslide, drought and coastal erosion are the most recurring and intense hazards while lightning, cyclones and earthquake make their presence felt at occasions. Moreover, high incidents of manmade disasters such as roads accidents, boat capsizing, fire and explosions, stampede put the state into a peculiar disaster risk situation. State's geographical location, weather pattern and high population density makes it prone to various hazards [1]. Notably, not many states in the country are as

multi hazards prone as Kerala. There are many triggering factors behind the hazard profile of the state. Continuous occurrence of high intensity rainfall for a few days is the primary factor contributing the extreme floods in the State [2]. The state experiences annual floods due to monsoon rains coupled with inadequate drainage systems, flat terrain, unplanned land use, impermeable surfaces, soil texture and high tides [4]. Western Ghats witnesses landslides very often during the monsoon [5,6] Landslides in Western Ghats concluded that intense rainfall exceeding 200 mm in 24 hour can trigger debris flow in vulnerable slopes [7]. Relatively higher population density and vegetation density result in more causality due to lightning. Accidents caused by ground conduction from trees, which is a special feature of Kerala could be the main attribute of lightning hazards [8]. The cause behind the high lightning incidents seems to be the formation of convective thunderclouds near the Western Ghats regions during the afternoon hours [9]. The state lies in the peninsular India which is generally defined as a Stable Continental Region in the context of earthquake productivity [10]. Though, several of the tremors in the state are spatially associated with the drainage basins of the major rivers, some of which may be fault controlled. Besides there are many more minor faults and fractures that can generate minor tremors as a result of crustal readjustment. The 590 km coast of Kerala is one of the most densely populated land area in the country exposed to different types of coastal hazards. The high-steep monsoonal waves cause severe seasonal erosion all along the coast [11]. Natural causes of coastal erosion are due to the action of waves, winds, tides, near shore currents, storm surges and sea-level rise. Human activities such as the construction of harbours, jetties and groynes, river training works, mining and dredging can also lead to erosion of certain regions. The state has 223 coastal villages which has the probability of being affected by cyclone [1] because of wind speed and storm surge. Significant spatial variation in the monsoonal rainfall across the state is the major cause of water scarcity consequence drought incident in the state. The decreasing rainfall over the region, late onset of the monsoon, failure

of the monsoon, and break in the monsoon in the state leads to many drought situations [12]. The monsoonal rainfall in Kerala is associated with breaks with little rainfall activity. So monsoon season is significant to regional climate, the variability in the onset, withdrawal and quantum of rainfall during the monsoon season plays an important role in drought scenario in the state [13]. In the humid tropical climate of Kerala, with more than adequate rainfall, moisture stress is noticed for 14 to 21 weeks. [14]. Long term data on rainfall analysis of Kerala showed that intolerably long dry spells [15] which consequently lead to the occasional drought situations in the state. Thus the overall geographical setting is conducive for triggering the multi hazards susceptibility of the state.

As a multi hazard prone state in India, Kerala has developed an elaborate framework on disaster management. It has followed national guidelines in disaster management. In the federal set up of India, the basic responsibility for undertaking rescue, relief and rehabilitation measures in the event of a disaster is lies with State Governments concerned [23]. Keeping in view of federal polity, Disaster Management act was enacted under the entry 'Social Security and Social Insurance in the concurrent list of the Constitution of India. This gives the state government an added scope of launching their own legislation [24]. The central government only supplements the efforts of the State Government. State Governments are autonomous in organizing relief operations in the event of natural disaster and in the long-term preparedness/ rehabilitation measures [29]. The National Disaster Management Act of 2005 provided a robust disaster management framework in the state level for dealing with various disasters. In accordance with the Disaster Management Act 2005, Kerala has adopted a fairly well-developed mechanism at various levels for managing disasters particularly the consequences of natural disasters. Kerala is acclaimed globally as a model thanks to its Human Development Indices. It has attained the stature by incorporating grass root level institutional and policy mechanisms. Likewise, in the arena of disaster management also, the state can project a stand-alone model.

2. METHODOLOGY

The discourse of disaster management has seen a paradigm shift after the event of Tsunami in 2004. Thus this study attempts to juxtapose the disaster management scenarios of Kerala in the pre and post tsunami context which helps to understand evolution of disaster

management in the state of Kerala over a period of time. The information collected was mainly of qualitative in type. The content analysis method is used in this paper. The study mainly relies on qualitative secondary data secured from various government reports and documents. Official documents were collected from the various government departments such as Revenue and Disaster management, Economic and Statistics, Home and Health, State Emergency Operation Centre, and various district disaster management authorities. Reports from NGOs, journal articles, newspaper clippings, TV reports and documentaries, and internet resources are also used. Moreover external funded project reports such as United Nations Development Programme (UNDP), Asian Development Bank and World Bank were also reviewed. In addition, informal discussions with stakeholders at different levels were also conducted. Basically, information from secondary sources collected on;

1. The existing policy framework of disaster management
2. The current institution arrangement of disaster management
3. The project/programmes of the various international organization in the state
4. The roles and activities of various stakeholders
5. The process of disaster policy-making and functioning of the elaborate institutional mechanism

3. PRE TSUNAMI CONTEXT- EVOLUTION OF DISASTER MANAGEMENT IN KERALA

In the pre tsunami context (before 2004) Kerala had been insensitive in managing various disaster situations. In this period Disaster management was mainly concentrating on limited preparedness and response related activities. Generally preparedness activities were more or less focused on construction of structural measures such as sea walls groynes, embankments and spill way as a mitigation tool from coastal erosion and floods. On the other hand disaster response dominated by the activities such as immediate relief and rescue, damage assessment and compensation distribution. The state revenue department was entrusted with handling all types of disasters in the state. Few other state departments such as Agriculture, Public Works, and Irrigation were also had limited action dealing with disaster situation. Nevertheless the roles and responsibilities of these stakeholders to address disaster

situation were barely mentioned anywhere. Overall, disaster management as a system was not in place in the state. As a result, disaster management was most often understood as providing relief to victims, aid recovery, providing compensation, organizing relief camps, rebuilding damage infrastructure etc. Thus the whole perspective was response centric one.

In this view, the disaster management was dominated by constructing of various structural measures mainly for mitigating the effects of floods and coastal erosion. Since the period of second five year plan (during 1951-56 period), flood control works were initiated such as construction of embankments, retaining walls, bed bars, permeable groynes etc. to protect the thickly populated banks of rivers to save lives and properties of the people and to protect public property including buildings, roads, canals etc from the ravage of floods. In this regard, the first evident disaster management related initiative in the state was the construction of Thotappally water spill way in Alappuzha district which was commissioned in 1954 to protect flood hazard from the Kuttanad during period of second five year plan period (16). It was also intended for prevention of ingress of salinity into Kuttanad during summer while allowing for discharge of flood waters during rainy season (17)). The Kattampally Project regulator cum bridge across Kattampally river in Kannur district introduced in 1958 was another important landmark to curb localized flood. This project was proposed to protect about 3168 acres of wetland from floods and salt water intrusion [28]. These were the two important early mitigation activities implemented in the state to control localized flood. Followed by this, a state flood control board and a technical advisory committee was constituted which is known as 'Flood Control Technical Committee' to scrutinize the flood control measures in the state during the early 1960's. Thus flood situation in Kerala was studied in detail, basin wise in 1963 and a long range plan of flood control was prepared. These flood control works were piecemeal and helped only to a limited extend. The need of permanent solutions for flood control was keenly felt after the 1978 flood havoc. But due to the lack of funds, flood control measures could not be taken up on a wide scale till the Sixth Plan. In this background the state ninth plan suggested a new approach for management for flood proofing after identifying the prone areas through basin wise studies. Even though a basin-wise study was proposed during the Ninth Plan, for finding out the causes of occurrences, intensity, duration etc, it was not initiated due to lack funds and technical support. By the introduction of decentralized planning during mid-

1996, local government institutions initiated the flood protection related works in the state. Other than preparedness measures immediate response activities such as immediate rescue rehabilitation and damage assessment were done all the major flood events in the state such as in 1961, 1968, 1975, 1981, 1985, 1986, 1989, 1992, and 1994. All these immediate response activities were coordinated by the Revenue Department. In addition, traditionally coastal erosion was considered as a major threat to the states 590 km long coastline where the state's most the economic development concentrated in its coastal areas. In this regard, since the second plan (1956-61) period a portion fund was allocated to construct sea wall and strengthening the existing sea wall of the state. Permanent methods for preventing sea erosion were considered as by constructing sea walls and groynes in the state. These traditional activities of constructing new sea walls and strengthening existing sea walls continued unto ninth five year plan period. Since then a multipronged approach integrating, eco preservation, regulatory and management measures have taken up to curb coastal erosion.

Other than floods and coastal erosion state had not adopted any type of mitigation activities in the earlier periods. Traditionally Western Ghats regions of Kerala have been considered as the one hotspot of the landslide. However no proactive mitigation measures had been taken other than immediate response like rescue operation, damage assessment etc. In the case of drought hazard, a notable initiative was taken up to tackle unprecedented drought in 1983 improving then existed water supply schemes on a war footing. The move benefited about 40 lakhs people. The total expenditure incurred for the drought relief was amounted to Rs 21.53 crores. [18]. Moreover, Forest Department drought relief measures included plantation in 1134 hectares of land, distribution of 69.72 lakh seedlings, construction of 2700 tree guards and preparation of 10714 nursery beds. Another notable initiative was a comprehensive programme by constructing disaster relief centers in various locations across the state in 1984 with support of European Commission. Unfortunately the initiative could not sustain in a long term run because of the negligence from the state run machinery. Even though earthquake was traditionally never being a major disaster event; few initiatives had been started in the state in early 1980's. In this view, the Centre for Earth Science Studies (CESS), Trivandrum initiated seismological studies after the tremors of 1984 in Calicut. After 1994, Wadakkancheri earthquake and its long aftershocks made to operate portable recorders to monitor aftershocks activity in this region by the

Geological Survey of India and Indian Meteorological Department (IMD) [4]. In 1999, a broadband seismic observatory at Peechi was established by CESS, under the World Bank assisted programme. The upgraded Kodaikanal and Manglore broadband station of IMD under the same programme was further augmented by the seismic monitoring capability in Kerala. With this improved network, the quality of earthquake monitoring in terms of instrumentally determined location and magnitude have improved dramatically. After the 2000/2001 Irattupetta earthquake, a major programme on time-evolving deformation based on GPS geodesy was initiated by CESS in and around Palaghat gap region and by Cochin University of Science and Technology (CUSAT) in and around Achankovil shear zone in collaboration with CMMACS, Bangalore. Table 1 is a brief of early disaster related initiatives in the state

Table 1: Early Disaster related initiative in the state

S. No	Disaster Management related initiatives
1	Construction of Thottapally Spill Way , 1954
2	Flood control technical Committee, 1956
3	Constructing structural measures to control floods
4	Construction of sea wall for protecting from coastal erosion related activities
5	Drought Relief Programme by Ground Water Board, 1983
6	Constructing Disaster Relief Centres (1984) by European Commission
7	Seismological monitoring station CESS, 1984

Source: Prepared by the author

Apparently in the post tsunami period, the contribution of various research and development institutions in the field of disaster management was negligible. In the state it is the Revenue Department that maintains data pertaining to disasters such as landslide. Several state and central government agencies in the state like Centre for Earth Science Studies (CESS), Geological Survey of India (GSI), Kerala State Land use Board, Centre Water Resource Development and Management (CWRDM) have carried out studies and site specific investigation. These studies mainly brought out reports covering various aspects of the phenomenon chiefly aiming at providing localized urgent relief measures and mitigation works. Since 1993 onwards CESS have been conducting number of awareness campaigns in association with NGO's and leading Malayalam newspapers throughout the state. As a model to other states in the country, Kerala was one of the first states in the country which kicked off disaster management at the institutional level. State Level Disaster Management Authority was formed in August 2003 to

look into the requirements of disaster mitigation or preparedness in a holistic manner in the initial period. In addition to strengthen the training facilities in the area of disaster management and preparedness, the Institute of Land Management was envisioned to act as a focal point at the State level for imparting training in the field of disaster prevention, mitigation, preparedness, response, relief and rehabilitation to the various stakeholders [19].

As elsewhere in the country in the initial period, all the disaster management related activities in the state were delimited to the relief centric works until tsunami. Most of the Disaster Management works tended to concentrate on the emergency service associated with post disaster rescue, relief, reconstruction and rehabilitation as well as maintaining law and order during the time of disasters. Overall there was no sustained effort to deal with disasters in the state. Nonetheless respective District Collectors acted as the focal point for all disaster related activities whenever the disasters occurred. Funds provided to them were utilized as per directions issued by the Government from time to time. There were no comprehensive guidelines prescribing the duties and responsibilities of various Government functionaries at the time of disasters situations. Consequently, vital decisions affecting the disaster victims were made on an ad hoc basis and no long term strategies on disaster preparedness existed. Thus overall, in the pre tsunami context whole disaster management arrangements in the state were inadequate and underprepared to face any major disaster which was exposed in the 2004 Tsunami.

4. POST TSUNAMI- PERIOD OF PARADIGM SHIFT IN DISASTER MANAGEMENT

Disasters are seen as opportunities for enhanced institutional and legal arrangements (21). In the aftermath of 2004 Tsunami, the state adopted pro-active and systematic approach in disaster risk management and planning. The tsunami has been described as a "wake-up call" [22] in many sense, in fact in Kerala, Tsunami of 2004 was indeed a wakeup call as all most all the major disaster management initiatives including institutional set up as well as policy framework have only been evolved after tsunami. Like most of other states in the country disaster management initiative in Kerala had also been traditionally post-disaster relief and rebuilding centric. In Post Tsunami context more pro-active approaches of disaster prevention and preparedness have been adopted. In this view several significant changes have influenced many facets of disaster management spectrum in the state.

Following the enactment of National Disaster Management Act in 2005 disaster management related initiatives in the Kerala has received wider consideration particularly constituting various institutional set ups and drafting policy framework on disaster management. The stated significant change in disaster management approaches demanded institutional restructuring of State Disaster Management Authority and strengthening of Institute of Land and Disaster Management, constitution of 14 District Disaster Management Authorities and

drafting various policy frameworks including State Disaster Management Plan, Districts Disaster Management Plans; State Disaster Management Policy etc. Through the various provision of the National Disaster Management Act, 2005, the state developed the disaster management framework at various levels. Generally the present state disaster management framework can be classified into two areas i.e. 1) Institutional set up and 2) Policy, techno legal framework

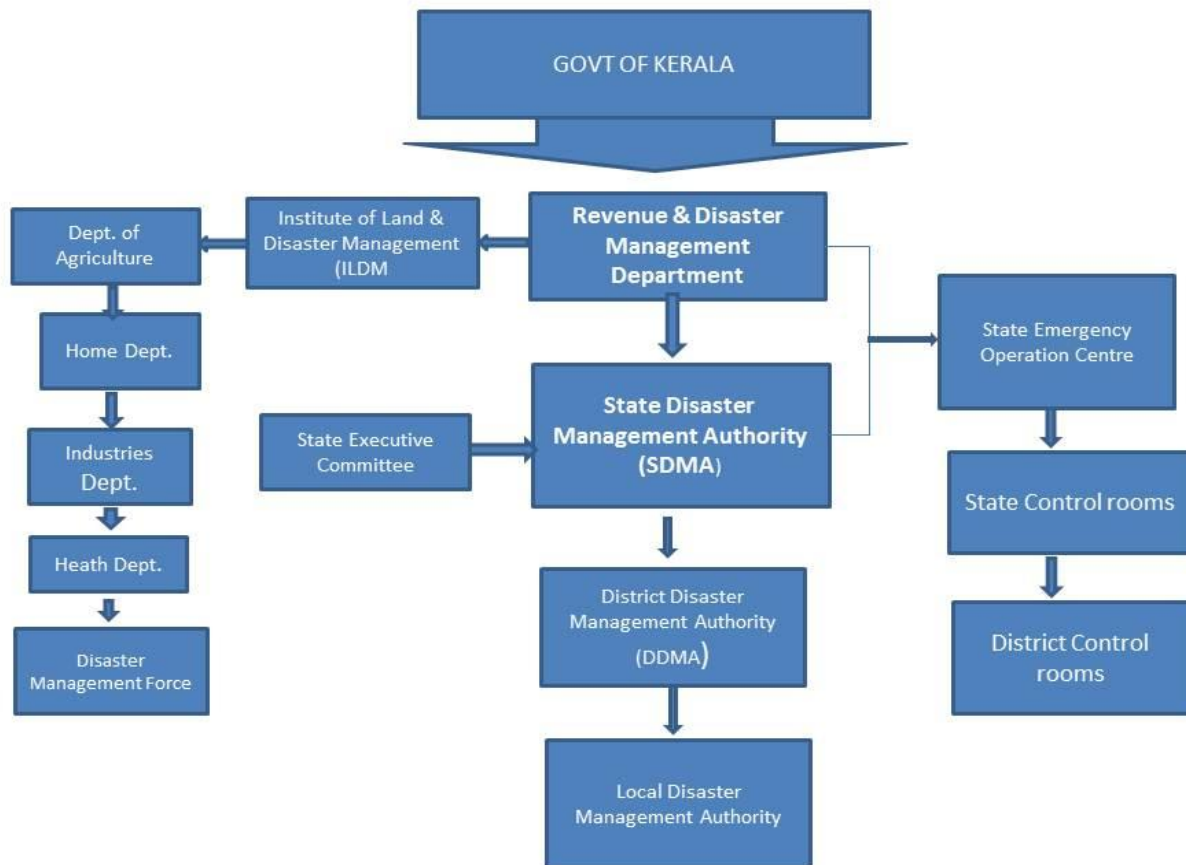


Figure 1. Structure of institutional set up for Disaster Management in Kerala

Source: Prepared by the author

Figure 1 depicts the institutional set up in the state. At the state level, three high profile bodies were established for the multispectral coordination of disaster management: State Disaster Management Authority (SDMA) and State Executive Committee (SEC) and State Crisis Management Committee. The mission of the bodies is to provide policy and management guidance as well as coordination activities at the time of emergency situation. SDMA is the apex decision making body to facilitate, coordinate, review and monitor all disaster related activities in the state. It is headed by the Chief Minister of the State as the

Chairperson and the Minister of the Revenue as Vice Chairmen and number of other members, not exceeding nine. It is supposed to lay down the State disaster management policy, approve the State Disaster Management Plan in accordance with the guidelines laid down by the National Authority. On the other hand, as an advisory role, the State Executive Committee is in the place to assist the State Disaster Management Authority in the performance of its functions and to co-ordinate action on Disaster Management in accordance with the guidelines laid down by the State Disaster Management Authority

and ensures the compliance of directions issued by the State Government, under the DM Act [25]. In this committee Chairperson is the Chief Secretary to Government and Convener is the Principal Secretary of Revenue Department also the Principal Secretaries of Finance Department, Home Department, and Health Department are the ex-officio Members. The SEC shall meet at least once in every 3 months. Moreover, a State Crisis Management Committee was set up under the Chairmanship of Chief Secretary. In this all the concerned Departments and organizations of the State and Central Government Departments located in the State represents this Committee. This Committee reviews the action taken for response and relief and gives guidelines/directions as necessary.

Presently the lead role in disaster management in the state including response, relief and rehabilitation is vested with the Revenue and Disaster Management Departments which was known as the Department of Revenue until 2002. It has the prime management role of all types of disasters that include both natural and manmade. It has the role of inter-departmental coordination, planning and response to disaster management. Under Revenue and Disaster Management Department two leading, specialized line agencies are created, State Emergency Operation Centre (SOEC) and Institute of Land and Disaster Management (ILDM). SOEC is for the disaster related information dissemination including warning and precautions. The information can be promptly assessed and relayed to concerned parties as rapid dissemination contributes to quick response and effective decision making during the emergency. It would maintain direct linkage with state control room as well as 14 district control rooms through phone, fax, wireless and internet. [1]. Thus it would ensure that a comprehensive information network is available for timely collection of hazard-related information and rapid dissemination of relevant information and warnings. In addition State Control rooms function at the office of the State Disaster Management Authority and Districts control rooms at the district collectorate there by processing and disseminating disaster related information. Control rooms would also be made operational under the nodal departments in the event of disaster. The Institute of Land and Disaster Management under the Department of Revenue and Disaster Management is responsible for training and research, documentation and development of state level information base, generation of technical data banks, generating short and long-term rehabilitation measures and for imparting appropriate training to State and District level officials on disaster management. This institute

promotes sharing and dissemination of specialized knowledge on disaster management among various implementation agencies, NGOs, private sector and the community in the state.

Table 2 gives the various nodal departments in the state dealing with major disasters. Other nodal departments on disaster management are Home, Agriculture, Animals Husbandry, Forest, and Public Works Department - having roles in handling disaster in their respective areas. Table 3 shows the nodal departments and respective roles. In addition to the purpose of specialized response to threatening disaster situations, State Disaster Response Force has been constituted with headquarters at Peerumedu Taluk in Idukki District. It has a well trained force with strength of 100 members deployed in Trivandrum, Ernakulam, Thrissur and Kannur ranges of the police. This force functions under the guidance of Home Department which is also a nodal department in the state on disaster management. Moreover, a Regional Response Centre of National Disaster Response Force is also set up in Kozhikode, in addition to the Seasonal Response Centre in Idukki.

Table 2. State nodal department dealing with major disasters

S. No	Nodal Departments	Disaster
1	Department of Revenue	Flood, drought, landslide, earth quake, and other major natural and made disasters
2	Department of Home	Manmade and human induced disasters including rail and road accidents
3	Department of Public Health	chemical, biological (health related), radiological and nuclear disasters
4	Department of Factories and boilers department	Industrial Department
5	Department of Agriculture Department	Pest attack
6	Department of Animals Husbandry	Cattle epidemics
7	Department of Water Resource	Dam Burst
8	Public Works Department	Major Building Collapse
9	Department of Forest	Forest Fire

Source: State Disaster Management Policy

At the district level, the District Disaster Management Authority is the organization to take all measures for the purpose of disaster management covering all 14 districts of Kerala. The Authority (DDMA) is chaired by the District Collector, and such number of other members, not exceeding seven. The Authority is to act as the district planning, coordinating and implementing body for disaster management. It is empowered to coordinate disaster management activities and mobilize resources of all relevant Departments at district level.

Kerala has established a Policy Techno – Legal Framework for disaster management in the State which creates an enabling regulatory environment and compliance regime in the State and facilitates the activities of different phases of disasters. [25] The policy level initiatives include State Disaster Management Rules, State Disaster Management Plans, district disaster management plans for 14 districts, and various department disaster

management plans etc. As the guiding principle of the State for disaster management, the State Disaster Management Policy is formulated by the Department of Revenue and Disaster Management and promulgated by the State Disaster Management Authority (State Disaster Management Policy, 2010). Its goals to institute structures and systems and to establish directive principles for effective risk reduction and crisis management in order to minimize human, infrastructure, property environment and livelihood losses and to contribute to the sustainability of development and better standards of living for poor and vulnerable sections. The Policy underscores an integrated approach to disaster management covering all phases of managing disasters such as prevention, mitigation and preparedness (pre-disaster phases), Disaster response phase (during disaster) and recovery (Post Disaster phase) emphasizing the roles and responsibilities of the each institutional set up of the state in each stages of the Disaster Management .

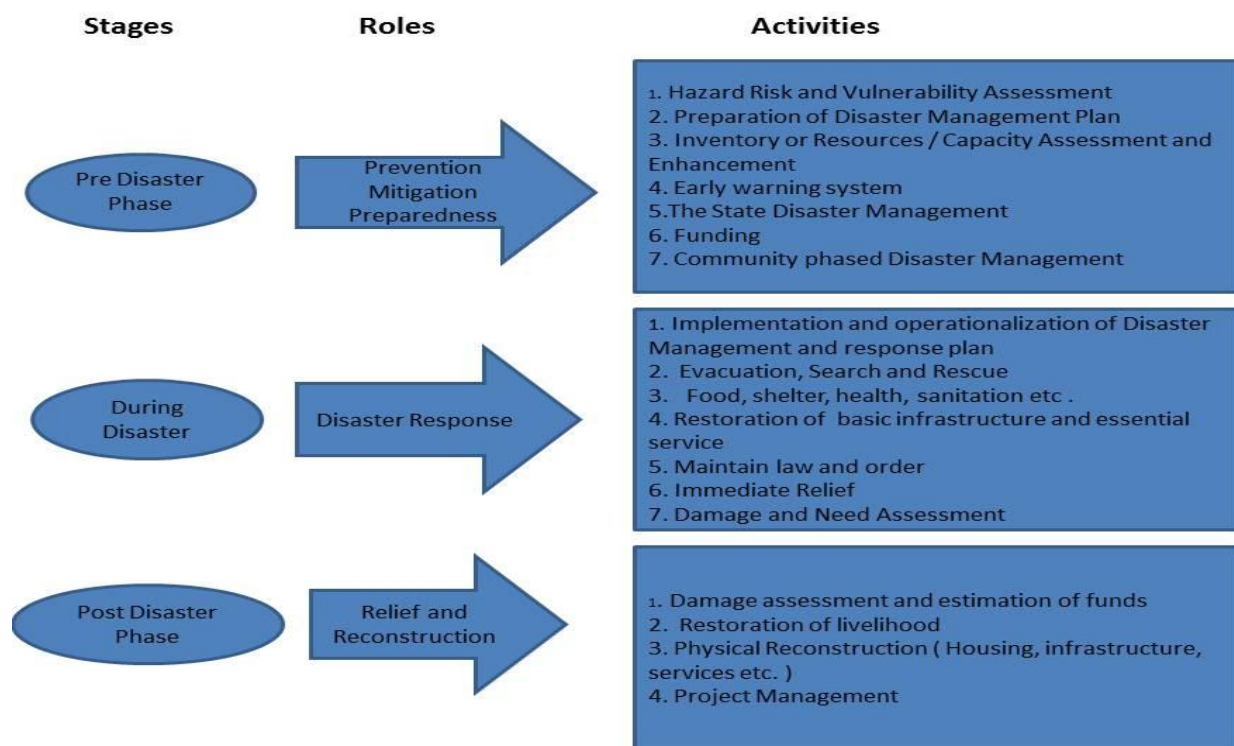


Figure 2 Roles and activities on various stages of Disaster Management

Source: State Disaster Management Policy

The State Government, in line with National Disaster Management Act, 2005, has notified Kerala State Disaster Management Rules, 2007 [26]. It emphasis the whole structure of disaster management spectrum in the state including constituting the powers and function of various state institution such SDMA, DDMA, State Executive

Committee etc. Moreover, the State Disaster Management Plan calls for a framework for mainstreaming disaster management in the State and necessitates the departments of the State Government to give priority to hazard identification and risk assessment in their plans and schemes and allocation of a portion of plan funds for

efforts that directly or indirectly help in disaster management. [1]. It envisages formulation of a strategy for mainstreaming disaster management in the State which includes awareness generation, advocacy for political commitment, legislation, training and technical support, development of tools, monitoring and evaluation, development of a set of indicators and assessment methodology. At the same time all the districts in the state have prepared their respective disaster management plans as per the guidelines of the National Disaster Management Authority. Moreover the departments of the State Government are also entrusted to prepare various Departmental Disaster Management Plans that involve programmes within the routine departmental works for disaster prevention, mitigation and preparedness and strategies for its successful implementation.

5. UNDERSTANDING CHALLENGES AND OPPORTUNITIES OF DISASTER MANAGEMENT FRAMEWORK IN KERALA

In Kerala much progress has been made in enhancing the disaster management framework during the last decades particularly after 2004 tsunami. In the post tsunami context the state has adopted proactive approaches in an organized and structured manner for strengthening the disaster management framework. It is widely accepted that a well-developed disaster management must be concentrated on the pre disaster planning activities such as prevention and preparedness. In this view, state has adopted many holistic approaches to deal with anticipated disaster risk. As it is evident from the institutional structure, Kerala has developed an elaborate framework and disaster response mechanism. Kerala is the one the first states in country constituting a State Disaster Management Authority. At the district level 14 District Disaster Management Authorities (DDMA) have been strengthened through various provisions of Disaster Management Act. As a result District Emergency Operation centres attached to various DDMA acts as a link between grassroots level disaster management institutions such as village and taluk officers and State Emergency Operation Centre. In addition proactive measures have been taken by the District Disaster Management Authority for disaster preparedness and precautionary actions. For an instance 'Operation Anantha', a flood mitigation project initiated by the District Disaster Management Authority of Thiruvananthapuram district in May 2015 had taken precautionary action on removing unauthorized and dangerous concrete structure from the urban drainage basin of corporation which is considered as leading factor

of urban flood in the capital city of the state. In 2012, the DDMA of Malappuram district adopted a comprehensive programme to mitigate drought incidents on the district through constructing eco friendly check dams which was widely acclaimed as Malappuram model has been replicated in many other districts in the state. Thus various District Disaster Management Authorities in the state have been in the leading devising various disaster risk reduction strategies.

In the state, disaster prevention and preparedness measures are being taken by the government authority during the various periods. As part of this the State Relief Commissioner issues special disaster warning instructions periodically during every South West Monsoon as well as summer season as a precautionary method from the challenges of occasional natural hazards such as floods, landslides and coastal hazards. Strict measures have been taken to regulate rock quarrying and other types of mining in the highlands regions to curb the landslide incidents in the state. The enactment of Kerala Conservation of Paddy Land and Wetlands Act 2004 can also be considered as the flood reduction and drought mitigation strategy. To control recurrent droughts in the state, various initiatives have also been started such as 'Mazhapolima' a community based roof rain harvesting and open well recharge project, 'Jalavarshini' for reviving selected ponds in the state, minor check dams with local materials etc have been taken by Kerala State Disaster Management Authority. It has also entrusted respective District Disaster Management Authority to ensure issuing license for land and coastal excavation/mineral excavation/mining. In the response to the anxiety prevailing in the public minds regarding the strength of Idukki reservoir, a Mullaperiyar Crisis Management Plan has been established as a preparedness initiative in the vulnerable areas of Vandiperiyar, Upputhara, Elappara, Kumali, Kanchiyar and Ayyappankovil of Idukki district. Moreover it has become mandatory that any construction related activities in the hazard prone sites need to get prior consent from the competent authority after considering the hazard prone area maps published by State Emergency Operational Centre. It clearly shows that the disaster risk reduction measure has become mainstreamed through these holistic approaches

Perhaps, State Emergency Operation Centre (SEOC) of Kerala would be the first of its kind in the country to give technical and scientific inputs to the overall functioning of the Disaster Management System in a state. It is a centre of group of multi-disciplinary teams having a professional

mechanism in Disaster Management. As a frontline technical agency in Disaster Management, it has been entrusted with monitoring, recording and updating each disaster event and timely coordination with various stakeholders which helps in better disaster planning. Attached to the SOEC, fourteen District Control rooms are operating from various district headquarters round the clock. In each district these control rooms are well coordinated with various villages and taluk officers who come under respective district jurisdictions. Moreover, the state has developed well organized interdepartmental coordination in the area of disaster management which not only identified nodal departments but also proper facilitation for the interdepartmental coordination. The capacity building to various stakeholders is always one of the important aspects for successful disaster management at the administrative level. In this regard, the set up of Disaster Management centre attached to Institute of Land and Disaster Management has now emerged as nodal agency in the training in the areas of disaster management. As part of this it organizes various training programmes for state officials on various aspects of disaster management which is very important for strengthening of the state administrative machinery for sensitizing on disaster management. It also engages activities such as developing training modules, brochures and pamphlets as well as research activities on disaster management. It has published information brochures on landslides, lightning, coastal erosion, fire safety, floods, drought, sun burn, cyclones, earthquake, chemical accidents, drowning and family disaster management preparedness and has circulated widely [1] Moreover, it has already trained over 3000 stakeholders in the period 2010-16 which is considered as human power resource for managing various disasters.

The District Disaster Management Plans of 14 districts is a guiding document to prepare, plan and respond to the disaster at the district level. It is considered as a dynamic document which is subjected to periodic revision and up gradation, as mandated by the Disaster Management Act 2005. In this regard all the district disaster management plans got occasional revision and up gradation which also helps in revisiting and reviewing the available resources and capacities related to disaster management of the state. In the state, district disaster management plans were initially drafted in 2010 focused on creating resource inventory of the districts rather than systematic document pertaining activities needed at the time of a disaster. Redrafting and updation of the same plan again done in 2015 which is now a comprehensive documents that follows the guidelines prescribed by the National Disaster

Management Authority such as the topic on hazards, risk and vulnerability assessment, institutional arrangements, finance assurance, planning and response mechanism on disaster management at the district level. It helped district to focus more on the issues to prepare, mitigate and respond in a much better way than in the past..

Kerala is a leading front in the various research activities in the area of disaster management. The various scientific institutions such as Centre for Water Resource Development and Management (CWRDM) Kozhikode, Geological Survey of India, Thiruvananthapuram, Meteorological Resource Centre, Thiruvananthapuram, National Centre for Earth Science Studies (NCESS) Thiruvananthapuram and various universities in the state are actively engaging research in various aspects of state specific disaster and its management. Perhaps Kerala would be the first state in the country which prepared a multi hazard prone areas map of the entire state covering major natural hazards in the state which is a prominent work by the National Centre for Earth Science Studies. Moreover, Disaster Management Department has started collecting and updating various disasters in the state periodically. The State Emergency Operation Centre has started scientific assessment of various characteristics of hazards in the state. Coastal hazard monitoring system and digital seismic monitoring networks are two sophisticated technology using for the disaster risk planning which is supported by the state government. These research activities help to strengthen technical capacities in disaster management in the state.

The State Disaster Management Authority (SDMA) periodically organizes various awareness and capacity building programmes as part of disaster reduction strategies. Various Disaster Mock drills such Tsunami Mock Drills, Fire Mock Drills etc are periodically organized for better preparing the disaster risk situation in the various vulnerable locations of the state. In the state for the first time a state wide Tsunami Mock Drill exercise was organized on 11th March 2013. Staff of Revenue and Health Department, Police, Fire and Rescue Services, Army, Navy, Air Force, Coast Guard, Indo-Tibetan Boarder Police and Coastal Police participated in the programme that covered 9 coastal districts of the State [26]. Moreover, the Kerala State Disaster Management Authority organizes and supports series of workshops on various disaster management topics under the title 'Towards a Safer State'. Formation of School safety clubs, swimming training programme for school children, training programme on emergency management professionals, residence association etc are few initiatives

target wider awareness of disaster reduction in the state. Every year on 13th October observes as the International Day for Disaster Risk Reduction (IDRR) in which state government conducting various awareness related programmes such as State wide quiz, photo exhibitions, painting competitions for school student's magic shows and various innovative initiatives.

Despite well functioned disaster management framework, state as a whole has not been sufficiently strengthened its institutions to implement disaster risk strategies particularly at the local levels. The state has a well acclaimed grassroots level planning process and decentralization but disaster management is yet being its mainstreamed task. State Disaster Management Rules and other policy have failed to provide a decentralized approach in the state disaster management framework. Consequently Panchayat Raj Institutions such as Urban Local Bodies such as city corporations and municipalities, District Panchayats, and Grama Panchayat are insensitive on the disaster risk management and planning. In addition the state Local disaster management authorities are yet to be constituted. As a result, no initiative could not been taken for developing Local Disaster Management plan even after enactment of the State Disaster Management Policy. Moreover no approaches have been adopted from the state for capacity building or sensitizing the local body representatives. Kerala Institute of Local Administration (KILA) Thrissur is a training institute entrusted for capacity building activities related to Panchayat Raj Institutions (PRI) Members which could not conduct a training programme on disaster risk reduction so far. In addition Disaster Management Centre at Institute of Land and Disaster Management, Thiruvananthapuram has neither adopted any task for sensitizing disaster management issues focusing the PRI members. Yet disaster management is not one of the competencies allocated to local government but rather to state and district administration

At the operational level, there have been equal concerns to strengthen related organizational arrangement at the lower level. Other than state level institutions and departments, most of the officials at the district and lower level hardly have professionalism to deal disaster management. Most of the officials in the nodal institutions at lower levels particularly village and taluk offices have no expertise to deal emergency situations. Moreover, multiple responsibilities with excessive work load makes difficulties while responding to a disaster situation. In most cases they handle this work for limited time period as their jobs are transferable at any time. As a result there is a

serious problem of maintaining institutional memory to carry the process forward. Consequently an appropriate action to be taken for managing disaster management is hindered and sidelined. Hence professionalization should be ensured particularly at district and local government hierarchy administration.

Disaster Management is a multi-sectoral affair involving partnership and coordination among various departments and organization. A well-coordinated and unified response of various State departments and agencies appropriate to the proportion and demand of the crisis situation need to be ensured by the State government. Currently there is no such mechanism in the place for state inter-departmental coordination as and when a disaster situation arises. Other than significant contribution of nodal stakeholders the synergy among multiple stakeholders is absent in the state. This is mainly because state yet to prepare 'Crisis Management Plan' or 'Standard Operating Procedures' which is supposed to be defined response, roles and responsibilities of different government departments and agencies at the time of any disaster situations. Moreover, Departmental Disaster Management Plan for all the state departments specifying departmental responsibilities during disaster situation yet to be prepared in the state. As a result there is no clarity in the division of responsibility among nodal departments in the state. Therefore, a broad-based partnership involving all the stakeholders is desirable and a realistic approach to realize the full potential at all stages of disaster management, namely, prevention, preparedness, response and recovery [30].

National disaster management acts clearly depicted the role of NGOs at various level phases of disaster management. The role of NGOs remains crucial in all phases of disaster management namely relief, response, rehabilitation, reconstruction, recovery, preparedness and mitigation (NDMA). Emerging trends in managing natural disasters have highlighted the role of Non Governmental Organizations (NGOs) as one of the most effective alternative means of achieving an efficient communication link between the Disaster Management agencies and the affected community. Many different types of NGOs are already working at advocacy level as well as grassroots level; in typical disaster situations they can be of help in preparedness, relief and rescue, rehabilitation and reconstruction and also in monitoring and feedback. [2009]. Community is the centre stage of any disaster risk management and its real objective could be only achieved through the collective efforts of government agencies and non-governmental organizations. In the state NGO Co-

ordination Committees were not constituted at State/District levels. As a result NGOs have limited role in any disaster risk management activities of the state. Other than a few NGOs participating in arranging public awareness campaigns and training programs they are inactive in the disaster spectrum in the state.

It is worth noted that after the tsunami state government implemented early warning system from the support of Asian Development Bank and United Nation Development Programme (UNDP). The system of Very High Frequency technology well known for alternative communications is a last mile connectivity technology which aims to build strategies around information, communication and community mobilization in disaster preparedness. It was installed in 234 vulnerable coastal villages locates in the 9 coastal district of the state. It is now found that all most all the early warning system installed in these villages are not entirely functional. Despite huge investment in the early warning system state could not identify or assign an agency or professional team to give technical support for the proper functioning of these instruments. Even it is also reported that some instruments installed in village offices got missing as result of the negligence of the authorities. It is mainly because lack of coordination, proper training and technical knowledge of the users. In addition, community-based disaster risk management (CBDRM) programme was also taken up in the state which has many aspects such as preparation of village disaster management plan, committee, teams etc in addressing the vulnerability of the poor to natural hazards and socioeconomic shocks. It now become of subject to stern criticisms because whole aspect of this programmes is found to be inactive. In the state 197 Village Disaster Management Committees as well as teams have been formed in nine coastal districts under CBDRM programme in which neither a single village committee nor team is functioning as intended. In addition, village disaster management teams were also formed which are not now active in the state

The Kerala state municipal and panchayat buildings Rules dealing has not been incorporated the disaster management provision. In the Panchayat building rules in 2011 it is only mentioned building constructions should not be permitted in a area liable to flood or on a slope forming an angle of more than 45 degrees with the horizontal which has chance of landslide and landslips. Other than using the provisions of environment policy and coastal zone regulation act it has nothing to deal with disaster risk reduction. Thus the review of state municipal and panchayat building rules clearly illustrates that provision of disaster management are not strictly complied.

Moreover every state in the country was directed to set up State Disaster Response Force by the National Disaster Management Authority. In Kerala, State Disaster Response Force was not constituted as category wise staff strength by Government. Currently the state disaster situation is mainly handled by the Rapid Response and Rescue Force (RRRF) which comes directly under department of home and limited control by the disaster management department.

Incorporating disaster management in development plans still a distant dream in the state. The need for disaster risk reduction and development integration due to the dramatic rise in the number of disaster events and their impact on development gains. The country's commitments to mainstream disaster risk reduction into the process of development planning have not been carried forward across sectors. None of the latest development projects has considered any disaster risk reduction aspects. There would have been a wider scope for incorporating disaster risk reduction and planning element in the development plan in sectors such as infrastructure projects like Metro Rail projects, roads and bridges, urban master plan preparation etc. As yet, there does not seem to be any clear thinking on inclusion of disaster management in any of the state development plan projects. The result is that, disaster risk reduction has largely been peripheral and would have a long way to go before they become mainstreamed in development projects. The argument is that, all development planning in the state must have disaster risk components. In this process, all development projects and planning must consider the disaster risk profile of the specific level of government before funding can be allocated

6. CONCLUSIONS

As elsewhere in the country, pre tsunami phase of disaster management in Kerala was relief centric, giving less attention to institutional and policy framework. However, comprehensive and elaborative disaster management framework has been devised particularly after 2004 tsunami in the state. Both preparedness and response capacity of the state have increased as a result. Particularly for the last one decade, much progress has been made in enhancing the disaster management capacities in the state. Institutional strengthening, policy and plan pronouncements in recent years etc indicate that the state government has been adopting a proactive approach in disaster management enhancing the disaster management capacities. An appraisal of disaster management shows that disaster management spectrum in Kerala is in early

stages of development. In line with its status as a model state in human development, Kerala could have achieved the same in the arena of disaster management as well, had it adopted proactive approaches in the early stages itself. Even though the state is in its infancy with respect to disaster management, a well knitted grassroots level integration could develop and strengthen institutional/policy framework through proper planning. In this view, in the sphere of disaster management, integration of well-developed local government institutions is inevitable for long term disaster risk planning, management and for developing more effective disaster management initiatives.

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