KERALA AND CALAMITIES: EVOLVING PRACTICES IN DISASTER MANAGEMENT

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ABSTRACT:*The land of Kerala is a beautiful territorial segment of peninsular India that abounds with radiant streams, vast lakes, large backwaters, rich fauna and flora. It is widely acclaimed as God's Own Country but is at times exposed to the vagaries of nature, especially in the form of floods and other hydrological problems. It is vulnerable to natural as well as man-made disasters. The Kerala State Disaster Management Authority (KSDMA) is the authorized body in Kerala to offer timely assistance to the affected people in the state during times of disasters. It was formed under the Disaster Management Act, 2005 (Central Act 53 of 2005), in the aftermath of the December 2004 Indian Ocean tsunami. Among the disasters in Kerala, special mention should be made of the 2004 Indian Ocean earthquake and tsunami, floods in Kerala during 1341, 1999, 2011, 2015, 2018, and 2019, railway accidents and incidents like the Peruman train accident and the Kadalundi train derailment, the 2021 Nipah virus outbreaks, the COVID-19 pandemic, boat disasters of Kumarakom, Tanur, Thattekkad and Thekkady, the Sabarimala stampede, the Puttingal temple fire, the 2020 Pettimudi landslide, etc.*

Man has struggled against the rudimentary forces of nature ever since the beginning of life itself. History is replete with numerous incidents of disasters that have struck mankind. Wind, water, and tectonic forces have wreaked havoc in the past and continue to cause large-scale loss of life and damage and destruction of property and the living environment. Although science and technology have made tremendous progress in the struggle of mankind against the destructive forces of nature, it has not ceased altogether, and large regions of the world continue to remain susceptible to natural disasters and are becoming increasingly vulnerable.

The land of Kerala is a beautiful territorial segment of peninsular India that abounds with radiant streams, vast lakes, large backwaters, profuse vegetation, rich forests and

mountains.[1] It is widely acclaimed as *God's Own Country* but at times is exposed to the vagaries of nature, especially in the form of floods and other hydrological problems. It is highly vulnerable to natural disasters and the changing climatic dynamics along the sea coast, with a steep ramp through the slopes of the Western Ghats. Kerala happens to be one of the country's most flood-prone states. The floods that happen almost every year continue to be the greatest natural disaster in Kerala. At times, torrents of floods devastate the hilly regions. Nearly 14.5% of the State's land area is prone to floods, and the proportion is as high as 50% in certain districts. The Kerala State Disaster Management Authority, in its Disaster Management Plan (DMP), has identified thirty-nine hazards that the State is susceptible to. These were categorized under two broad heads, i.e., Naturally Triggered Hazards (Natural Hazards) and Anthropogenically Triggered Hazards (Anthropogenic Hazards). Disaster risks are exacerbated by a critical factor that has been silently increasing in the State—its land use pattern and practices. Among the disasters in Kerala, special mention should be made of the 2004 Indian Ocean earthquake and tsunami, floods in Kerala during 1341, 1999, 2011, 2015, 2018, and 2019, railway accidents and incidents like the Peruman train accident and the Kadalundi train derailment, the 2021 Nipah virus outbreaks, the COVID-19 pandemic, boat disasters of Kumarakom, Tanur, Thattekkad, and Thekkady, the Sabarimala stampede, the Puttingal temple fire, the 2020 Pettimudi landslide, etc.

The territory of the state is broadly divided into three natural divisions, viz; the high land the midland and the lowland.[2] The Western Ghats, which range along the eastern border, constitute the highland. It is covered by thick forests in its upper ranges while in the lower ranges the forests are interspersed with plantations. The low land stretches along the coastal plain on the western side of the state. The soil in this region is sandy. Sand witched between the lowland and the highland is the mid land. It is basically an agricultural country, 42.2 per cent of the population depending for their means of subsistence almost upon

[1] A Sreedhara Menon, *A Survey of Kerala History*, Madras, 2003, p.1.

[2] Jitendra Singh, *Communist Rule in Kerala*, New Delhi, 1977, p.1.

lands.[3] The southwest coast of India is set apart from the rest of the peninsula by both physiography and climate. Bounded by the Indian Ocean on the west and the Western Ghats on the east, the region consists of mountain evergreen and semi –evergreen tropical forests dissected by well-watered alluvial valleys. The Western Ghats not only act as a rain shadow during the summer monsoon, ensuring a fairly high rainfall along their western slopes, but they also send down numerous small navigable rivers to the coast.[4] Most of the natural disasters in Kerala are decided by the topographical features.

The geographical position has its own uniqueness and its landscape has its own beauty. In the poetic language of Mahakavi Vallathol Narayana Menon, it "Sleeps with head on the lap of the Sahyadri clad in green" and her feet pillowed on the Lord Gokarna on the other".[5] This geographical position as a narrow strip of land hemmed in between the Western Ghats on the one side and the Arabian Sea on the other has considerably influenced the course of its history. The climatic conditions decided the temperaments of the people largely. The climate although very hot and seldom above 95 degree is usually equable and the dampness of the sea breeze continually blown over the land by the prevailing south-west breeze, keeps the temperature approximately the same throughout the day and night.[6]

Kerala, which lies in the tropic region, is mostly subject to the type of humid tropical wet climate experienced by most of Earth's rainforests. It belongs to the category of tropical monsoon climate. Meanwhile, its extreme eastern fringes experience a drier tropical wet and dry climate. Kerala receives an average annual rainfall of 3,107 mm – some 7,030-crore m^3 of water. This compares to the all-India average of 1,197 mm. Parts of Kerala's lowlands may average only 1,250 mm annually, while the cool mountainous eastern highlands of Idukki district – comprising Kerala's wettest region – receive in excess of 5,000 mm and

[3] V. Nagam Aiya, *Travancore State Manual*, Vol. III, Trivandrum, 1903, p.1.

[4] Burton Stein, 'South India: Some General Considerations of the Region and its Early History' In *Cambridge Economic History of India*, Vol. I ed. T. Raychaudhuri and I.Habib, New Deli, 1982,pp.14-42.

[5] V. Nagam Aiya, *op.cit.*, p.2.

[6] T.H. Somervel, *Knife and Life in India*, London, 1955, p.27.

4,200 crore m³ that are available for human use annually. Kerala's rains are mostly the result of seasonal monsoons. As a result, Kerala averages some 120–140 rainy days per year. In summer, most of Kerala is prone to gale-force winds, storm surges, and torrential downpours accompanying dangerous cyclones coming in off the Indian Ocean. Kerala's average maximum daily temperature is around 37°C; the minimum is 19.8°C. The moisture-laden winds of the southwest monsoon, on reaching the southernmost point of the Indian peninsula, divide into two branches: the "Arabian Sea Branch" and the "Bay of Bengal Branch". The "Arabian Sea Branch" of the Southwest monsoon first hits the Western Ghats making Kerala the first state in India to receive rain from the Southwest monsoon. [7]

In deciding the natural disasters on Kerala, the Western Ghats play the most decisive role. is a continuous mountain range of 450 kms along the eastern side of Kerala. It forms almost an unbroken wall guarding the eastern frontier and helps the people of Kerala to lead a sheltered life of their own through the centuries. The Western Ghats is also responsible for the high and steady rainfall in Kerala. It converts 50% of Kerala into highlands and is studded with more than 50 peaks above 5000 feet above Mean Sea Level. With a height of 8841 feet (2,695 metres), Anamudi is the highest peak in India outside Himalayas. Anamudi is located in Idukki district in Kerala. The Athirapilly Falls, which is situated on the background of Western Ghats Mountain ranges. It originates from the peak of Anamudi and is also the largest waterfall in the state.[8]

The Western Ghats have constituted almost an unbroken wall guarding the eastern frontier and helped the people to lead a sheltered life of their own through the ages. What the Himalaya Mountains are to the Indian sub-continent the Western Ghats are to Kerala.[9] Isolated by the towering mass of Western Ghats, hidden away in a confusion of bays and creeks, hills, dense forests and groves of coconut palm it is situated in the southernmost corner of India.[10] It ranges from 3,000 ft. to more than 8,000 ft. above the sea level. The

[7] https://en.wikipedia.org/wiki/Geography_of_Kerala
[8]S.L Kuriakose, G Sankar and C, Muraleedharan, , *History of landslide susceptibility and a chorology of landslide prone areas in the Western Ghats of Kerala, India*, Environmental Geology, 57(7), 2009, pp. 1153–1568.
[9] V. Nagam Aiya, *op.cit.*, Vol.1, p.11.
[10]T.K.Velu Pillai, *The Travancore State Manual*, Vol.I, Trivandrum, 1940, p.2.

Agastyakutam, the southernmost peak in the Ghats, is 6,132 ft. above sea level and figures in the popular tradition connected with Agastyamuni.[11] The Western Ghats have prevented large-scale incursions by aggressive powers from beyond and have thus acted as a natural wall of protection. It is separated from the Madras presidency and conferred distinctiveness on its history and culture.[12]

Kerala's coastal belt is relatively flat, teeming with paddy fields, groves of coconut trees, and heavily crisscrossed by a network of interconnected canals and rivers. The coastline is prone to erosion, monsoon storm surges and sea level rise. The coast line of Kerala (590 km) is one of the most densely populated land areas in the country. More than half of the area of the State is only four meters above sea-level and encroachment by the sea severely affects the economy of the State. A substantial part of population not only lives close to the coastline but also lives off it and they belong to the vulnerable sections of the society. This coastline is exposed to high waves, storm surges and Tsunamis. Sea erosion is one of the recurring natural hazards affecting the coastline in the State, as part of the erosion - accretion cycle. Their vulnerability to the vagaries of sea waves and magnitude of the following disasters have been increasing, damaging livelihoods and properties of the fishermen community.

The Kerala coast was significantly affected by the Indian Ocean Tsunami on 26 December 2004. It was a massive tsunami with waves up to 30 m (100 ft) high devastated communities along the surrounding coasts of the Indian Ocean, killing several thousands of people.[13]It was one of deadliest natural disasters in recorded history caused by a rupture along the fault between the Burma Plate and the Indian Plate, and reached a Mercalli intensity up to IX in some areas. It was the most powerful earthquake ever recorded in Asia, the most powerful earthquake in the 21st century. It had the longest duration of faulting ever

[11] A Sreedhara Menon, *op.cit.*, p.4.

[12] *Administrative Report of Travancore* for 1104 M.E. p.2.

[13] *National Earthquake Information Center (26 December 2004).”M 9.1 2004 Sumatra-Andaman Islands Earthquake”, United States Geological Survey.*

observed, between eight and ten minutes. It caused the planet to vibrate as much as 10 mm (0.4 in), and also remotely triggered earthquake as far away as Alaska.[14]

The coast located in the shadow zone with respect to the direction of propagation of the tsunami encountered unexpected devastation. Although the tsunami affected parts of Kerala coast, maximum devastation was reported in the low coastal land of Kollam, Alappuzha and Ernakulam districts, particularly a strip of 10 km in Azhikkal, Kollam district. This varying effect along the coast could be attributed to local amplification of tsunami waves in certain regions. About 176 people were killed and 1600 injured in the coastal belt. Further, the tsunami pounded 187 villages affecting nearly 250,000 persons in Kerala. As many as 6,280 dwelling units were completely destroyed, 11,175 were damaged and nearly 84,773 persons were evacuated from the coastal areas and accommodated in 142 relief camps after tsunami. As this tsunami is believed to be first of its kind to have significantly affected the Kerala coast, the post-tsunami field investigations and measurements would give valuable information on various changes brought by the tsunami.

The Kerala State Disaster Management Authority (KSDMA), established under the Disaster Management Act, 2005 (Central Act 53 of 2005), in the aftermath of the December 2004 Indian Ocean tsunami, identifies disaster risks as one of the main challenges to Kerala's development aspirations. It is the authorized body in Kerala that tries to offer timely assistance to the affected people. It ensures that proper planning and recovery methods are implemented in the state during disasters. It is a non-autonomous body. The disaster management team must plan the resources to decrease the loss it causes. Disaster management undertakes the prevention of catastrophes and calamities. They should act quickly, ensuring less loss of life and property. It could be a natural disaster or a man-made emergency.

The Kerala State Disaster Management Authority (KSDMA) is the authorized body in Kerala. They ensure that proper planning and recovery methods are implemented in the state during disasters. The management was formed under the Disaster Management Act,

[14] Satake K; Atwater B. (2007). *" Long Term Perspectives on Giant Earthquake and tsunamis at Subduction Zones" (PDF). Annual Review of Earth and Planetary Sciences. Annual Reviews. 35 (1):*

2005. They began their operations on May 7th, 2007. It is a non-autonomous body. The chairman of the management committee is the Chief Minister of the state. Besides the Chief Minister, the management comprises 10 members. It is headed by the Additional Chief Secretary, Revenue and Disaster Management. There is also the Kerala State Emergency Operations Centre (KSEOC). They take care of technical matters and emergency operations. Other committee members include the Minister for Home and Vigilance, the Additional Chief Secretary, Home, the Head of the State Emergency Operations Centre, and the Minister for Agriculture. The Kerala State Disaster Management Authority has the following duties including legislations, notified disasters, state DM policy, DM plans, guidelines, funds, administrative orders, disaster notifications, circulars, and annual reports.

The preparedness of the Kerala State for Disaster Management includes Early warning systems, Projects, Communication, Alert archives, Maps, Meetings and Inter-agency groups. The cities like Thiruvananthapuram, Alappuzha, Idukki, Ernakulam, Thrissur, Palakkad, and Malappuram came under the District Disaster Management Authority (DDMA). The DDMA acts in coordination with the state government. They are in charge of monitoring and planning given by the Kerala State Disaster Management Authorities (KSDMA). It should react to the disaster and take steps to minimize the effects of the disaster that has taken place in the region. It is an ongoing process that the state government does.[15]

The State Disaster Management Plan lays clear guidelines for various departments; however, compliance is limited to the implementation of centrally sponsored projects. The institutional setup for disaster management in the state has an enabling legal and policy environment in place. KSDMA started to function as envisaged under the Disaster Management Act, 2005, only from 2012. Until Cyclone Ockhi in 2017, KSDMA had only 9 staff members. Additional multidisciplinary scientific staff were infused into KSDMA post-Cyclone Ockhi. Having said that, KSDMA has fairly fulfilled its mandate over the years in promoting awareness of disaster risks faced by the state and building a scientific evidence base to support risk-informed development planning, though not consistently applied by the implementing agencies. For disaster response Civil Defense Institute at Thrissur has been

[15]Data collected through Interview

established with the assistance of Government of India and land for a Regional Response Centre of National Disaster Response Force has been allotted in Ernakulam in 2016.[16]

The Disability Inclusive DRR programme of KSDMA has been referred to as the national model for developing the National Disaster Management Guidelines - Disability and Disasters. The programme yielded results during the Kerala floods, where NGOs trained by KSDMA in the domain conducted special rescue missions for persons with disabilities. Multiple government agencies and departments deal with Disaster Risk Management (DRM), directly or indirectly. The existing institutional arrangements for DRM mainstreaming are complex. Risk governance, capacity, and funding limitations indicate that DRM mainstreaming efforts have not been fully embedded in core sector activities in the state. As per the approved stakeholder responsibilities of the National Disaster Management Plan, the responsibility of early hazard detection is vested in various central agencies, namely the India Meteorological Department (IMD), Central Water Commission (CWC), Geological Survey of India (GSI), Indian National Centre for Ocean Information Services (INCOIS), etc. The responsibility of the KSDMA is to support the central initiatives, which KSDMA has done significantly. The State Disaster Management Plan mandates a checklist for all infrastructure projects to follow prior to acceptance for financing by the State. However, this mandate is not seen to be complied with by the departments. Under the existing governance structure, KSDMA and DDMAs are placed to support DRM across various government departments and agencies in the state through their coordination and facilitation mandate. However, to play its role in DRM, protocols for relationships and links between the KSDMA and other agencies that produce and analyze DRM-related data and information, the sector departments, and agencies, need to be developed with clearly defined roles for each institution. For e.g., the roles and responsibilities of the Department of Water Resources and agencies under it, responsible for flood protection infrastructure and hydrological activities, need to be clearly articulated and strengthened. The KSDMA's and DDMAs'

[16]Data collected through Field Study

existing information management capacity needs to be substantially expanded and strengthened to integrate their services with all relevant data sources.

Endnotes and References: