# Disaster Management in Coastal Areas

## Planning Disaster Resilience for Communities Living Around Coastal Thermal Power Stations in Tamil Nadu

Citizen consumer and civic Action Group (CAG)

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## Introduction

Tamil Nadu is contributing significantly to renewable and non-renewable energy production in India.[1] Among the non-renewable sources, coal, gas and diesel, are used for 79.74 percent of thermal power generation in Tamil Nadu.[2] Lignite, a type of coal, is mined from coastal areas of Tamil Nadu like Cuddalore, Thiruvarur, Thanjavur and Ramanathapuram.[3] There are a total of 64 operational coal power units in Tamil Nadu, out of which 55 coal power units lie in three coastal districts, that are Chennai, Cuddalore and Thoothukudi.[4] The coal combustion for generating electricity in the power plants releases air pollutants such as SOx, NOx, particulate matter and Mercury.[5] The coal slurry is collected in the ash-pond, which often contaminates the water bodies such as rivers and oceans during heavy rainfalls.[6] Leakage in the pipelines which carries these slurry leads to severe land and water pollution in surrounding areas. The leaching of heavy metals present in coal slurry reduces the soil fertility in the surroundings of coastal coal power plants.

The above-mentioned issues become even more dangerous for the already vulnerable coastal communities and their livelihoods with the rising frequency of natural disasters due to the climate crisis.[7] Thus, there is a need to strengthen the disaster resilience of communities residing in the nearby areas of coastal thermal power plants through making efforts to increase awareness, develop action plans and practice them effectively.

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[1] http://teda.in/
[2] All India Installed Capacity (In Mw) Of Power Stations
[3] Indian Minerals Yearbook 2019
[4] Global coal plant tracker
[5] New emission norms: 70% of India's coal-fired power plants won't meet 2022 deadline, report says
[6] Wading in toxicity
[7] The impacts of climate change on the risk of natural disasters

## Objectives of the study

The goal of study on "Disaster Management in Coastal Areas" is to check the status of resilience of coastal communities in the neighbouring areas of thermal power plants to current and future risks from various disasters and the issues with access, planning, implementation and monitoring of disaster management plans (DMPs).

Following strategy is prepared in order to achieve the study goal,

Objective 1: Collect information about policy/plan/procedure to address the vulnerability of coastal communities living near coal thermal power plants.

Objective 2: Check awareness and perception of local communities and subject experts about the disaster management plans, as well as, immediate and extended environmental and social problems due to rising extreme weather events, with a specific focus on issues related to continued reliance on coal.

Objective 3: Advocacy on above-mentioned points to high level government officials at state and district levels for mainstreaming effective and inclusive disaster management and climate change adaptation measures into development planning.

## Rationale of the study

The communities residing in the surroundings of coastal power plants are suffering due to both natural disasters and the air, water and land pollution from thermal power plants. Considering that coastal communities are going to go through more natural hazards in the years to come due to climate

change, there is a need for robust disaster management plans and its effective implementation and monitoring to ensure resilience.

## Methodology

Primary Research: The study comprises a multilevel analysis of disaster management plans and policies of coastal thermal power plants in Tamil Nadu and Gujarat to achieve objective 1. The questionnaire based survey conducted for this study helped in understanding the awareness and perceptions of local communities and experts working in coastal areas about Disaster Management Plans in their areas as per the objective 2.

Secondary Research: The qualitative and quantitative data was consolidated and analysed from peer-reviewed research articles and reports downloaded from websites like CEA (Central Electricity Authority), World Bank, DowntoEarth and Carbonbrief. Also, the critical online blogs/news articles have been reviewed to recommend necessary actions to strengthen the disaster resilience of coastal communities in order to full-fill the objective 3.

## Disasters and their Impacts in Coastal Areas of Tamil Nadu

The last three decades have been excessively warmer at the Earth's surface than any preceding decade since 1850.[8] Though the effects of climate change can be seen all over India, the basic reason for the higher vulnerability of coastal communities and infrastructures is the occurrence of storms and cyclones in the coastal zones almost every year. The India Meteorological Department (IMD), Indian National Centre for Ocean Information Centre (INCOIS) and the Central Water Commission (CWC) are the departments that monitor, measure and forecast the natural disaster.

[8] IPCC, 2013: Summary for Policymakers.

Other events like earthquakes, droughts and fires rarely occur in coastal areas.

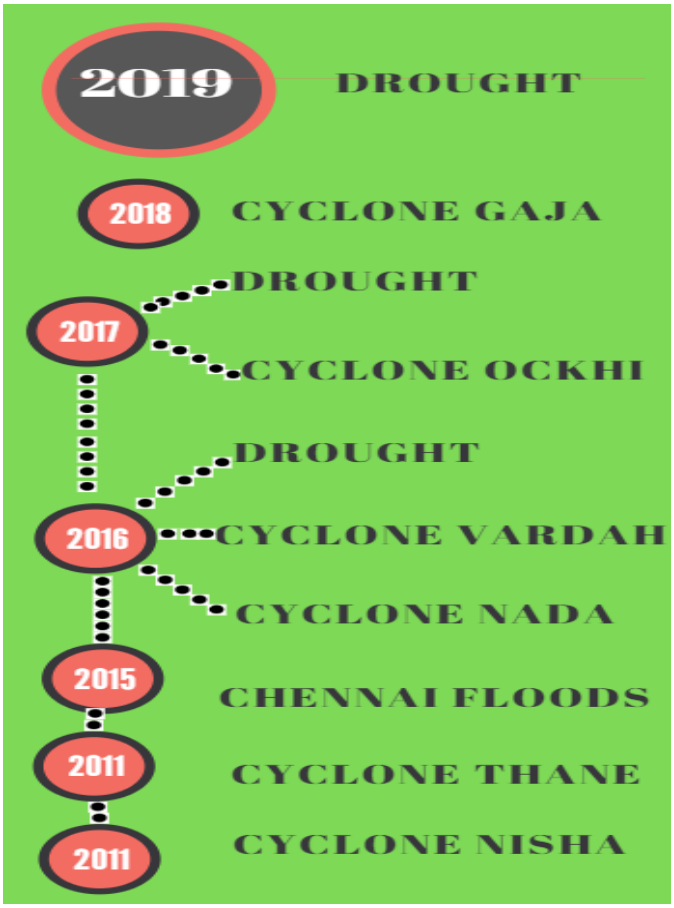


**Figure 1:** The timeline of extreme weather events in Tamil Nadu (Source: India Meteorological Department)

There are three major disasters that affect coastal communities and infrastructures of Tamil Nadu, as follows:[9]

1. **Tsunami:** Tsunamis have great erosion potential, stripping beaches of sand, coastal vegetation and dissipating their energy through the destruction of houses and coastal structures. It is also known as "Aazhi

[9] Disasters in Tamil Nadu, India: Use of Media to Create Health Epidemic Awareness

Peralai'' in Tamil language. Based on the reason for its origin, it can be of two types:

a. The seismicity generated tsunamis are the result of abrupt deformation of the seafloor resulting in vertical displacement of the overlying water. For earthquakes occurring beneath the sea level, the water above the deformed area is displaced from its equilibrium position. The release of energy produces tsunami waves which have small amplitudes but a very long wavelength (often hundreds of kilometres long).
b. The non-seismic events such as a landslide or impact of a meteor can also cause a tsunami.

2. **Cyclones:** The IMD can predict cyclones and their landfall occurrence accurately up to 12 hours validity along with the extent of damage to power infrastructure during these cyclonic events.

**Table 1:** Damage prediction for power infrastructure
(Source: India Meteorological Department)

| **Cyclone Type** | **Wind Speed (Kmph)** | **Inundation distance from coastline** | **Damage** |
|---|---|---|---|
| Severe | 88-117 | Up to 5 km | Moderate |
| Very Severe | 118-167 | Up to 10 km | Large |
| Extra Severe | 168-221 | Up to 10-15 km | Extensive |
| Super | 222 & above | Up to 40 km | Catastrophic |

The incidence of cyclonic storms in Tamil Nadu is high during the northeast monsoon season i.e., from October to December. The coastal areas of Tamil Nadu are classified under zone B (wind speed > 50 m/s), which is very high

damage-causing as per wind speed and cyclone intensities measured in various parts of India.[10]

3. **Flooding:** It is a major natural disaster that occurs in coastal areas. The fatalities and destruction during floods depend mainly on rainfall duration, intensity and location, soil type, geological condition, geomorphological feature, land use and land cover. While the scale and frequency of flood has increased due to climate change, the improper management of rivers and encroachment in floodplains reduces their capacity to absorb flood waters.[11]

## Disaster Risk Management in Coastal Areas

Disaster Management today is a continuous and integrated process of planning, organizing, coordinating, and implementing measures to protect critical assets/ infrastructures.[12] It is necessary to make and implement a strategic plan, also known as disaster management plan, for the prevention of danger or threat of any disaster, mitigation or reduction of risk, capacity building, preparedness, prompt response, evacuation, rescue, relief rehabilitation and reconstruction.[13]

1. **Resilience and prevention:** It involves training, capacity building, making do's and don't checklists and other necessary actions to enhance the capacity to recover from catastrophe by avoiding the dangerous events.[14]

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[10] Tamil Nadu State Wind and Cyclone Hazard Zones
[11] Flood vulnerable zones in the rural blocks of Thiruvallur district, South India
[12] Disaster Management
[13] National Disaster Management Plan (NDMP)
[14] Coastal Disaster Management Plan - For local self-government

2. **Mitigation:** Various structural and non-structural activities undertaken before the occurrence of disaster to limit the adverse impacts such as environmental degradation and technological hazards.[15]
3. **Preparedness:** Activities and measures that are taken in advance to ensure an effective response to the impact of disaster. It helps in timely and effective evacuation of people and cattle in threatened locations after getting an early warning.[16]
4. **Response:** Specific actions taken immediately after a disaster to provide support to those affected. These activities are immediately initiated by the community itself and then by the district, state, national and international levels. These are actions and functions undertaken to face the consequence of disaster when it occurs. These include warnings to vulnerable populations, evacuation to avoid further damages, search and rescue, restoration of key infrastructure etc. A quick and effective response requires adequate planning and preparedness.[17]
5. **Rescue and relief:** An act of helping or alleviating the conditions of a person who is suffering from the effects of disaster/calamity. A relief plan includes provision of assistance or intervention during/immediately after a disaster to meet the basic needs of affected people.[18]
6. **Reconstruction:** These include long term measures e.g. houses, livelihoods, infrastructures etc. which are capital intensive and need careful planning. Community participation also provides a good opportunity to plan developmental activities which are more robust and disaster resilient.[19]

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[15] Disaster Mitigation
[16] Multi-Hazard Disaster Preparedness & Response Plan
[17] Coastal Disaster Management Plan - For local self-government
[18] Coastal Disaster Management Plan - For local self-government
[19] Post Disaster Reconstruction Experiences In Andhra Pradesh, In India

7. **Restore and build back better:** Effective government measures can be localised depending on the particular characteristics of each region's geological nature, ecosystem richness and pro-activeness of local organisations. Following are considered as leading practices for building resilient infrastructure:[20]
    a. Formulate a robust post-disaster plan, guided by community and regional sustenance strategies.
    b. Prioritize projects based on strategic importance, potential value, and available resources.
    c. Incorporate economic, sustainability, and livability goals.
    d. Provide transparency and close control over funds and capital of projects to ensure no delay in recovery.

## Disaster Management Groups (DMGs)

The roles and responsibilities for disaster risk management are divided in a four-tier structure – Central Level, Regional Level, State Level and Local Unit Level (see figure 2), for effectively dealing with disaster situations in the power sector depending on the severity of the disaster /calamity affecting the plant, installation or site.

**Table 2:** The composition of the disaster management groups at various levels (Source: Central Electricity Authority)

| Name | Composition | Responsibilities |
|---|---|---|
| Central Level Disaster Management Group (CDMG) | a) Secretary (Ministry of Power, Government of India) - Chairman<br>b) Chairperson, CEA | a) To facilitate development of a comprehensive disaster management plan and policy formulation for the power sector. |

[20] 2018: Are we ready to commit to building resilient infrastructure?

| | | |
|---|---|---|
| | c) CEO, Power System Operation Corporation (POSOCO)<br>d) Chairman of RPCs<br>e) Chairman & Managing Directors of NTPC, NHPC and Power Grid Corporation of India Limited<br>f) Chief Engineer (PS & LF), CEA - Convener | b) To interact with the National Disaster Management Group.<br>c) To facilitate support from other national and state level agencies.<br>d) To coordinate for any assistance in terms of manpower and materials at national level.<br>e) To act as an information source desk for all developments in the event of a disaster. |
| Regional Level Disaster Management Group (RDMG) | a) Member Secretary (RPC) - Chairman<br>b) Secretary in-charge of Rehabilitation and Relief of the affected State of the Region<br>c) Representatives of each State Civil Defence<br>d) Regional HODs CPSUs (NTPC, NHPC, PGCIL etc.)<br>e) Chairman and Managing Director of State TRANSCOs/Power Departments<br>f) Head of Regional Load Despatch Centres - Convener | a) To provide inter-state emergency & start up power supply.<br>b) To coordinate early restoration of the regional grid.<br>c) To participate in damage assessment.<br>d) To facilitate resource movement to affected state(s) from other states. |
| State level Disaster Management | a) Principal Secretary / Secretary (Energy) of the State - Chairman | a) To mobilize resources for restoration. |

| | | |
|---|---|---|
| Group (SDMG) | b) MDs of Generation, Transmission, Distribution companies<br>c) Representatives of health and welfare agencies<br>d) Chief fire safety officer<br>e) Inspector General of Police<br>f) General Manager (SLDC) - Convener | b) To ensure that disaster management plans are in place.<br>c) To mobilize financial resources.<br>d) To facilitate inter-agency support.<br>e) To coordinate information<br>f) To facilitate damage assessment. |
| Plant level Emergency Management Group (EMG) | a) In-charge of the installation<br>b) Plant safety manager<br>c) Chief Plant Operation Administration<br>d) Representative of District Administration | a) To direct action in the affected area taking into consideration the priorities for safety of plant personnel, minimize damage to plant, property and the environment.<br>b) To direct fire and security personnel for immediate action.<br>c) To ensure that all non-essential workers/staff in the affected area are evacuated to safer places.<br>d) Set up communication points.<br>e) Report all development and requirements/ assistance needed.<br>f) Preserve all evidence so as to facilitate any inquiry into the cause and circumstances which caused the emergency.<br>g) To coordinate with district administration for necessary |

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| | | finance, medical facilities, law and order etc. |

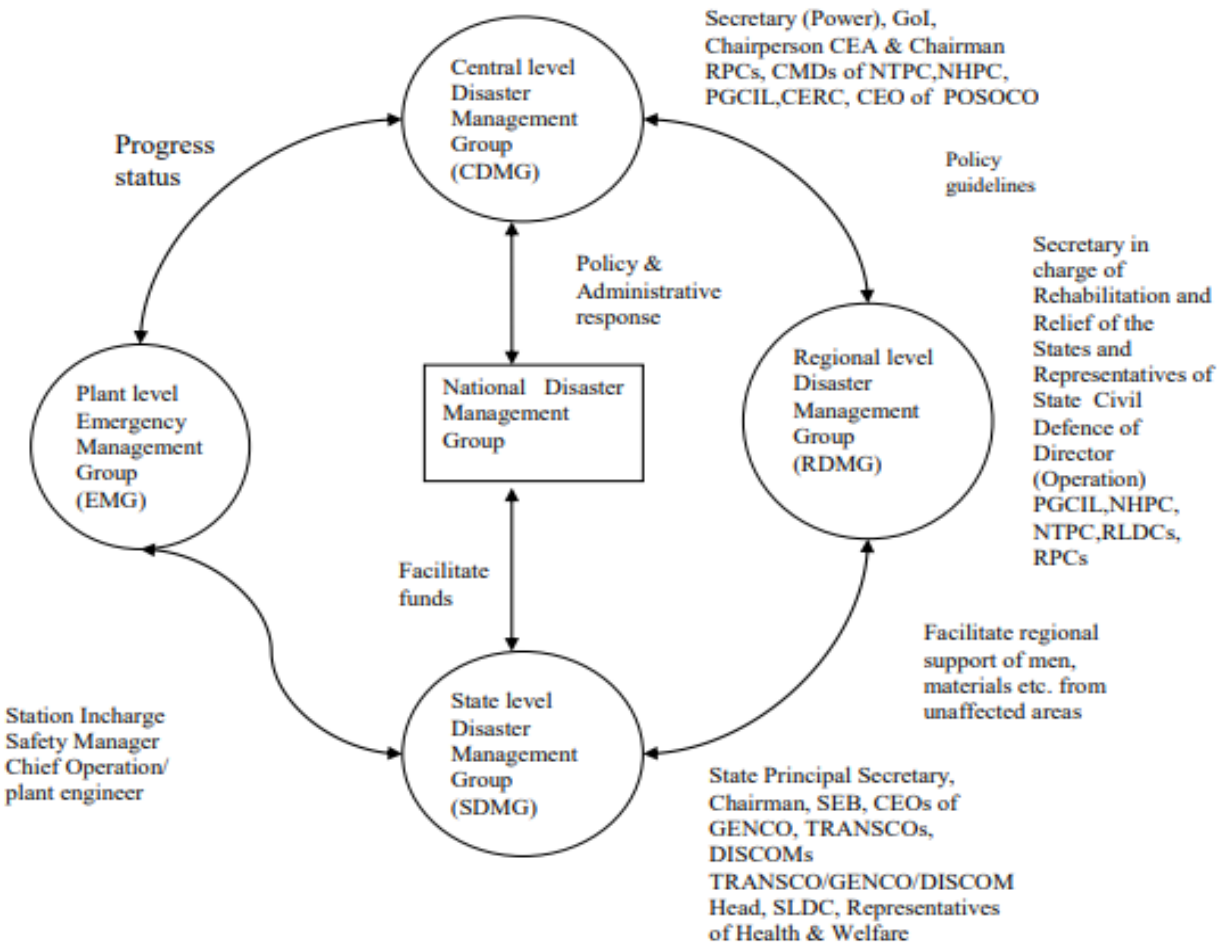


**Figure 2:** Inter-group relationships in a disaster management system and an overview of composition of these groups and their responsibilities
(Source: Central Electricity Authority)

## Actions for Disaster Resilience

Mainstreaming disaster management plans into developmental projects focuses on the hazards that cause the disaster and implementation of action plans to eliminate or drastically reduce its direct effect. This provides resilience to infrastructure and neighbouring communities from recurrent

disasters due to climate change, and ensures sustainable development and climate change adaptation.

**Table 3:** Requisites to jointly handle disasters by thermal power plants and coastal communities

(Source: Central Electricity Authority)

| **Immediate actions** | |
|---|---|
| Hazard mapping | A hazard map should be prepared with designated areas expected to be under high risk from disasters. Historical data could be of help in showing areas inundated in the past to prepare a geographical profile of all on-going major thermal power plants in Tamil Nadu and understand the vulnerability of surrounding community and environment by occurrence of disasters like flood and cyclones. Keeping in mind the vulnerable areas, evacuation routes should be constructed and mapped. The plan should be followed by an evacuation drill. |
| Early warning | With the use of satellite technology, nearly immediate warnings of potentially tsunamigenic earthquakes are provided. Warning time depends upon the distance of the epicentre from the coast line. The warning includes predicted times at selected coastal communities where the tsunami could travel in a few hours. In case of tsunamigenic earthquakes or any other geological activity people near to the coastal areas may get very little time to evacuate on receiving warning. A well networked system is established to warn the communities of the coastal areas when the threat is perceived. Tsunami warning is disseminated to local, state, national as well as the international community so that they can evacuate the place on receiving the warning as per the evacuation plan. |

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| Community preparedness | Since, communities in the coastal areas face cyclones, storm surge and tsunami waves, it is important that they are better prepared to take suitable actions on receiving the threat. They should know and follow emergency evacuation plans and procedures. For this purpose, public awareness programmes should be conducted regularly to make the general public aware about potential disasters likely to occur in their area. Emphasis may be given to the following aspects:<br>a. Pamphlets and booklets containing details dos and don'ts in the event of crisis/emergency situations and hazards associated with electricity generating stations be prepared and be made available to the general public.<br>b. Permanent notice boards be fixed at all the suitable places in the area displaying information maps, escape routes, precautions to be taken and emergency communication details of nodal officers be displayed.<br>c. Help from local youth organizations, voluntary organizations, and educational institutions be sought to conduct educational sessions to make people aware about the safety measures and rescue operations in the event of a disaster. |
| **Short term actions** | |
| Communication facilities | Communication and information management is the key to any crisis response and recovery plan. People trained for disaster management should have walkie-talkie sets of appropriate capacity to cover the farthest point of their area for effective communication. |
| Recovery equipment and | In case of any crisis/ disaster, it is necessary to have inventory of recovery equipment and spares available with various power |

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| spares inventory | utilities so that these could be pressed into service within the shortest possible time. |
| Transport and other arrangements | Arrangements for an adequate number of vehicles for movement of people and materials must be ensured. Medical facilities around the clock shall be made available to the staff engaged in the restoration activities. Arrangements for drinking water supply must also be ensured. |
| Black start facilities | Arrangements for start-up power sources for each major installation must be identified. Regional Load Dispatch Centres should be ready with necessary plans. |
| Solar energy systems and photovoltaic system[21&22] | The renewable energy sources can play an important role in reducing the exposure to risks of natural disasters and in speedy recovery because distributed renewable energy power systems are much less prone to being knocked out of service from catastrophic natural disasters than the centralized power systems. For example:<br>1) Dewatering Pumps: During floods the immediate concern is to minimize the impact of flood water on generators and other equipment. Availability of dewatering pumps is, therefore, considered necessary for stations located in flood prone areas. A mobile solar pump is the most convenient and sustainable option to provide emergency relief & to meet the needs of dewatering pumps.<br>2) Lighting: An off-grid solar lighting system is a safer alternative, which is based on clean energy and works well in disasters and in normal situations. |
| **Long term actions** | |

[21] How Mobile Solar Pumping System Can Revolutionize Indian Farming
[22] How Solar Lighting Systems Improves Security after a Natural Disaster

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| Strengthen the collaboration and integration between diverse stakeholders | The collaboration with NGOs like Goonj, CARE India and Rapid Response can lead to a quick relief during the disaster and sustainable revival and restoration of the lives of local communities post-disaster by valuing their local knowledge, local wisdom and natural resources. |
| Identify and be ready to tackle uncertainty and unexpected events | The local project authorities of disaster prone areas should keep a list of competent contractors/agencies who can be assigned the various components of restoration activities in the event of a disaster. |
| | For infrastructures like coal power plants, which are immediately affected or likely to be affected as decided by the EMG (Emergency Management Group), efforts shall be made to shut down the plant and make the process units safe. |
| | Fire alarm and extinguishing system to be checked regularly for its healthiness and regular drill should be carried out for its operation by involving the officers and staff of that unit so that they also know how to operate the system. |
| Improve the implementation of policies and practices | Periodically assess the effects of climate change on current and future disaster risks and uncertainties through Indian Climate Disaster Resilience Index (IN-CDRI) to integrate knowledge of changing risks and uncertainties into planning, policy and programme design to reduce the vulnerability and exposure of people's lives and livelihoods.[23] |
| Ensure regular feedback loops for policies and | State level support groups shall meet at least once in six months. Project Monitoring Group (PMG) at National level has to meet once in 12 months for exchange of views and also for |

[23] Coastal community resilience frameworks for disaster risk management

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| practices to tackle changing disaster risk | updating the disaster management plans to ensure environmentally sensitive and climate smart development. |
| | All state and central power utilities shall constantly review the equipment/system design standards and practices based on the new developments and the state of art technologies and design practices available at that time. The equipment, which frequently creates problems, needs to be replaced. |
| | Carry out comprehensive statewide drills periodically (at least once in every three months) to test capabilities. Emergency scenarios shall be developed to test the emergency plans and operational response at all levels through mock drill exercises. At the end of each exercise, an evaluation of the response call shall be carried out to take care of any deficiency noticed. |
| Promote more socially just and equitable economic systems for disaster management | Each power station /power utility shall create a fund which would be non-lapsable and would be accumulated. The disaster management funds would be at the full discretion of the emergency management group once an emergency has been declared. |
| | Increase access and capacities of all stakeholders to information and support services concerning changing disaster risks, uncertainties and broader climate impacts. |
| | Empower communities and local authorities to influence the decisions of local to national governments, national and international private sector organisations to promote accountability and transparency. |

The damage assessment in post-disaster phase by the thermal power plant level emergency management group (EMG) and district level departments provides a rough estimate of the type and the extent of damages, including

probable cost and the need for financial assistance. This information is collected and transmitted to the state government. When the state and local resources are inadequate to effectively respond to an emergency or disaster, the central assistance is sought by the State. However, each power station /power utility has a separate fund for meeting the requirement of disaster management plan, known as disaster management fund, which is 1% of the annual revenue of the station utility. State government declares the disaster in the state and will send a memorandum to the central government for central assistance for the infrastructures and communities affected by the disaster. On receipt of memorandum from the state government, the government of India constitutes an inter-ministerial central team for assessment of the situation after the disaster. The Ministry of Power provides relief for repair of damaged power sector infrastructure of immediate nature whereas the Ministry of Home Affairs or the Ministry of Agriculture provides National Disaster Response Fund under the National Disaster Management Act, 2005.[24]

**Table 4:** Government incentives and instruments for disaster risk management (Source: Asian Disaster Reduction Center)

| **Disaster Risk Management Approach** | **Required Steps** | **Supporting Government Plans/ Projects/Schemes** |
|---|---|---|
| Fragility and vulnerability assessment | Identifying and modelling effects to the environment during a natural disaster to analyse the amount of damage with respect to predefined damage scale. It gives a clear picture | 1. State Disaster Management Perspective Plan, 2018-2030.[25] |

[24] Guidelines on constitution and Administration of the State Disaster Response Fund and National Disaster Response Fund
[25] State Disaster Management Perspective Plan, 2018-2030

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| | of fragility/vulnerability function with the intensity of disaster considered for the infrastructure and community in its surrounding. | 2. District Disaster Management Plan.[26] |
| Disaster zoning and disaster proof design of structures | Identifying the areas having similar parameters (vulnerability to disaster) on average. The infrastructure in areas prone to disasters is designed taking into consideration all the disasters in the particular zone. | 1. Blockwise Disaster Management Plan.[27]<br>2. TANGEDCO DMP, 2017.[28] |
| Complete resilience | The intensity, suddenness and extent of any natural calamity are beyond any perfect assessment and have to be effectively managed in the event of its occurrence. This requires the community to be well aware of options for disaster resilience. | 1. Community Based Disaster Risk Management (CBDRM) Program.[29]<br>2. Integrated Coastal Zone Management Project (ICZMP).[30] |
| Awareness generation | Proper guidelines/ instructions should be issued and a format should be prescribed for reporting the incidents of flooding and management of this information and data at a central location and update from time to time. | 1. Vision Tamil Nadu 2023.[31]<br>2. Coastal Disaster Risk Reduction Project (CDRRP).[32]<br>3. Disaster Preparedness & Mitigation Program in India.[33] |

[26] District Disaster Management Plan
[27] Blockwise Disaster Management Plan
[28] TANGEDCO DMP, 2017
[29] Community Based Disaster Risk Management (CBDRM) Program
[30] Integrated Coastal Zone Management Project (ICZMP)
[31] Vision Tamil Nadu 2023
[32] Coastal Disaster Risk Reduction Project (CDRRP)
[33] Disaster Preparedness & Mitigation Program in India

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| Address poverty and vulnerability | In case of incidents involving loss of human or animal life, electricity rules have made it mandatory for all installations to report such incidents within 24 hours of its occurrence to the Electrical Inspector, under section 44 A of the rule (repealed with the notification of Regulation and Measures relating to Safety and Electric Supply under Section 185 (2) (c) of Electricity Act, 2003).[34] The government also has to reach out in selected villages to redress the grievances of affected people and reconstruction of houses and infrastructure. | 1. Mass contact programme.[35]<br>2. AMMA Thittam.[36]<br>3. Fisheries Management for Sustainable.[37]<br>4. Livelihoods (FIMSUL I & II).[38]<br>5. Indra Housing Scheme.[39] |

## Survey Analysis and Findings

Based on interviews of 10 subject experts and a questionnaire based survey of 43 local community members residing within 10 kms of the decommissioned Ennore thermal power plant (Annexure I and Annexure II), can be used to update the existing disaster risk management plan to effectively address the vulnerability of communities near coastal thermal power plants.

[34] The Indian Electricity Rules, 1956
[35] Mass contact programme
[36] AMMA Thittam
[37] Fisheries Management for Sustainable
[38] Livelihoods (FIMSUL I & II)
[39] Indra Housing Scheme

**Findings from locals' survey:** 40 out of 43 respondents from local communities don't have any information about the disaster management plans in the coastal area. However, they have shared their vision for an ideal disaster management plan, as follows:

- As the lack of actions can be dangerous in the era of changing climate, every infrastructure should have its disaster management plan and the local communities should be the part of planning and monitoring the implementation of the plan. This will not just increase the level of awareness but also the transparency of the process by public participation.
- Most of the local community members are unaware about the disaster management plan of Ennore thermal power plants. More than 90% local respondents have said that they "Not at all" trust existing disaster management tools and services available for them by the thermal power plants, local government and NGOs. Thus, it is necessary to make the disaster management plan accessible and available in simple language for local communities to understand.
- The local communities also believe that having a disaster management plan should address the additional risks caused by coastal thermal power plants such as air and water pollution.

**Findings from experts' survey:** People from research, law, journalism and environmental activism background have shared their vision for ideal disaster management plan for ensuring the resilience of communities in the neighbouring areas of coastal thermal power plant, as follows:

- The disaster management plan should be available in public forums and should cover all the local hazards and natural disasters and should be actively implemented. Just creating a plan is not enough.

- While preparing a disaster management plan, the future climate impacts should be considered along with historical disasters occured at the project site.
- There should be a clear allocation of budget for disaster preparedness in addition to the post-disaster scenario.
- People should know the risk of big projects through their disaster management plan along with a clear view of evacuation routes for them.
- A disaster management plan should empower the local communities in the post disaster phase.
- The existing disaster management plan is too complex to understand by local people and thus should be simplified.
- There should be no homogenous plan for all coastal areas, and it should be a localised plan.
- Broadly the disaster management plan looks at the infrastructure to be built and does not pay attention on impacts on the surrounding area
- Unless it is a large-scale project which has funding from sources like the World Bank, the public participation in creating a disaster management plan is not there.
- There is a need to internalise the climate risk in disaster management plans for all kinds of infrastructures, new or old, especially for the power sector which remains operational for a long period (30 years and more) causing a higher environmental burden that enhances climate change.
- The disaster management plans should help in controlling the worst situations by giving a pre-planned strategy to manage the situation and improving the structural design.

## Anatomising Disaster Management Plans (DMPs)

The DMPs of thermal power plants are rarely available in the public domain to analyse and understand its functionality. RTIs can be filed for getting the DMPs of government owned thermal power plants only, DMPs of private thermal power plants are neither available publicly nor can be asked for through RTIs. The DMPs of six coastal coal thermal power plants were collected and analysed for this study that belongs to the following organisations:

1. NLC India Limited- Neyveli Thermal Power Station II
2. TANGEDCO (Tamil Nadu Generation and Distribution Corporation Limited)- Ennore Thermal Power Station Replacement and North Chennai Thermal Power Station I
3. GSECL (Gujarat State Electricity Corporation Limited)- Sikka Lignite Thermal Power Station, Bhavnagar Lignite Thermal Power Station and Kutch Lignite Thermal Power Station

It was observed that these DMPs vary from bulky to compact in information that they contain. Though they lack any uniformity in the structure, they contain following basic information:

A. Plant site details
B. Disaster Scenarios
C. Action Plan:
    a. Details of Emergency control room, Alternate emergency control room (location/ facilities)
    b. Roles & responsibilities of person/group involved in disaster management
    c. Emergency Response Plan
    d. Arrangement and responsibility for mock drills

e. Other useful information such as list of essential staff, contact number of relevant government authorities, important equipment, aid providers etc.

**Table 5:** Overview of DMPs of coastal coal thermal power plants in Tamil Nadu and Gujarat

| **Name of thermal power plant** | **Strength of DMP** | **Weakness of DMP** |
|---|---|---|
| Sikka Lignite Thermal Power Station | • Provides preventive & safety measures for flood or cyclone, earthquake, epidemic, fire, technical faults, human errors, terrorist attack & sabotage, strike or agitation and gas leakage<br>• Provides a layout of plant highlighting safe escape route, assembly point, buildings etc<br>• Provides details of control rooms to immediately communicate about emergency situation<br>• Mentioned contact details of important people and resources available at plant | • No information about disaster related training for employees is provided<br>• No information about awareness drive for general public<br>• No specific duration mentioned about for mock drills<br>• No information about role and responsibility of Emergency Management Manager (EMM)<br>• No full action plan is provided |
| Bhavnagar Lignite Thermal Power Station | • Provides details of control rooms to immediately communicate about emergency situation<br>• Mentioned contact details of important people & services<br>• Provides details about Emergency Management Manager, its responsibility and emergency resources available at power station<br>• Mentioned a pre-action plan for cyclone, heavy rainfall & flood | • A limited number of on-site and off-site emergency scenarios are considered<br>• Only one emergency controller and one Emergency Management Manager are administering the Emergency Control Centre (ECC)<br>• A full action plan is available only for incidents like chlorine leakage, fire, explosion, chemical spill, ash spill, medical emergency, cyclone and emergency evacuation |

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| | | • No information about the mock-drills conducted by the plant<br>• No information about one day DMP training provided by the plant to its personnels<br>• No information about annual refresher program for updating DMP<br>• Lack of information about local communities and environmental factors that can be potentially affected due to thermal power plant<br>• No information about any training program conducted to create awareness about disasters among local people residing in the neighbouring area of thermal power plant |
| Kutch Lignite Thermal Power Station | • Provides details of control rooms to immediately communicate about emergency situation<br>• Mentioned contact details of important people & services<br>• Provides details about Emergency Management Manager and its responsibilities<br>• Provides a format for damage & loss assessment for plant due to disaster<br>• List of emergency equipments available at power station<br>• Mentioned a pre-action plan for cyclone, heavy rainfall, Earthquake, Epidemic & flood | • No action plan is provided for any of the emergency situation<br>• No information about mock drills<br>• No information about procedure for updating DMP<br>• No information about disaster related training they have provided to their employee<br>• No information about awareness drive to aware general public |
| Neyveli Thermal Power Station II | • Provides a glossary for all disaster management related keywords used in the report<br>• Provides general | • Action plan has only mentioned about responsibilities of different personnel and their contact details<br>• No information about mock |

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| | information and brief description about plant site<br>• Provides information about safety & health policy of NLC, roles & responsibilities of employees for implementation of the policy<br>• Provides information about on-site emergency, resources available at plant and safety measures<br>• Provides information about hazardous chemicals stored at the plant<br>• Provides information about restoration of power supply during black out in Tamil Nadu<br>• Provides do's & don'ts on disaster response published by Ministry of Home Affairs for natural disasters & CBRN (Chemical, Biological, Radiological & Nuclear) disaster | drills<br>• No information about procedure for updating DMP<br>• No information about awareness drive for general public |
| Ennore Thermal Power Station Replacement | • Mentioned the potential hazards, their consequences and prevention measures<br>• Provides information about emergency equipment, communication facilities, emergency control centre etc.<br>• Provides detailed on-site & off-site emergency plan<br>• Provides disaster scenario & geological formation at plant site<br>• Provides information about mock drill | • Action plan has only mentioned about responsibilities of different personnel<br>• No contact details of key personnel & services are provided<br>• No information about disaster related training for their employees<br>• No information about awareness drive to aware general public<br>• No specific duration mentioned about for mock drills<br>• Lack of detail about procedure for updating DMP |

| | procedure | |
|---|---|---|
| North Chennai Thermal Power Station I | • Provides detailed information about Emergency Management Group and function of each team member<br>• Provides contact details of key personnel and emergency services | • Lack of information about plant site<br>• Lack of information about disaster scenario<br>• No pre-plan and full action plan for any of the emergency situation is mentioned<br>• No information about mock drills<br>• No information about procedure for updating DMP<br>• No information about disaster related training they have provided to their employees<br>• No information about awareness drive for general public |

## Conclusion

The disaster resilience of communities residing within a 10 km area of coastal infrastructure like coal power plants in the disaster-prone coastal areas through a holistic plan can prevent the loss of lives and local livelihood of the coastal communities people like fishermen, as well as, protect their livestock and ecosystem. The existing plans and projects have only mentioned the responsibilities of state and district level departments and emergency management organisations within the thermal power plant, while no role has been assigned to local communities and damage to their property, fatalities and other issues during disaster are considered as responsibility of public administration. This study has found that local communities can be empowered and made disaster resilient if they are involved in planning, monitoring and evaluation of outcomes of a disaster management plan. A joint effort by experts and local communities into each step of disaster management from preparedness to post-disaster phase will frame a community based disaster management (CBDM) plan to tackle the

ever changing disaster risks and uncertainties, enhance adaptive capacity and address the structural causes of vulnerabilities during both on-site and off-site emergencies that affect the neighbouring population. CBDM is a decentralized bottoms-up approach that allows intensive, micro interventions at the local Panchayats, ward or village level capacity building, awareness, knowledge, partnership, and ownership in local disaster management plans. The crucial stages for planning the disaster management strategies to develop the CBDM plan are:

1. Disaster/vulnerability risk assessment
2. Risk reduction planning
3. Early warning
4. Post-disaster relief
5. Participatory monitoring and evaluation

An ideal CBDM plan should be guided by following principles:[40]

**1. Subsidiarity:** To ensure a good 'fit' between the planned tasks and the governance structures delivering them.

**2. Economies of scale:** To ensure minimum impacts of disasters on regional growth.

**3. Equity:** To improve the capacities of socially vulnerable people and communities to prepare for, respond to, and recover from extreme natural hazards.

**4. Heterogeneity:** To address heterogeneous effects of experiencing natural disasters on mental health.

**5. Public accountability:** To enable scrutiny and understanding of actions taken at different levels, and of those responsible for such actions.

[40] Community-Based Disaster Management Strategy In India: An Experience Sharing

A CBDM Plan necessarily includes:

**I. Community Profile:** It provides details about community characteristics including its physical, administrative, geographic, demographic, socio economic, and infrastructure status.

**II. Resource Inventory:** It provides information on local resources available within the community, which can be harnessed and enhanced for disaster preparedness and response.

**III. Risk map through Community Maps:** It represents the important places such as, medical facilities, transportation facilities, water facilities, temporary shelters, sanitation facilities, and search and rescue operation facilities.

**IV. Future Mock drill:** Prior information about the dates when the periodic mock drill in the community will be conducted every month.

**V. Final community plan:** A concise and interactive, one-page summary of the main components of the CBDM plan, which can be distributed in local language among community people.