RESILIENCE TRACK

Challenges for Building Resilience to Climate Change and Disasters

All of the following challenges will need to be adapted to function within the context of COVID-19 pandemic restrictions. This includes the that they are deployable with only the need for online support and monitoring, that they can function within social distancing guidelines, and that they can function without exposing people to additional risk.

1. RISK INFORMATION AND RESILIENCE ANALYTICS

For both slow and sudden onset emergencies, Disaster Management Authorities do not get the necessary data to facilitate timely decision-making or incident management for a variety reasons. Data acquisition and analytics is critical to disaster risk management and building resilience.

(a) Data Collection and Monitoring of risk

The Challenge: Climate and disaster resilience crucially relies on data on risks and hazards reaching local and state level decision makers in a timely, contextual and dynamic manner, especially when connectivity is compromised by events. Do you have an information management solution that can change the way information is collected and presented and address the challenges below ?

The issues:

The collection and monitoring of data to facilitate situational awareness and make rapid assessments to predict, monitor and assess emergency response differs dramatically from state to state in India. Solutions need to address the following challenges:

- Inadequate risk and hazard data collection/ monitoring systems with centralized , are based on dated, inaccurate technologies/ do not extend to remote areas.
- Data Collection/ monitoring systems often get disabled at the time of the emergency/ adverse weather conditions/ snowfall
- Remote data collection/ monitoring systems such as through satellite imaging and drones are not timely and not collected in a format, or have processes in place to analyse data and make rapid assessments in a dynamically changing situation.
- Data collection/ monitoring systems need to include significant localised data (e.g. water levels in rivers, landslide risk, situational or geographical vulnerability) in addition to the hazard risks in order to mediate the extent of damage.
- Data collection across all classes of data, including collection of weather data, wherever static, needs to be dynamic and have built-in decision support analytics.

- Data collection processes need to incorporate information and situational awareness intelligence provided remotely by members of the public

(b) Integrated data display and analysis to facilitate decision-making

The Challenge: Resilient development and emergency planning requires data to be presented in a manner that allows disaster management and sectoral practitioners to have an overall understanding of a dynamic situation, one that maps both detailed risks and resources across a range of parameters. Do you have digital platforms that can collate and present data dynamically across multiple data points and multiple relevant agencies in a seamless manner?

Issues: Digital platforms like Emergency Operation Centres have very different capabilities amongst different States in India, from some that have developed integrated IoT enabled systems that track several classes of risk in real time, to others that have basic radio and community-based information systems. Integration and inter-operability of different Emergency Operation systems, such as health and disasters (in case of COVID-19), is critical. Risk information and analysis systems that can pull together all the data dynamically, in real time and cross reference this to local vulnerability, hazard and capacity are still not actively enabled in most states. The use of new technologies that can dramatically add value to information analytics such as Artificial Intelligence, remote sensing are only in their nascent stages in one or two states. Solutions are sought for addressing the following challenges:

- Enable rapid and accurate, visual, or live comparison of different affected areas for relief or post damage assessments and planning.
- Integration of hazard and vulnerability mapping to give a situation specific risk analysis
- Integration of dynamic response capacity, emergency support functions, or map of available resources to facilitate incident management/ relief planning
- Enhanced accuracy to allow targeted response (e.g. vulnerable/impacted populations – for relief and resilience building, which infrastructures need to be reconstructed/made more resilient) to crises.
- Enhanced vulnerability and impact mapping - to include key missing attributes such as public buildings, basic communication infrastructure, key assets and resources, availability of services, such as schools and hospitals, livelihood resources etc.
- Ability to dynamically update to incorporate information provided by the public
- Need to provide localised, decentralised information and data processing capabilities to facilitate local response.

(c) Integrated system for the Management and Monitoring of Resilience and Recovery Efforts

The Challenge: The resilient recovery phase of disaster management and building resilience to climate change and disasters can take 3-5 years. Monitoring progress, ensuring resilience and quality standards into recovering assets and infrastructure are more complex and there is a lack of adquate platforms to record, analyse and manage resilient recovery and resilience building. Do you have a GIS enabled platform for recording, monitoring and

reporting (360 degrees) on the implementation of recovery and resilience contracts to manage state financial support to departments and beneficiaries?

The issues: The management of disaster response and recovery in India occurs at a huge scale, is typically community based, includes initiatives and the participation of a large number of NGOs, companies, religious groups and other stakeholders, and is very robust in terms of expenditure and direct support facilitated by these players and of course by the many departments state and national government, and a large volunteer base.

State Disaster Management authorities have to cope with hundreds of competing demands, directives and a need to provide solutions at speed and at scale, with a strong emphasis on increasing the resilience of the population to further disaster events. In terms of population India displays a high variation in terms of income of assets, and there is a marked emphasis to direct both relief and response to poorer sections of society. India also exhibits a complex mix of the traditional and the modern, so while people may live in basic and vulnerable shelters in high risk areas they may be conducting financial transactions and receiving government grants through direct mobile transfers to their bank accounts.

Relief and recovery projects are managed through multiple contracts, through district disaster management teams. Setting up these agreements and contracts through a central disaster fund has been established and audited systems and are relatively established. Challenge remains in developing a comprehensive system to ensure accountability, quality and compliance and monitor progress.

HYPERLOCAL EARLY WARNING SYSTEMS

The challenges: Forecasting and early detection of risks using sensors can generate dynamic and accurate data for early warning and active hazards. Multiple hazards (from large scale cyclones to lightning and avalanches) need to be continually monitored, and remain connected online to provide real-time analysis and warning during adverse events.

1. Can you supply and install sensors that provide multi hazard warnings or systems that can detect and forecast the risks enumerated below in real time, and remain connected in adverse conditions across large geographies

2. Can you supply a proven multi-hazard platform to analyse risk in a dynamic fashion to create early warning messages through multiple warning systems (digital, ground based, broadcast, radio, SMS, platform based etc.)

The issues: Early warning systems for disasters have been updated in many states in India often in the aftermath of pervious disasters. But the types of adverse events for which early warnings can currently be given, as well as the systems for providing these warnings to local communities at risk are both limited.

While EWSs for large scale adverse events such as cyclones are fairly well established in some states, it is the smaller and more localised events such flash floods, landslides, cloud burst, lightning storms and avalanches that can cause more damage to populations annually. What is required is an EWS system that incorporates multiple hazards, that can then be used for providing warnings specifically targeted at the areas and people at local risk. Sensors for the detection/ monitoring, and analysis /forecasting on a dynamic basis are needed to cover a variety of hazards.

Risk is not always stationary as, in India, particularly in mountainous regions, hundreds of thousands of pilgrims visit sites of religious importance on foot, exposing themselves to hazards and risks that they are not aware of and at present cannot dynamically be warned against

Detection and Forecasting

- Landslide forecasting systems that build on risk maps but are dynamic in that they update risk based on weather and other adverse events, for enabling critical warnings
- Early warning system that dynamically tracks storms and detect and forecast lightning storms/ remote cloudbursts/ hailstorms/ high winds in an integrated manner
- Monitoring of temperature to identify urban heat islands and creation of local heat maps to provide critical warnings.
- Earthquake and aftershock prediction and forecasting
- Two-way incident reporting systems for boats and monitoring of boats (fisherfolk)
- Early detection and critical warnings systems for flash/ river flooding, especially on dry riverbeds
- Early detection of forest fires that are built into risk maps.
- Early detection or critical warning systems for avalanches, especially for vulnerable habitations and roads
- A system to detect loss of moisture in crops to protect against drought.
- Systems to record and track disease spread and epidemiology in a dynamic manner
- Detection systems and sensors for the above that are robust, connected, can continue to operate in adverse connections, snowfall, and situations of no internet connectivity or electricity.

Analysis and Warning

- Hyperlocal localised dynamic forecast and warning systems for weather events for tourist sites/ trekking roads, farmers, artisanal fishermen.
- Hyperlocal ground-based systems to cover wide geographies such as simple audio alarms at local levels to alert people in a radius of 10 kms, potentially sited at religious places, schools, along riverbeds etc.
- Ground based systems such as simple audio systems that can also be used to give localised warnings on cloudbursts and lightning to tourists, pilgrims and travellers on the move.

- A networked system for connecting different inputs and providing an overall mapping (remote sensing by satellites, Ham radios, ground stations, coastguard, deep sea trawlers, small boats) to provide security alerts and warning via a handshake protocol to with. 12-30 kms of the coast. The devices to connect boats should not weigh more than 1 kg and require no separate power source.
- Systems for analysis and warning should be accessible to community-based emergency teams in local geographies.

BUILDING RESILIENCE AND MITIGATING RISK OF CRITICAL INFRASTRUCTURE AND LIVELIHOODS

The challenge: Disaster Management authorities in India are looking for solutions to mitigate risk and build resilience of critical infrastructure including communications, to protect people and their livelihoods, and in their response capacity. Do you have demonstrated risk mitigation and resilience solutions to any of the specific challenges listed below?

The issues: States require strengthening of technical know-how to protect against adverse events, the updating technologies, resilient and green infrastructure solutions, greater awareness of resilience building measures amongst communities, and training in building resilient and environmentally secure 'green' technologies in all preparedness, response and recovery efforts.

a) Infrastructure protection, mapping and monitoring

Building resilience and protecting infrastructure, resources, and communications from damage in the first instance is the face of adverse events is the easiest and most effective form to ensure that relief, response and recovery can be effective and timely. State DMAs highlight the challenges they face in simple and cost-effective technologies and know-how to map, monitor and protect basic infrastructure, populations, resources and communications. Some of the areas highlighted include

<u>Buildings, infrastructure and habitation</u>

- Coastal erosion detection and protection solutions (non-structural).
- Cost effective lightning conductor systems and shelters, to protect infrastructure, habitations, public buildings and people
- Snow protection systems for radio stations, key infrastructure such as electricity and weather stations, ways to stop pipes freezing
- Solutions for avalanche detection, deflection and resistance
- Hailstorm protection solutions for prevention of crops/horticulture

<u>Resilient Networks and Communications</u>

Communications Network

- Failsafe communications, internet and electricity in the event of large cataclysmic events such as tsunamis/ cyclones especially in areas that are remote and inaccessible
- Coordination system that incorporates two-way communication that will continue to function at times of emergencies/ adverse weather events.

Resilient Transport Connectivity

- Tools and remote sensing capabilities to check and monitor roads and communications for whether they are still functional, especially when during bad weather.
- Systems to enable transport connectivity that can be deployed to make areas accessible. Solutions sought are lightweight, mobile, and easy to use without heavy. Machinery (e.g. spans of bridges) or other means by which vehicles and people cross impassable structures. This is key to getting relief (med, food, water) out to remote areas quickly.

Resilient Livelihoods

- Arboreal mapping to address issues of agricultural productivity
- A database and tracking system for protection of natural resources that are important for livelihoods
    - Lack of effective tools to measure moisture stress in agriculture in a cost effective and simple manner on regular basis during the drought season
    - Systems that can be locally deployable to protect against and halt forest fires

LOCAL RESILIENCE AND RESPONSE CAPACITY

The challenge: Building resilience into recovery and restoration requires new skills, new building techniques, eco-sensitive policies, green technologies and awareness and knowledge of assessing resilience and risk.

Do you have training, demonstration, and awareness raising solutions to change the perspective and capacities of people and the state to plan and implement more resilient and green recovery?

The issues: States face the challenge of building in resilience and build back better principles, techniques and capacities into post-disaster recovery and restoration programmes especially where this is being done at scale and speed. In order to facilitate and manage this process new technologies, training and know-how need to be enabled to ensure that in future events risks are reduced. This is even more important where the frequency of adverse weather events is increasing and becoming more severe, whether these are droughts, cyclones, floods, landslides, cloudbursts, heatwaves etc. The impact on key infrastructure, the physical environment, people, their livelihood assets will require substantial inputs to make individual states more resilient to these events. A further aspect of resilience lies with people and their

participation in the resilience building process. The participation, awareness raising and training of people in the resilience process is also a key challenge faced by State DMAs. Specific areas that require solutions are:

- Capacity building solutions for eco sensitive and risk informed approaches to land use planning, settlement planning, road building, and integrated water management systems.
- Earthquake retrofitting training, awareness raising to mitigate against landslides, and to protect schools, hospitals etc during the recovery and restoration process
- Training and solutions to enhance building codes and zone compliance - building resilient infrastructure including for roads, houses, public buildings, electricity and communications infrastructure. This should include introduction of new materials, new techniques,
- Knowledge of green technologies that can be incorporated into public buildings and houses that make them less susceptible to outages in electricity, communication infrastructure, etc.
- Retrofitting assistance - awareness raising and training to be provided directly to private facility, hotel and homeowners, to contractors and others involved in building including labour.
- Training of volunteers, use of new technologies, new materials (e.g. fibre reinforced plastic) to make houses resilient to hazards. Resilience and mitigation training across departments, Public Works Departments.