

NATIONAL MEET ON

**Disaster** **RISK  
MANAGEMENT**

**Trends and Technologies**

**DMS programme of ISRO for  
Disaster Risk Reduction**

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Scientific Secretary, ISRO  
Prog. Director, DMS

**27 February, 2023, Hyderabad**

# Disaster Risk Reduction - Indian Context

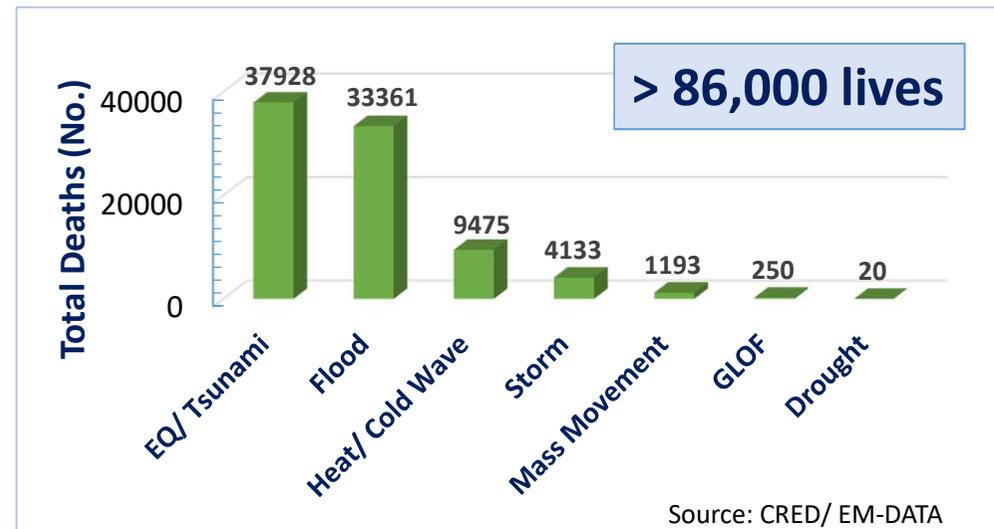
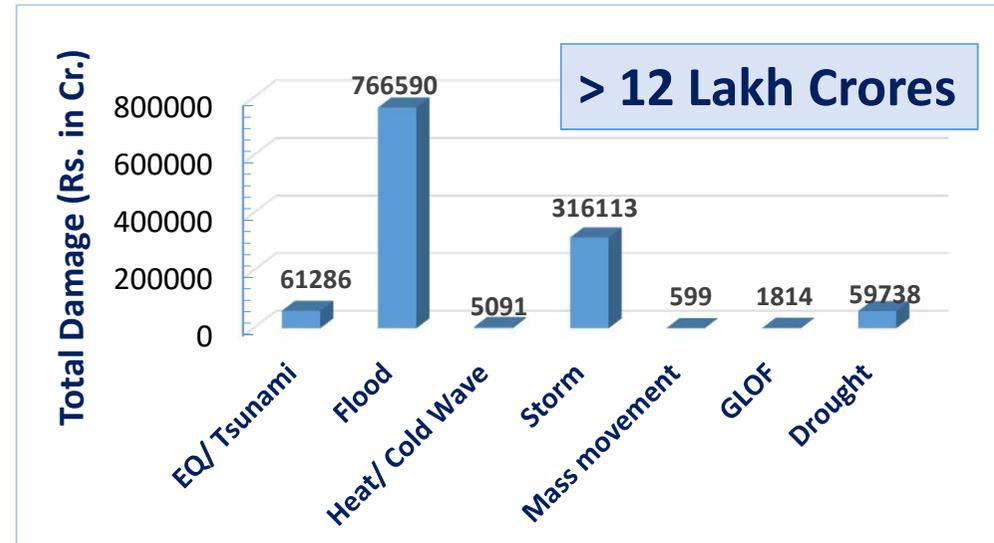
- Recurrent incidences of **Floods, Cyclones, Earthquakes, Landslides, Drought, GLOFs, Forest Fire** etc.

|           |                                   |
|-----------|-----------------------------------|
| Flood     | 12% of land (40 mha)              |
| Cyclone   | 8% of land (along 5,500 km coast) |
| Drought   | 65% of land under cultivation     |
| EQ        | 25% area, Seismic Zones IV & V    |
| Landslide | 12.6% of land (42 mha)            |

- **Disaster Management Paradigm - Mitigation & preparedness-driven approach**, to minimize loss of life; livelihood & property, for a **safe & disaster resilient nation**

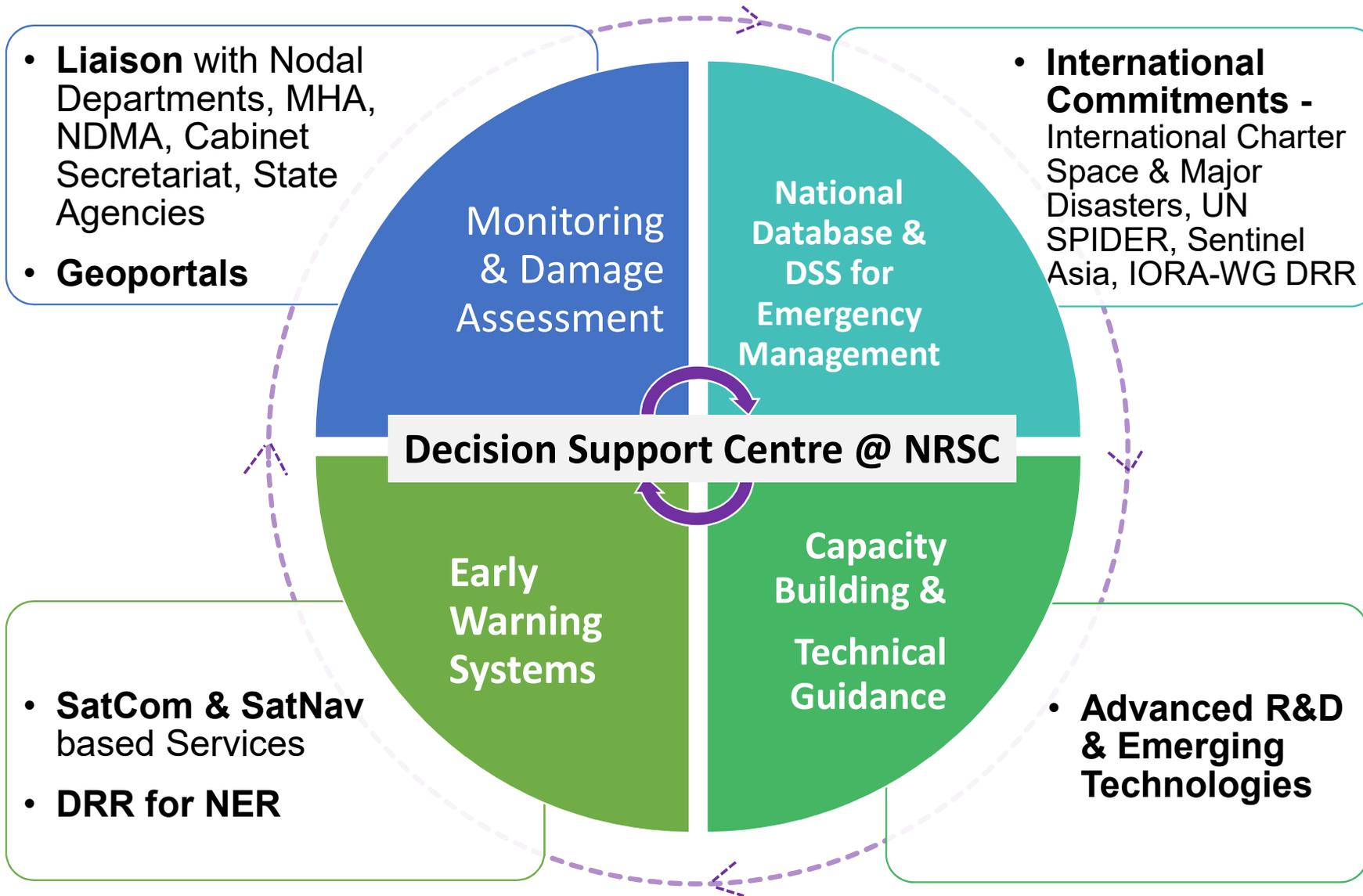
- Guided by
  - Prime Minister's Ten Point Agenda for DRR
  - National Disaster Management Policy, DM Act 2005

India Natural Disaster Statistics (2000-2022)



Source: CRED/ EM-DATA

# ISRO - Disaster Management Support Programme



Flood



Cyclone



Forest Fire



Landslide



Earthquake

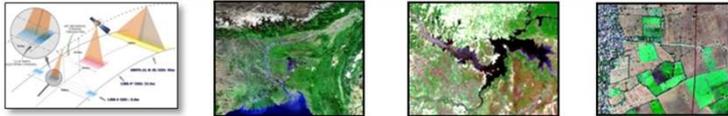


Drought

# Infrastructure Supporting Disaster Risk Reduction

## Earth Observation Satellites

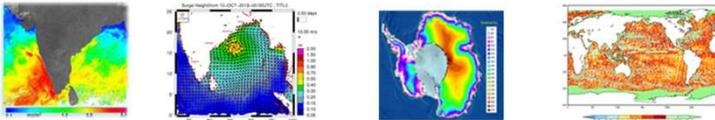
**RESOURCESAT & RISAT SERIES**  
Natural Resources & Disaster Management



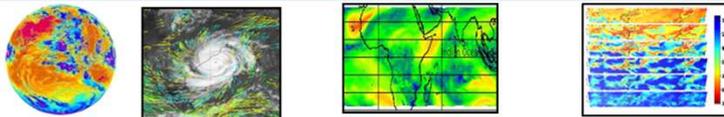
**CARTOSAT SERIES**  
Cartography & Large Scale Mapping



**OCEANSAT SERIES, SARAL**  
Ocean State, Altimetry, Wind Vector



**INSAT 3D & 3DR**  
Weather Forecasting; Atm. and Climate studies



Ensure Data Continuity with Improvements

## SatCom & SatNav

- **INSAT-3D/3DR, GSAT-17,6**
- **NavIC & Gagan**

## In-Situ Observations



- Doppler Weather Radars,
- Automatic Weather Stations,
- Lightning Detection Network
- Buoys

## Aircrafts/ UAVs



- **Beechcraft Aircrafts**
- **Sensors / Instruments**
  - LiDAR – DC, L & S band SAR, Hyperspectral Sensor
- **Hexa Copter & Quad Copter**
- **Fixed Wing UAV**

## Benefit for DRR

### Pre-Disaster Phase

Hazard/  
Risk Evaluation

Database/ DSS

Precursor /  
Early Warning

### During Disaster

Tracking/ Monitoring

Emergency Comm.

Relief/ Logistics

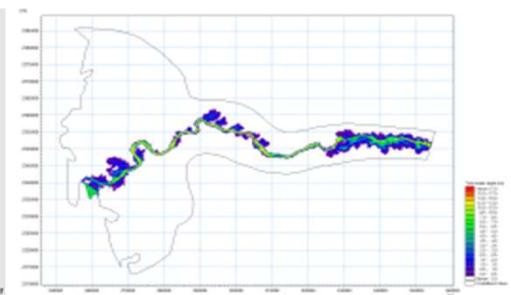
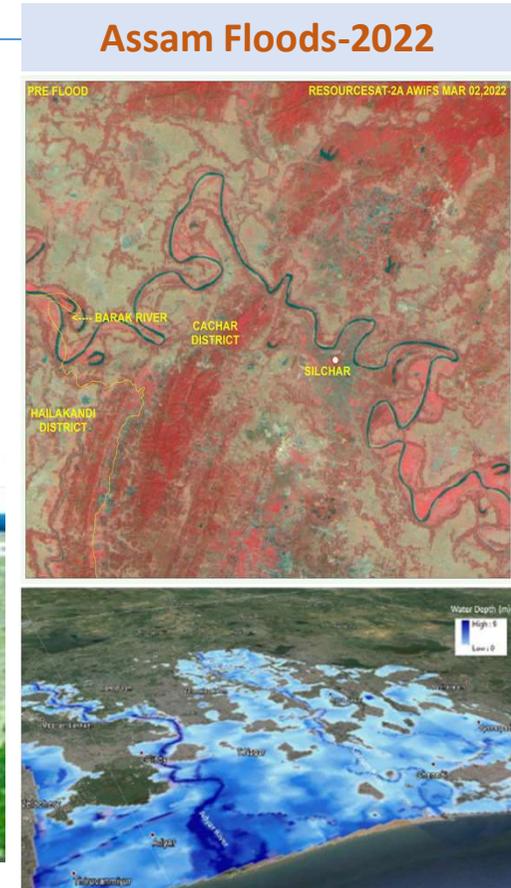
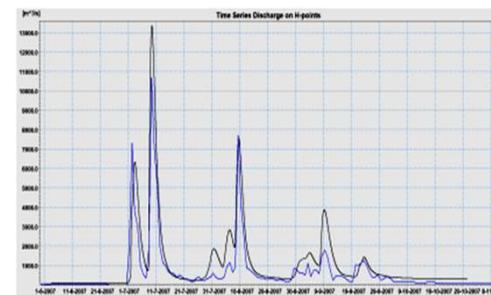
### Post-Disaster

Impact/ Loss

Rehabilitation

# Support for Managing Flood Disaster

- **Near Real-time Flood Monitoring & Mapping**
  - Flood duration, progression & recession information
  - > 250 products in 14 states disseminated in 2022
- **Flood Hazard Zonation & Aggregated Flood Maps**
  - **FHZ: Assam, Bihar, Odisha, AP, WB & UP**
  - **AFM: for less frequently flooded states (~10)**
- **Flood Early Warning & Inundation Simulation**
  - Tapi and Godavari Basins - operationally used during 2022
  - ~ 87% forecast accuracy, 36-52 Hr lead time
  - **Flood forecast models - Mahanadi, Krishna, Ghaghara, Brahmani-Baitarani, Kosi, Gandak - To be calibrated & validated with gauge-discharge data**
  - Inundation simulation using ALTM & Hydrological inputs
- **Glacial Lakes' Inventory & GLOF Risk Modelling**
  - Inventory: ~28,000 (>0.25ha)
  - GLOF risk modelling in 15 prioritized Glacial Lakes

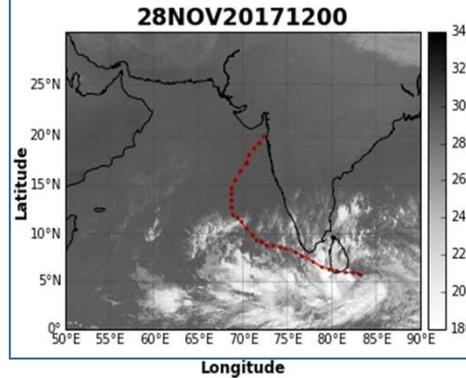


# Support for Managing Cyclones

## INSAT-3D/3DR for Tropical Cyclone Monitoring

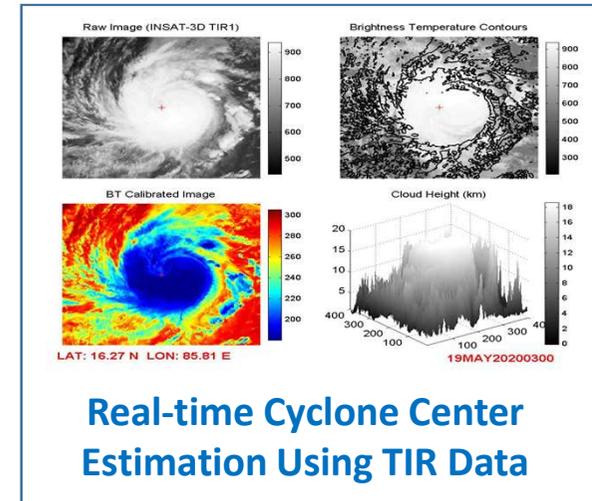
- Real-time monitoring
- Tropical Cyclone Center Estimation
- Cyclone Intensity estimation using Advanced Dvorak Technique (ADT)
- Cyclone structural information (cyclone size, eye diameter, eye temperature etc.)
- Landfall location estimation
- Rainfall assessment over cyclones
- Data assimilation into NWP models for cyclone prediction.

### Tropical cyclone monitoring & tracking



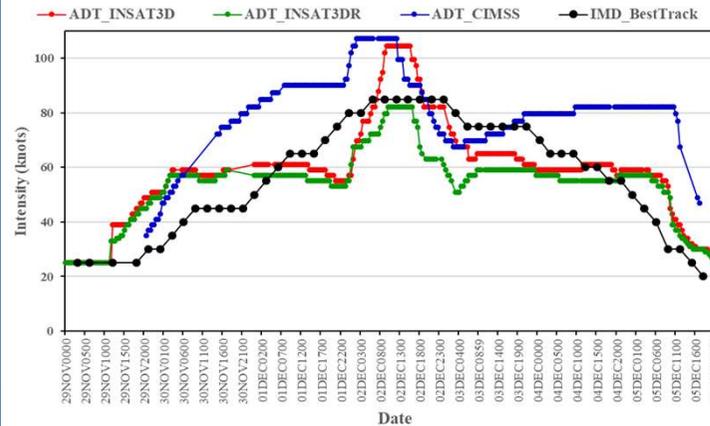
Rapid Acquisition of TIR data

TC OCKHI



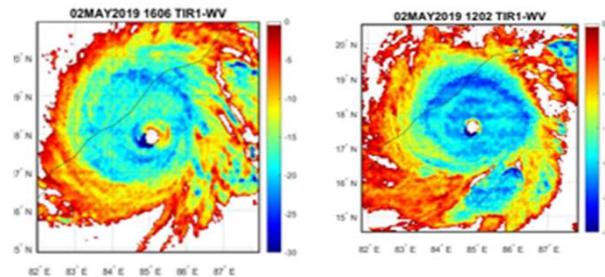
Real-time Cyclone Center Estimation Using TIR Data

### TC Intensity Estimation



Installed at IMD for operational use

### TC rapid intensification



- INSAT-3DR in rapid scan mode provides data over TC latitudes in every 4-minutes.
- To address the structural changes in inner core of TCs during its intensification.

# Support for Managing Cyclones

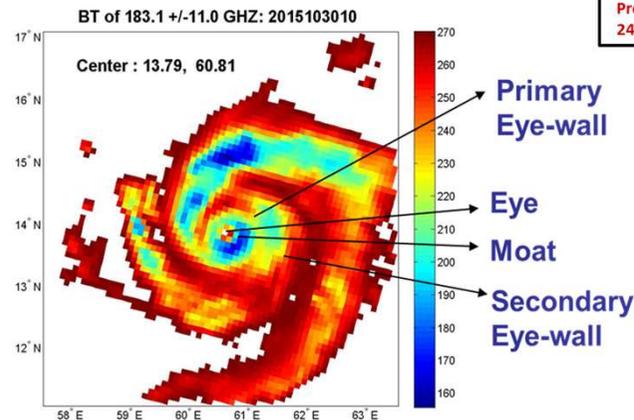
## ✓ Scatterometer:

- Monitoring of low pressure systems & Tropical cyclogenesis prediction
- Tropical cyclone geolocation estimation
- Radius of maximum winds & maximum wind speed estimation.
- Cyclone size estimation & Asymmetric wind estimation

## ✓ $\mu$ wave Humidity Sounder

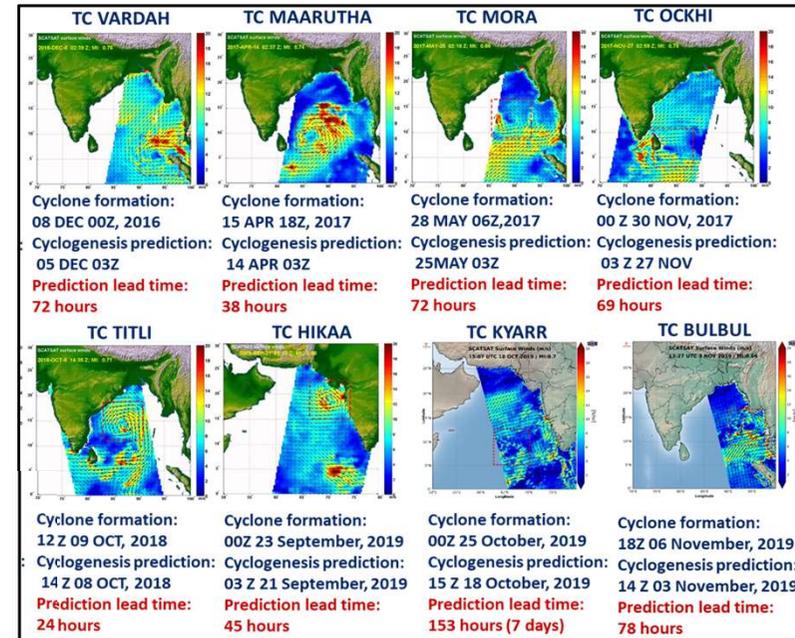
- For understanding the TC structure
- High BT in cloud-free areas of TC (eye & cloud streaks) and Low BT in cloud rain-bands
- In-house built MHS on Microsat to be used to estimate TC structural parameters.

Tropical structure cyclone observed by SAPHIR channel-6 observations



TC: CHAPLA (10Z 30OCT 2015), 125 knots

SCATSAT-1 Winds Showing the Earliest detection of Tropical Cyclogenesis

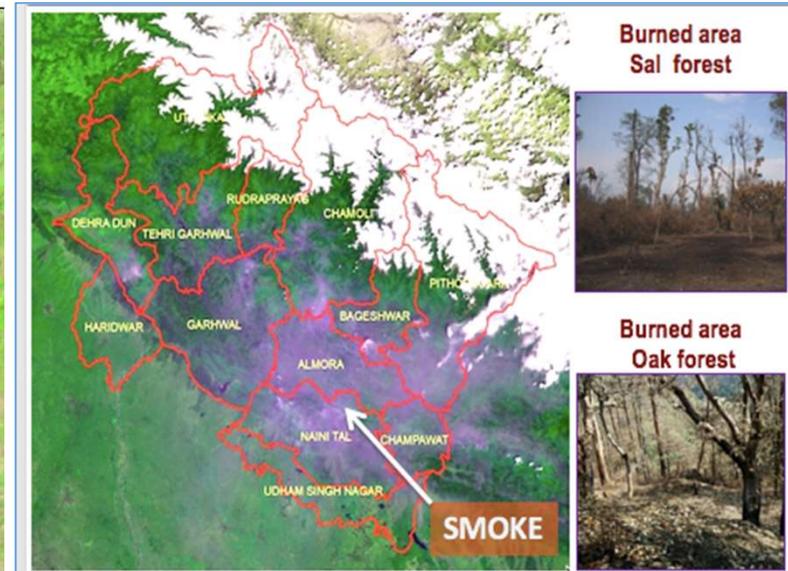
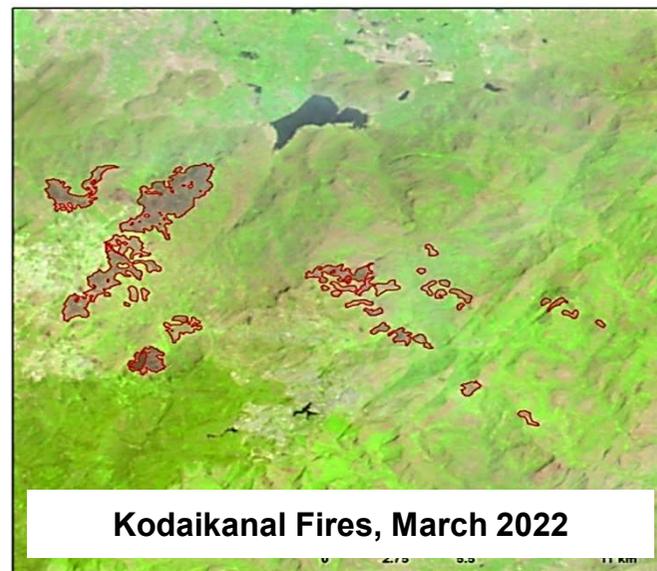
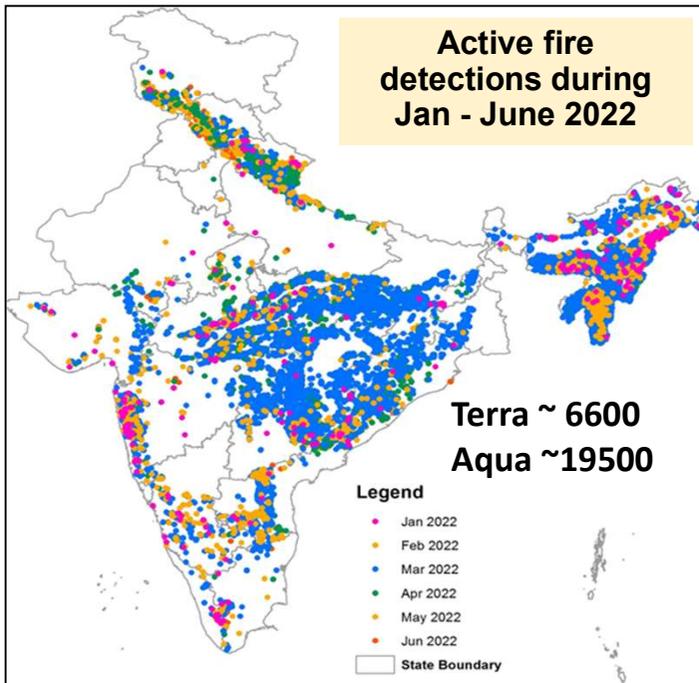
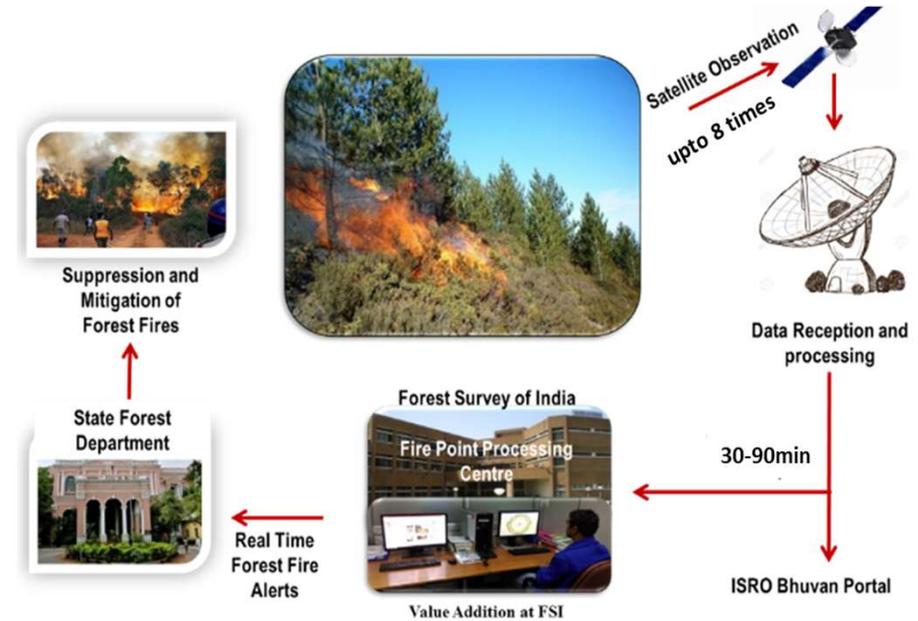


Prediction of cyclogenesis in North Indian Ocean with mean lead time of 72 hours

Probability of Detection : 100%  
False Alarm Rate (FAR): 3.8 %  
Success Rate: 96.5 %

# Support for Managing Forest Fire

- Near Real-time Forest fire detection & dissemination
  - Upto 8 detections daily, ~ 30 - 60 min Turn Around Time
  - multiple satellite data input (Terra, Aqua, S-NPP, NOAA)
- Burnt area assessment
- Decadal burnt area assessment (National Scale)
- Mobile App – Himachal, J&K, Mexico



# Forest Fire: Burnt area severity, Risk & Spread

## FIRE DANGER RATING

### 1. Ignition probability

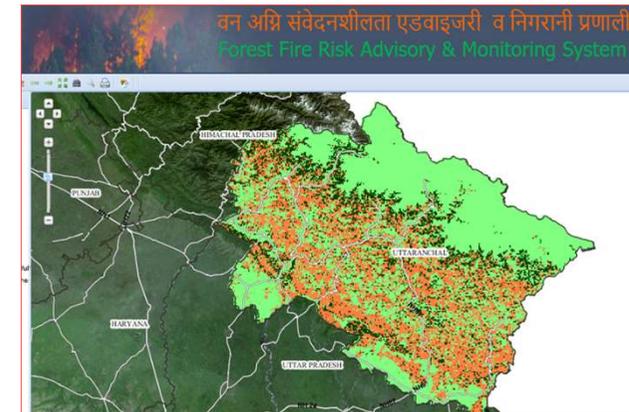
- Less relevant to Indian fire scenario as most of the fires are anthropogenic

### 2. Spread probability

- Requires fuel complex models coupled with fire weather.

## ✓ Forest Fire Risk Index

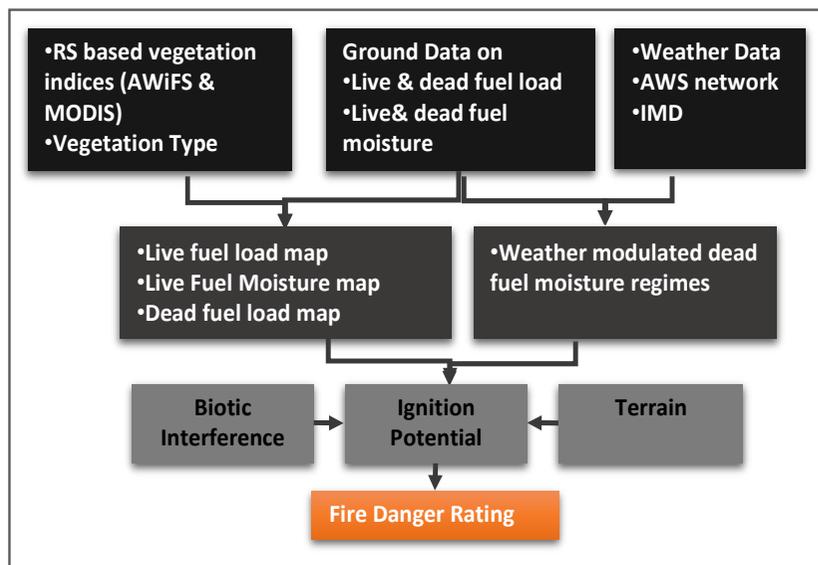
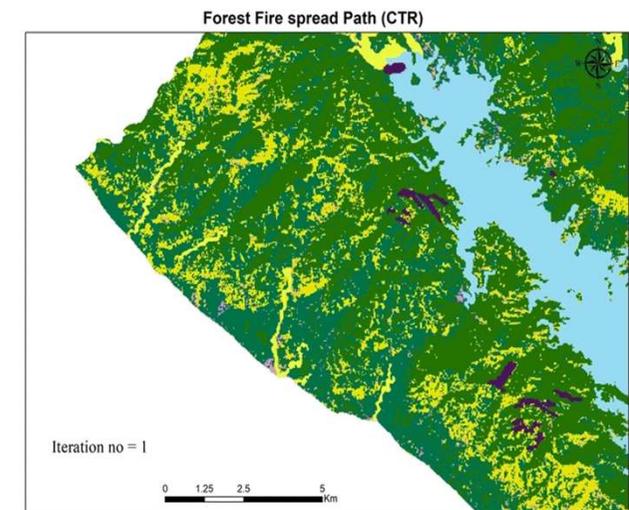
- ❖ Using Dynamic and Static Indices
- ❖ **DYNAMIC INDEX:** based on weather parameters such as **air temperature, relative humidity, wind speed & rainfall**
- ❖ **STATIC INDEX:** based on **fuel characteristics, topographic conditions, vegetation type, etc.**



Accuracy ~86% wrt actual fire occurrence

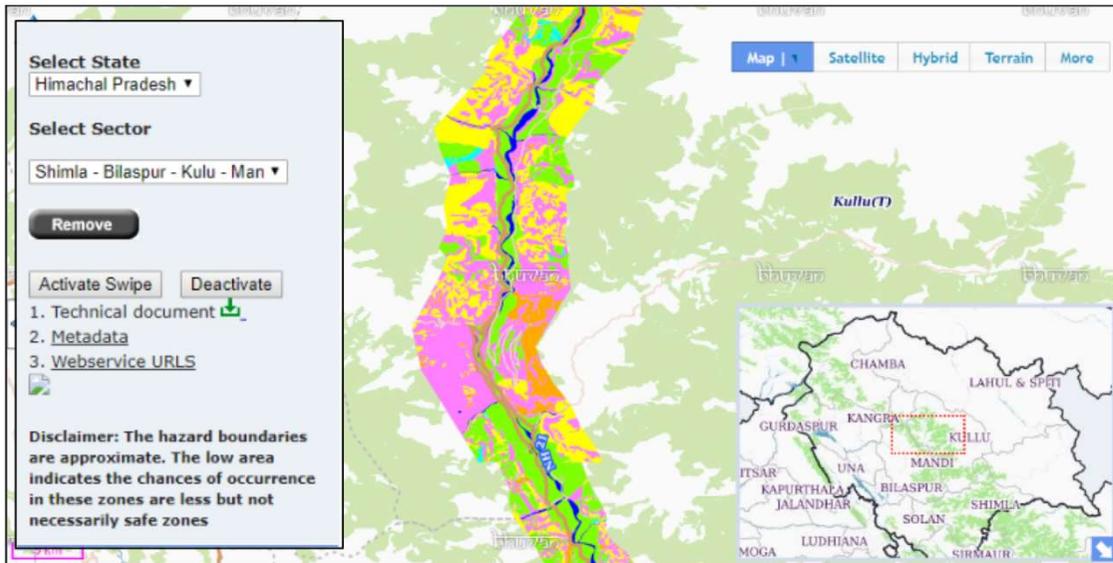
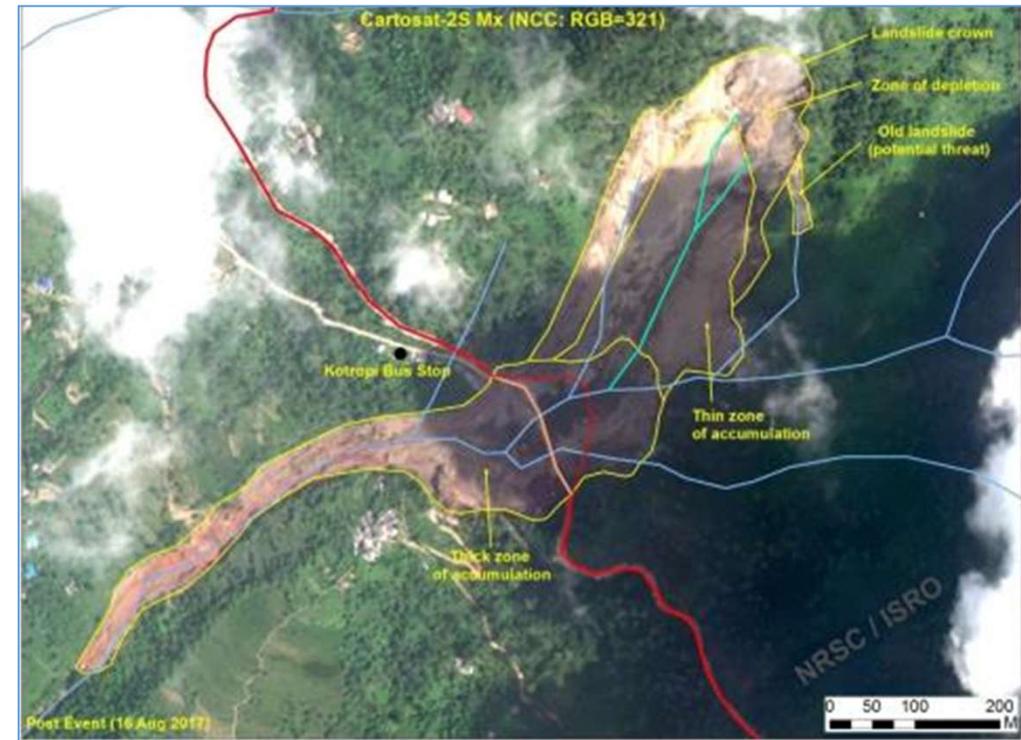
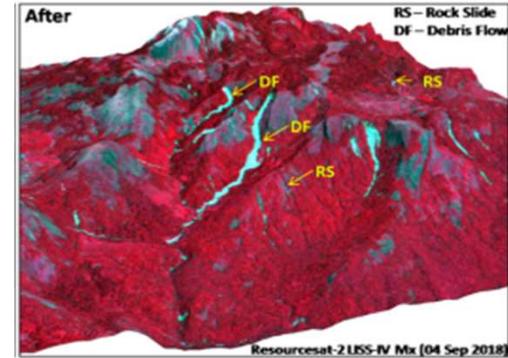
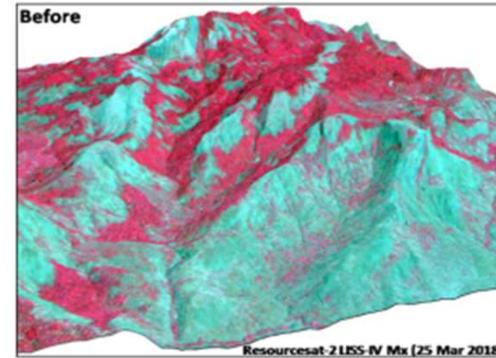
## ✓ Fire Spread

- ❖ Algorithm based on Cellular Automata
- ❖ Parameters:
  - ❖ Fuel availability
  - ❖ Meteorological conditions
    - ❖ Wind Speed & direction
    - ❖ Temperature, Humidity



# Support for Managing Landslide Disaster

- **Susceptibility Mapping**  
(along pilgrimage/ tourist corridors)
- **Landslides Early Warning** - UK, WB, Kerala  
(RF threshold, slope stability & movement based)
- **Landslide Inventory**  
(Seasonal & after major triggers)
- **Damage Assessment** - major events



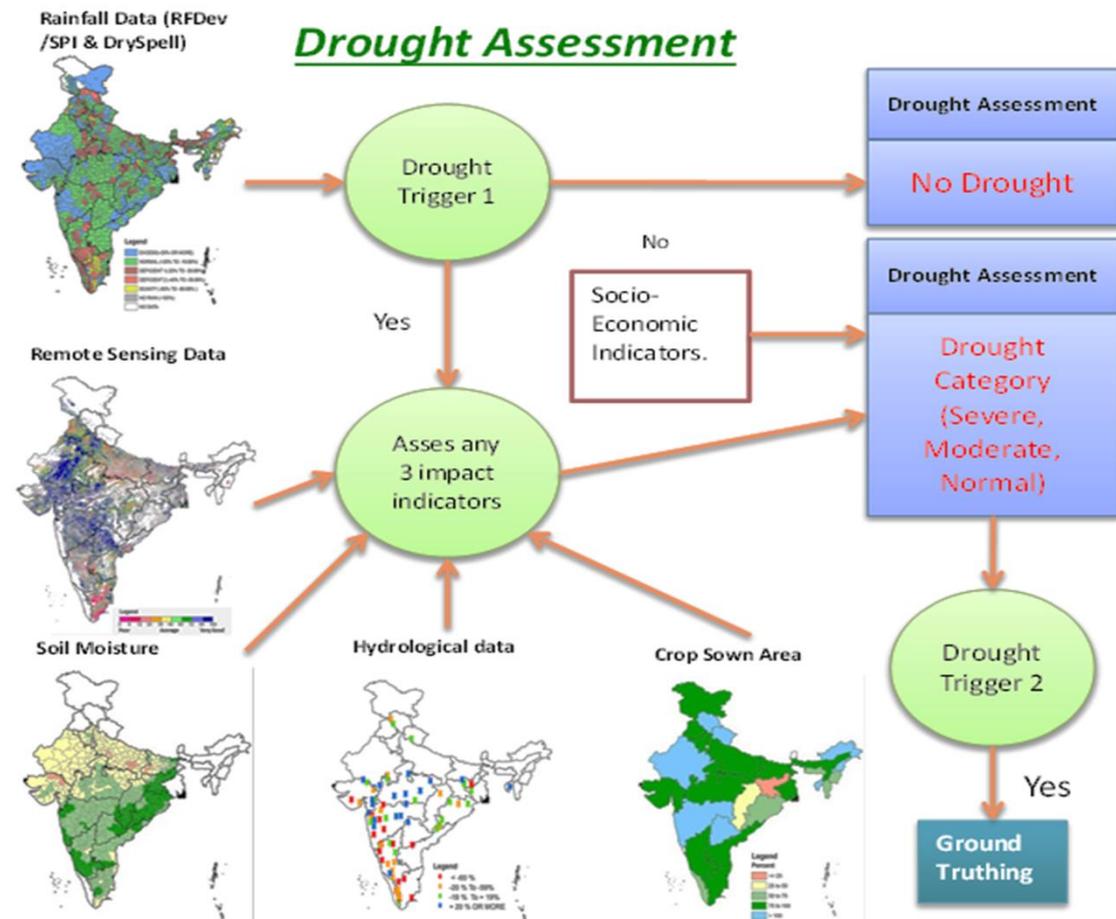
# Support for Managing Agricultural Drought

## National Agricultural Drought Assessment and Monitoring System (NADAMS)

- Information on prevalence, severity level and persistence of agricultural drought at state/ district/ sub-district level
- Developed by NRSC/ ISRO, operationally done by MNCFC.
- Covers 17 states of India, which are predominantly agriculture based and prone to drought situation

(Andhra Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Haryana, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha, Punjab, Rajasthan, Tamil Nadu, Telengana, Uttar Pradesh and West Bengal).

- Since 2017, the drought assessment is done using the methodology prescribed in “New manual for Drought Management 2016”.
- Rainfall, Remote Sensing Vegetation Index and Moisture adequacy Index during the Kharif season as inputs



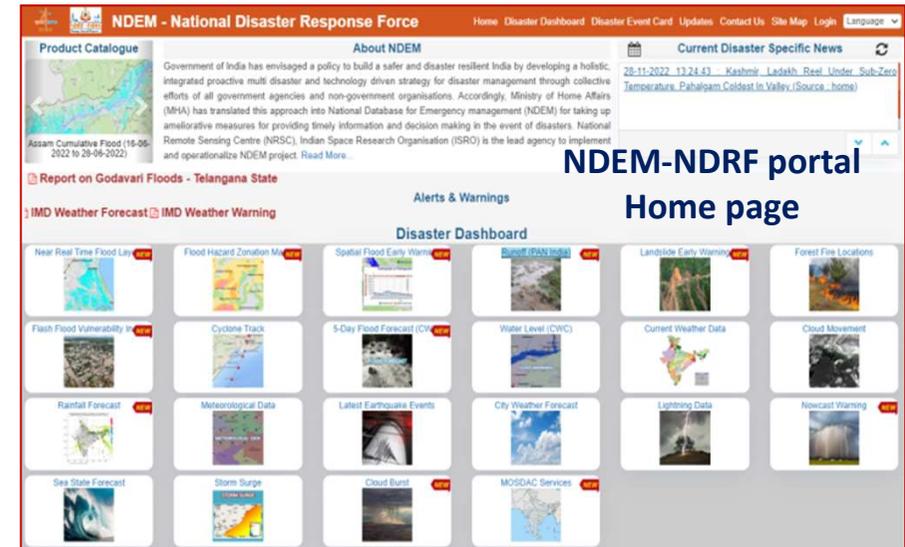
Source: MNCFC



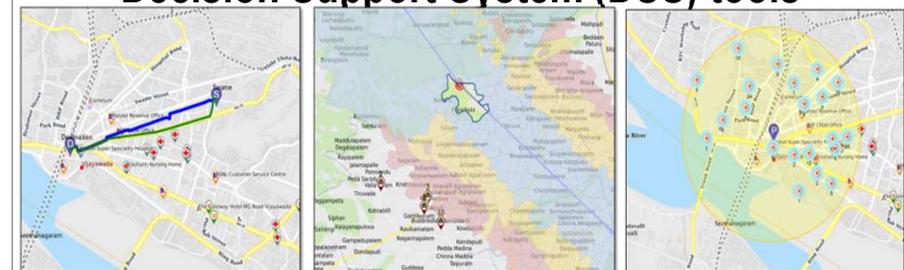
# National Database for Emergency Management (NDEM) - Version 4

- ✓ National Geo-portal with the amalgamation of multi-scale geospatial database and Decision Support tools
- ✓ Alerts & warnings from forecasting agencies (CWC, IMD, INCOIS, MOSDAC)

- New modules - Forest Fire Alerts, Run off, Cumulative Flood maps & past four years historical layers, Cloud burst, Flood Hazard atlases
- All States, UTs, NDRF, SDRF etc. upto District level
  - Near Real Time SMS alerts - on the fly statistics of Floods, CWC warnings, population density maps for flood affected areas etc.
  - Customized NDRF Portal - new battalion locations, NDRF equipment information etc.
  - Enriched database - with historical disaster specific layers, latest administrative boundaries, Satellite data & quarterly updates of Point Of Interest (Pols), Road/Rail network.
- Regional Language support i.e., Telugu, Tamil, Bangla , Malayalam, Hindi and English.



## Decision Support System (DSS) tools



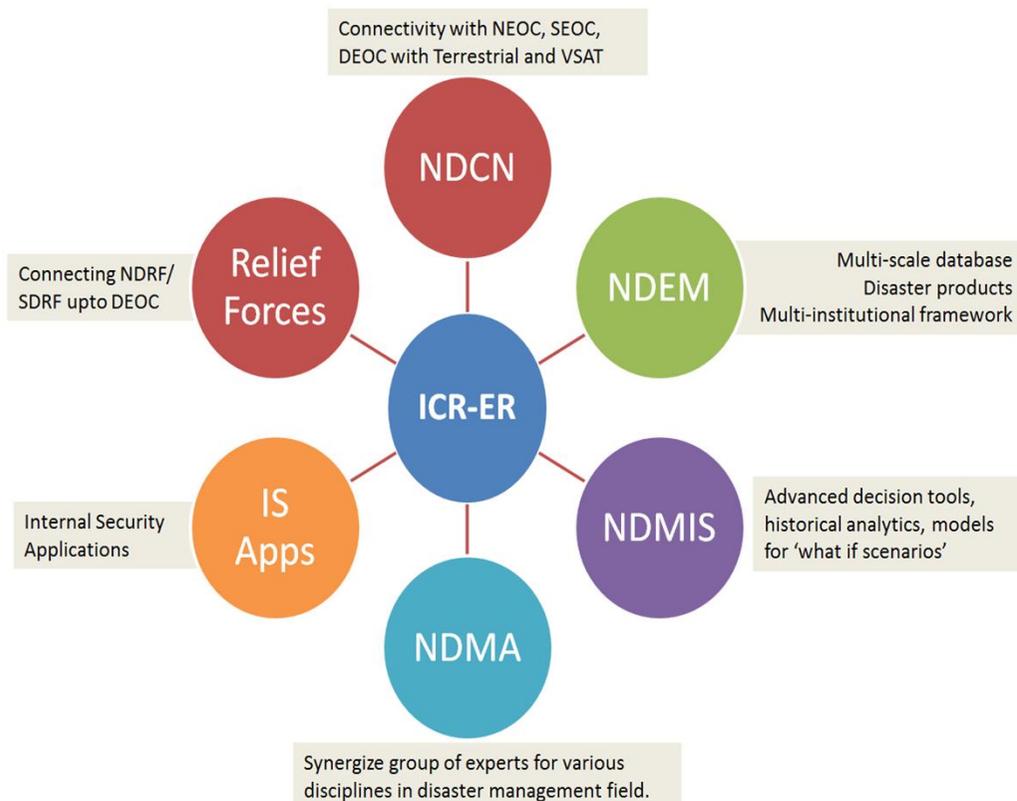
Route Analysis

Evacuation Plan

Proximity Analysis

# NRSC in Setting up ICR-ER at MHA, New Delhi

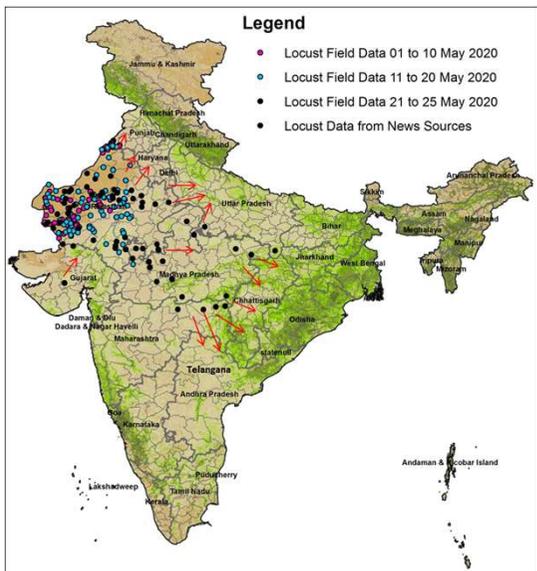
- ISRO to provide technical support through NRSC in establishing ICR-ER for MHA.
- Quadripartite MoU - MHA, ISRO, NIC, NICSI on 23.7.2021.
- Integrated Control Room at NDCC II, Exclusive & Common data sets for DM & IS; with a link to MHA, North Block.
- NRSC provided Design & Implementation plan for ICR-ER along with RFP, and RFP is approved



- ✓ **Replication of NDEM services for DM component in ICR-ER**
- ✓ **NDEM as mirror for ICR-ER**
- ✓ **Guidance on technical manpower**
- ✓ **Training on DM related applications**

# Support for other Disasters

## Locust Surveillance

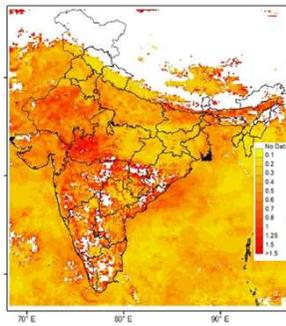
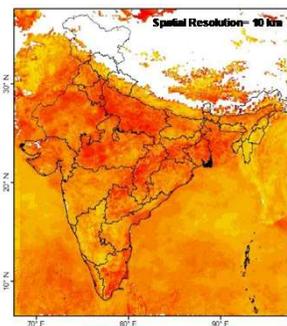


Locust Migration in India was studied, using Vegetation status, Soil Moisture, Wind direction and rainfall data along with Locust incidence reports

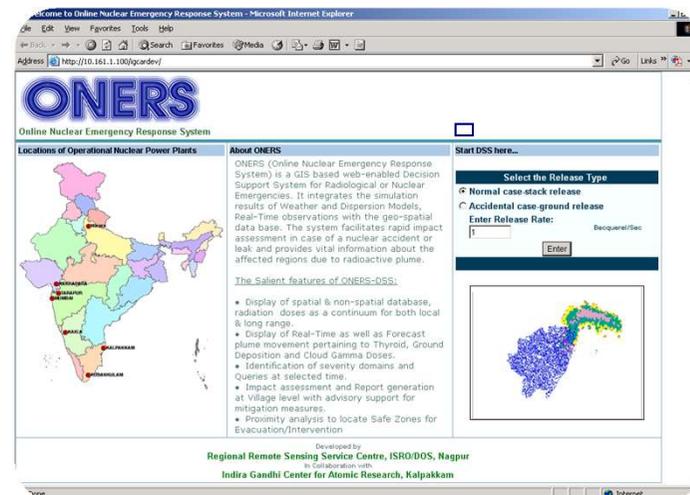
## Support during Covid-19

| Support  | Users                         |
|--|-------------------------------|
| COVID 19 Dashboard, Vaccination Centres  | MoH&FW                        |
| State level support- Mobile Rythu Bazar , Citizen Reporting & Officer Reporting, Home Quarantine Tracker, Food locations, bed status | Telangana, Tamil Nadu, Bihar, |
| Monal 2020 : Patient Geolocation & Contact Tracing, Patient geolocation & Tracing (112+ India)                                       | ECIL, CDAC                    |

- Spatial distribution of NO2
- Satellite based observations to measure the AOD and Particulate Matter PM2.5 & PM10



## Nuclear Emergency Response System



- Implemented at IGCAR Kalapakkam Nuclear Power Plant.
- Adopted for operational use by Madras Atomic Power Station ( MAPS )
- Reference Grids of 18km, 6km, 2km, 1km, 500m, 250m

Satellite data support for Glacial Lake monitoring, Oil Spill Detection and tracking, etc.

# SATCOM & SATNAV Applications in Disaster Management Support

## Two-way MSS Vessel Tracking Terminal

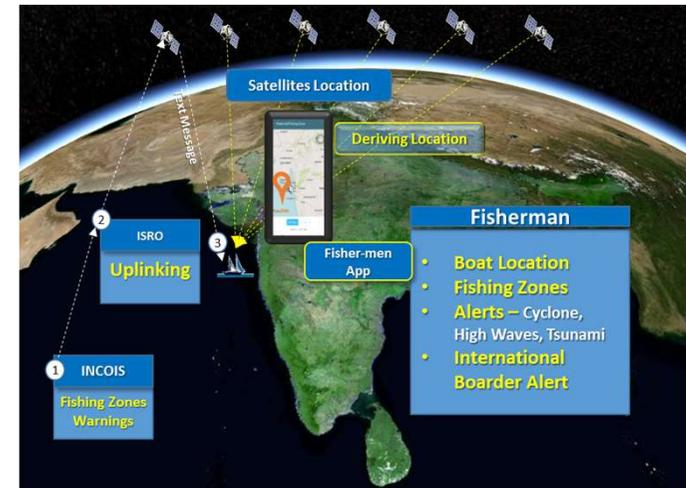
- Satellite based automatic periodic tracking of boats/ships
- Emergency Messaging (SoS) from Boat/Ship to Control Station
- Emergency warning broadcast from Control Station to Boats/Ships
- Mobile App for Connectivity to MSS Terminal using Bluetooth
- 1000 units fitted in boats in Tamil Nadu & Gujarat



## Distress Alert Transmitter (DAT)

- For Emergency Reporting by Fishermen using DRT transponder of INSAT (402.65-402.67 MHz)
- Six types of messages based on Manual Activation
- Message Acknowledgement using NavIC Messaging
- Low Cost battery operated terminal, Limited Short Messaging
- Hub at ISTRAC, Bengaluru

## NavIC Positioning & Messaging for Fishermen



## Satellite Aided Search and Rescue (SASAR)

- Operational services to the users in India and 7 neighbouring countries
- GEO and LEO ground segment located at Bengaluru & Lucknow, and GEO space segment at 74o E Longitude
- 601 alerts received and search & rescue supports provided to 12 real distress incidents in Indian service area , saving 56 human lives, in 2022

# Capacity Building

- Capacity Building of Ministries/ Dept. on Space Applications & Disaster Management
- Support to NIDM and NDMA training activities
- Exclusive training for NDRF & State DM officials

## Enhancing role of Academia & Research Agencies

### Advanced Studies in Space Based Disaster Management Support

- ❖ New methodologies
- ❖ New algorithms for hazard detection
- ❖ Application of AI and ML in DRR
- ❖ Early warning systems
- ❖ Multi-hazard vulnerability assessment

- ❖ 14 projects ongoing
- ❖ Selected through rigorous screening from 84 proposals

- ❖ IIT-Roorkee; IIT Bombay
- ❖ IIT Patna, IIT Ropar, IIT Mandi
- ❖ GBPUAT, NIT Karnataka;
- ❖ Central University Jharkhand
- ❖ CBRI, IISER-Mohali

## 18<sup>th</sup> DMS Training Program



26 Participants from 13 various State & Central government agencies, during Jan 30- Feb 03, 2023



NDEM Online training programme for NDRF officials

# International Engagements in Disaster Management Programme

## International Charter Space and Major Disasters

### ❑ ISRO's Leadership role during 2021

- **31 activations**, the highest by any country since Charter inception.
- **New Membership** - National Academy of Science (NAS), **Belarus**
- **New Authorised Users**: Mexico, Gambia, Armenia, Kenya, Mongolia.
- **Coordination with** GEO, UNITAR & UNOOSA.

### ❑ Data Processing Environment by ISRO

- Prototype demonstration for Quick processing of the satellite data in a cloud based environment

## Indian Ocean Rim Association – DRR WG

- ❑ Capacity building, data support

## APRSAP initiative - Sentinel Asia

- ❑ In 2022, > 30 Datasets for 17 disasters in 8 countries
- ❑ 2 webinars in 2022- Spatial Flood Forecast Modelling for DRR & Drought Risk Management (~175 participants)

## NASA – NOAA – ISRO Collaboration

- ❑ **NISAR**: Multiple applications: mapping/ damage assessment, monitoring floods, volcanoes, oil spills, crustal deformation etc.
- ❑ **NOAA-ISRO**: Flood, Tropical Cyclones

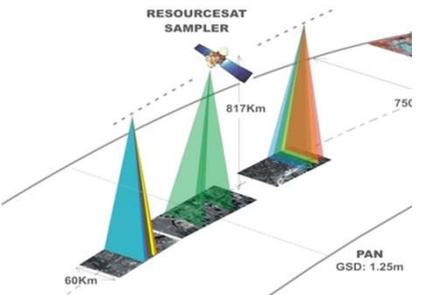
## CEOS, GEOSS Initiatives

## UN Initiatives- ESCAP, SPIDER

# ✓ Way forward - Enhanced Space Based Support

## Resourcesat Sampler

| Sensor | GSD    | Swath | Revisit |
|--------|--------|-------|---------|
| PAN    | 1.25 m | 60 km | 4 Days  |
| MX     | 2.5 m  | 60 km |         |

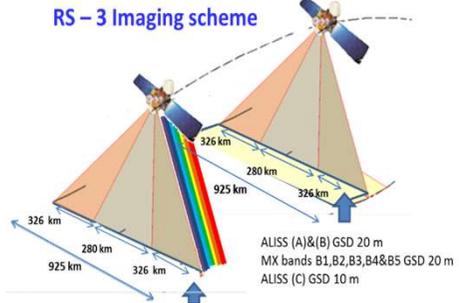


## HRSAT (3 Nos.)

| Sensor | GSD   | Swath | Revisit     |
|--------|-------|-------|-------------|
| PAN    | < 1 m | 15 km | Daily (AOI) |
| MX     | < 4 m | 15 km |             |

## Resourcesat - 3 & 3A

| Sensor      | GSD  | Swath  | Revisit |
|-------------|------|--------|---------|
| ALISS-3     | 20 m | 925 km | 4 days  |
| ALISS-3 (C) | 10 m | 280 km | 11 days |



## NISAR



|                  |                                   |
|------------------|-----------------------------------|
| Frequency        | L-band 1.26 GHz<br>S-band 3.2 GHz |
| Swath            | Up to 200 km                      |
| Incidence Angles | ~ 34 - 48 degrees                 |
| Resolution       | 3 to 10m                          |
| Repetivity       | 30 days                           |

## ✓ Way forward - Reactive to Proactive Disaster Management Support

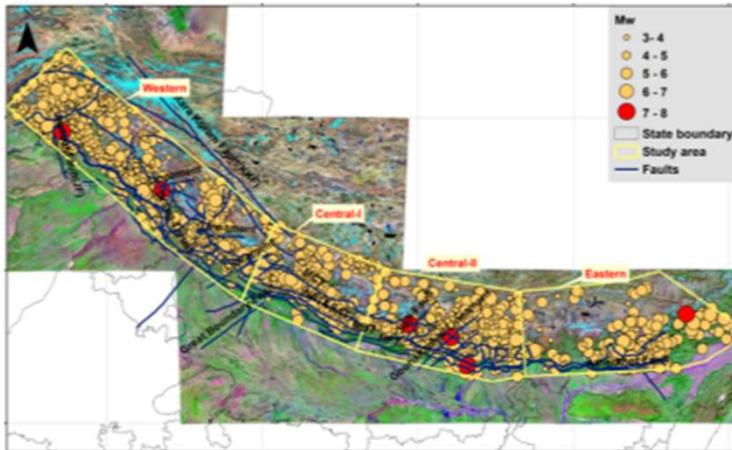
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- **Enhanced understanding of Disasters & understanding the risk**
  - Actionable Science, linking physical process to spatio-temporal disaster scenario
    - Cyclones, Flash Floods, Earthquakes, Cloudbursts, Avalanches/GLOFs, Lightning, Landslides,...
- **Leverage technology, including mobile, our disaster risk management efforts**
  - Event driven sensing, Onboard Information retrieval & dissemination,..
- **Better Preparedness and Effective Response - Multi-hazard risk assessment**
  - Robust early warning and Impact based disaster forecasting
- **Strengthening Risk Reduction, Recovery and Resilience**
  - Reducing risk & building resilience - Retrospective & modeled disaster impact analyses
  - Improved vulnerability; exposure and coping capacity assessments – Integration of Socioeconomic & hazard data
- **Adopting Best Practices/ better cohesion in international response to disasters**
  - Sharing and co-developing technology
  - Technical exchange of knowledge

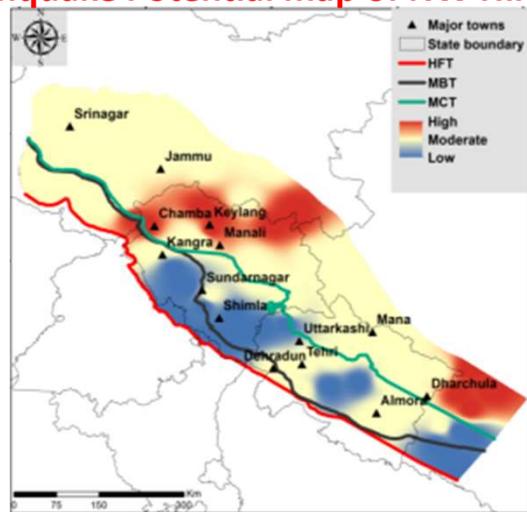
Thank you

# Earthquake Disaster

## Seismic Zones in Himalayas



## Earthquake Potential map of NW Himalayas



## List of Projects/Activities

Event-based Rapid response

Meso-scale seismic hazard zonation

Geodynamics using CORS

Anomalous TEC and Thermal precursor

Strain modelling

DInSAR for earthquakes



# **Lessons from OP 'DOST' in Turkiye and Technologies for the Future**



## OP DOST- Turkiye Earthquake



- 1. 06.02.2023, 0647 hrs (IST), earthquake of magnitude 7.8 struck SE Turkiye and Northern Syria.**
2. India sent 03 NDRF teams, 154 rescuers including 05 lady rescuers, 11 vehicles, 06 rescue dogs for SAR operations from Feb 7 to Feb 17.
- 3. Effective coordination resulted in immediate mobilisation and deployment – first team left the same night.**
4. In addition to rescue operations, **NDRR & other relief aids** were sent to Turkiye and Syria.



## OP DOST- Turkiye Earthquake



5. NDRF **rescued 02 live victims and retrieved 85 dead bodies.**
6. Details of **live victims**:
  - 09<sup>th</sup> Feb - Beren, 6 yrs, girl
  - 10<sup>th</sup> Feb- Miray Karatas, 8 yrs, girl
7. **Hon'ble PM Sh. Narendra Modi** interacted with and appreciated the teams of NDRF and MoD
8. He **emphasized to document and work** on the **learnings** from the Turkiye operation to improve.















## Lessons learnt from “OP DOST”



1. **Rapid deployment** crucial to saving lives during golden hour.
2. Effective **coordination** mechanism required to activate all stakeholders.
3. **Latest equipment – NASA – FINDERS (life detection), EMIT**
4. Good **troop carriers with Comn, cameras, drones etc.**
5. **Thermal imaging**
6. **Adm and gear** for rescuers – attire, tentage, camping, food, fuel, sanitation and hygiene.
7. **Plus point-** Speed, scale, tenacious, experienced, adaptable & sensitive rescuers, INSARAG preparation.



# GEOGRAPHICAL INFORMATION SYSTEM



- Predictive forecasting – NRSC examples
- Risk assessment
- Locate dangerous points
- Find shortest route
- Live GPS tracking
- Finding evacuation routes
- Plotting medical centres, police stations...all facilities
- To organize damage information and evaluation of sites for reconstruction



# DRONES AND UAV



- i. Ability to work beyond line of sight in non-GPS environment
- ii. Risk Mapping – aerial mapping using drones to identify disaster prone areas
- iii. High-resolution real time images – to assist in movement of Rescue Teams and to prioritize Relief Op.
- iv. Payload Drones as a Force Multiplier – for emergency deliveries, **sensors for CRBN**
- v. Evacuating victims – Drone taxis





# SMART WEARABLES AND SIMULATION



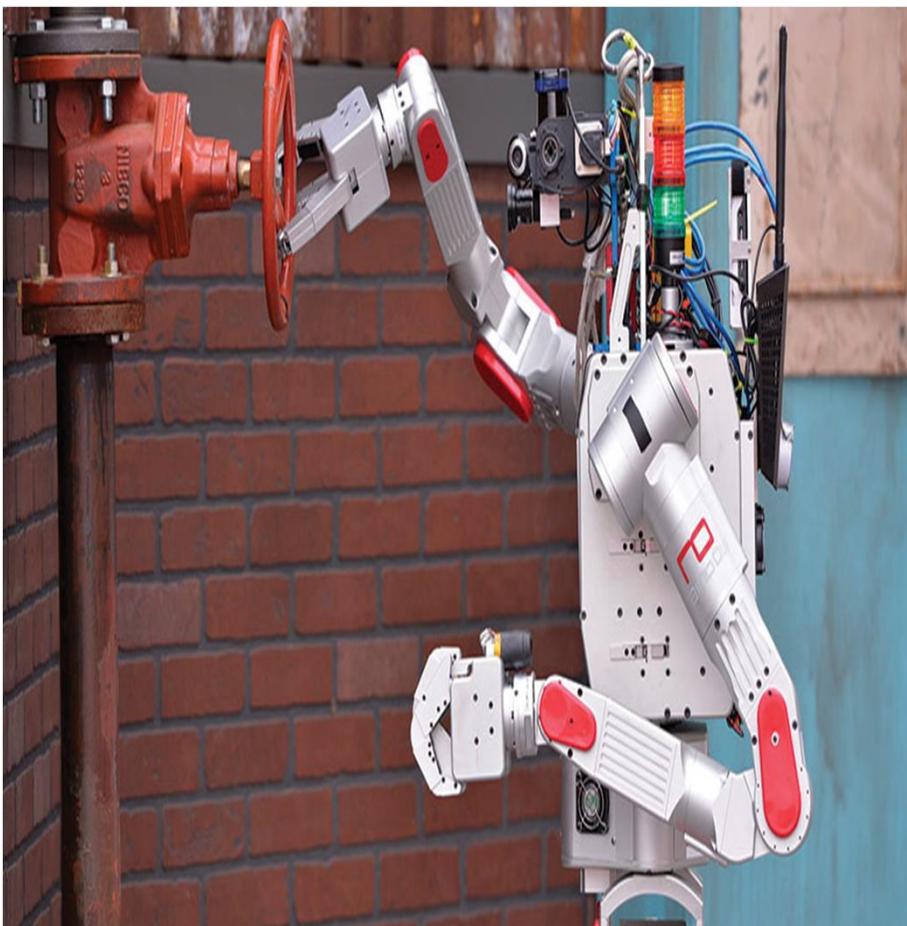
Mini computers and sensors embedded in devices that attach to body, leverage mobility and can be operated handsfree.

- i. Body-mounted sensors – monitoring vitals
- ii. Fitness trackers
- iii. Smart clothing
- iv. AR/VR headsets.
- v. Exoskeletons
- vi. Jet Packs





## ADVANCE ROBOTICS - ROVs



- i. These can be extremely valuable for NDRF units especially in challenging terrain and life-threatening operational environments.
  
- ii. On ground, Underwater, with SONAR sensors and AI.



# LEVERAGING FIRST RESPONDERS



1. E-content for NSS, NCC... all citizens
2. Database that can keep track
3. Regular updates
4. Software for deploying



## Other useful technologies



1. Satellite- NASA (Turkey), *Cloud to Street now FloodBase*
2. Social Media- *META (Safety Check), Google (Crisis)*
3. Spatial- TN Smart, Karnataka model
4. Crowdsourcing - Volunteered Geographic Information (VGI)
5. Mobile Crowdsensing (MCS)



Thank

YOU



# Disaster Risk Reduction Initiatives in Odisha



**Dr. Gyana Das, IAS**  
**Executive Director**  
**Odisha State Disaster Management Authority**

# Odisha: India's most disaster prone State

## Cyclone Vulnerability

1999 – Super Cyclone

2013 – Cyclone Phailin

2014 – Cyclone Hudhud

2018 – Cyclone Titli

2019 – Cyclone Fani and Bulbul

2020 – Cyclone Amphan

2021 – Cyclone Yaas, Gulab & Jawad

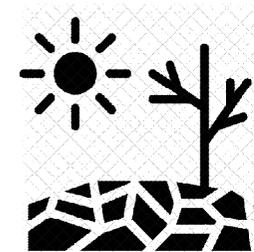
2022 – Cyclone Asani

| 1891 - 2000       |           |
|-------------------|-----------|
| State             | Total No. |
| <b>Odisha</b>     | <b>98</b> |
| Andhra Pradesh    | 79        |
| West Bengal       | 69        |
| Tamil Nadu        | 62        |
| Gujarat           | 28        |
| Maharashtra & Goa | 18        |
| Kerala            | 3         |
| Karnataka         | 2         |

## Major disasters in last 25 years



2001, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2013, 2017, 2018



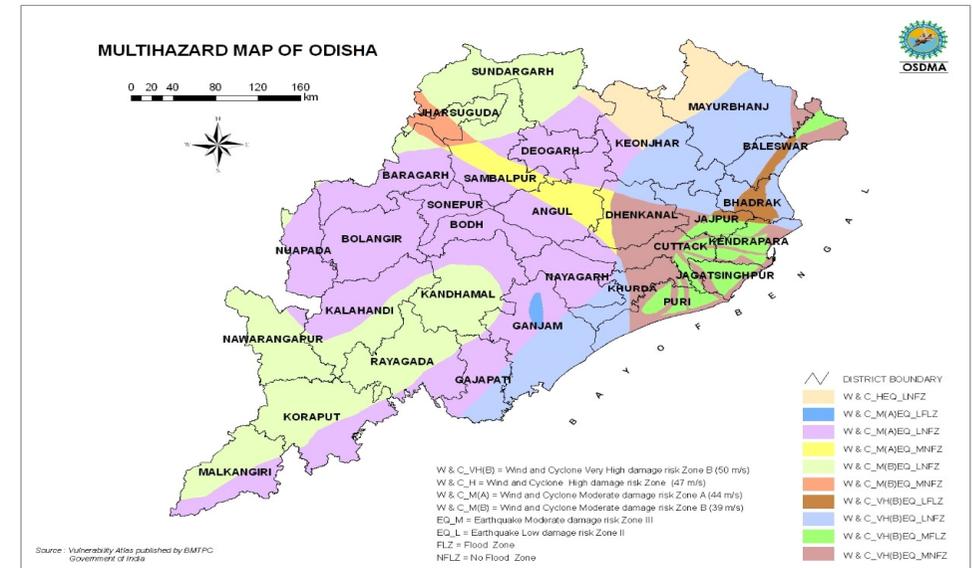
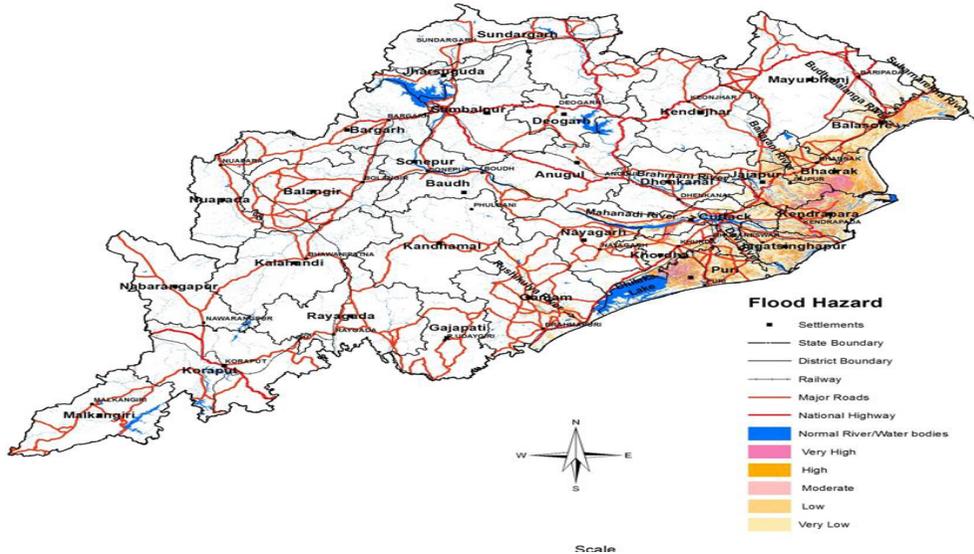
1996, 1997, 1998, 2000, 2002, 2009, 2010, 2015



Heat Wave

Cyclones in Odisha increasing in frequency and intensity. 7 Cyclones in the last 3 years

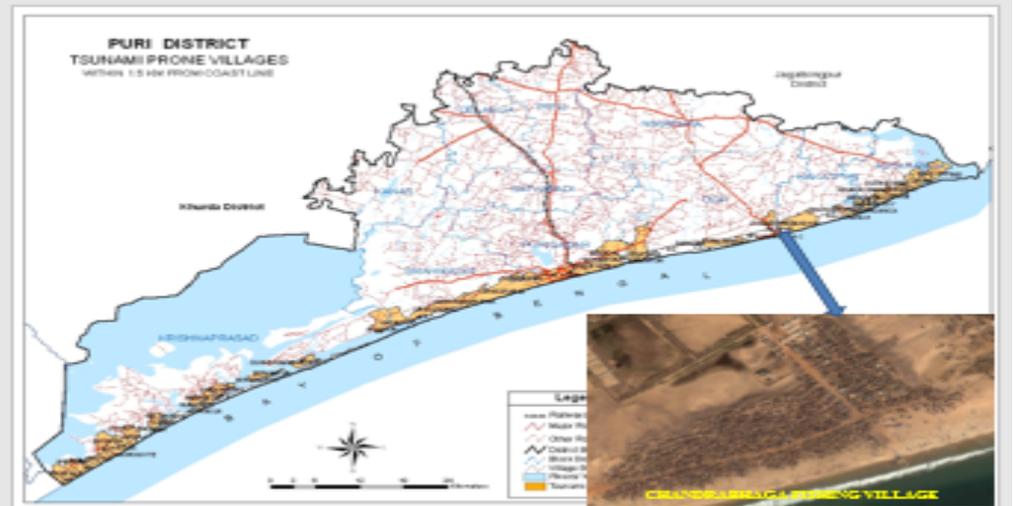
# Hazards Maps



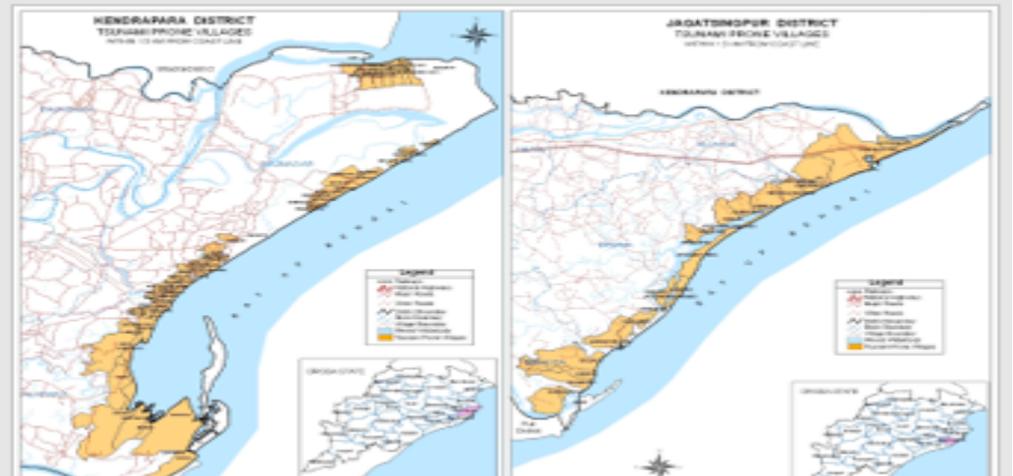
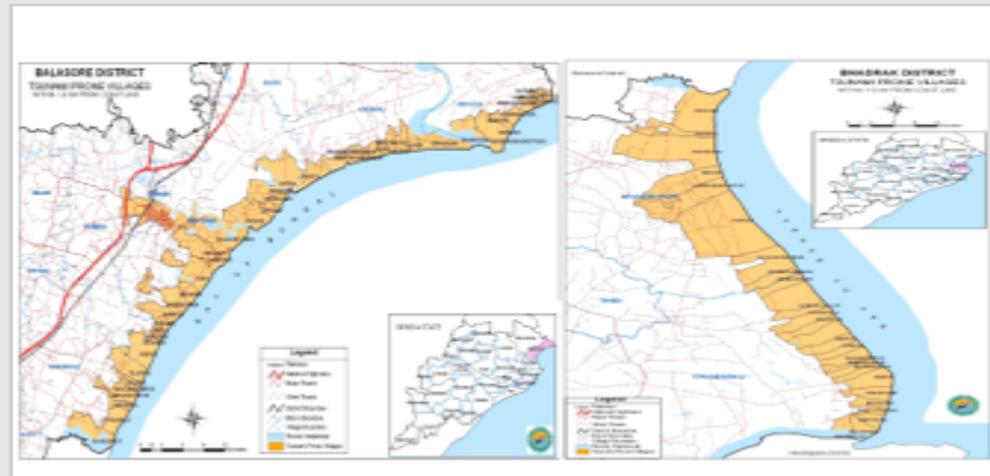
# Vulnerable to Tsunami



9



10



# Lessons from Super Cyclone, 1999

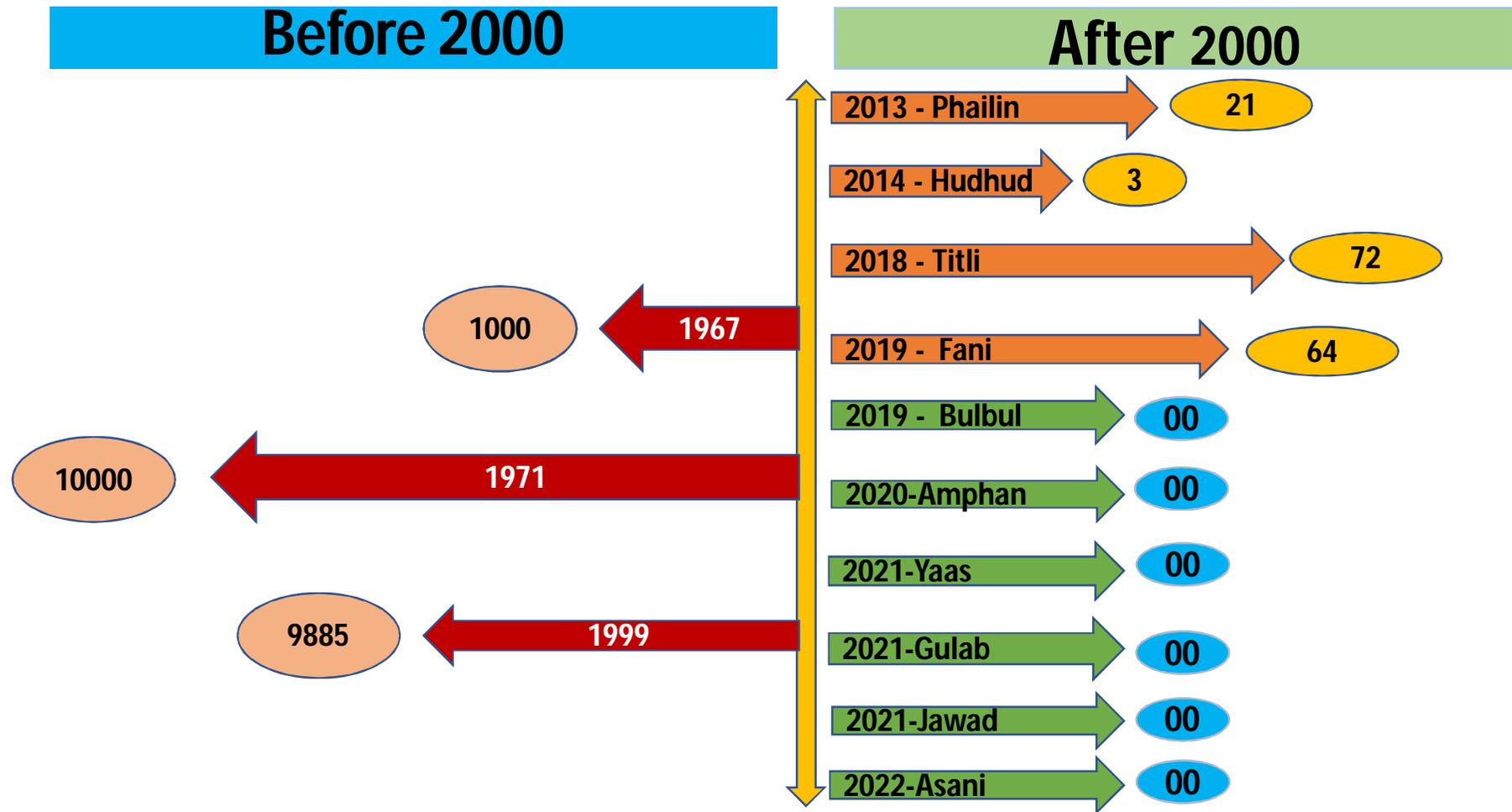
- Sketchy prediction by IMD
- Preparedness not adequate
- Capacity to respond to a Super Cyclone lacking
- Disaster proof infrastructure missing

## Result:

- 10,000 human lives lost



# Reducing loss of human lives



# The Journey after 1999



**The 1<sup>st</sup> Disaster Management Authority of the country.**



**Impact Based Forecasting**



**Safe Shelters**



**Odisha Disaster Rapid Action Force (ODRAF) raised in 2001**



**Disaster Management Planning at all levels**



**Stakeholder Networking**



**EOC & Communication Network Strengthened.**



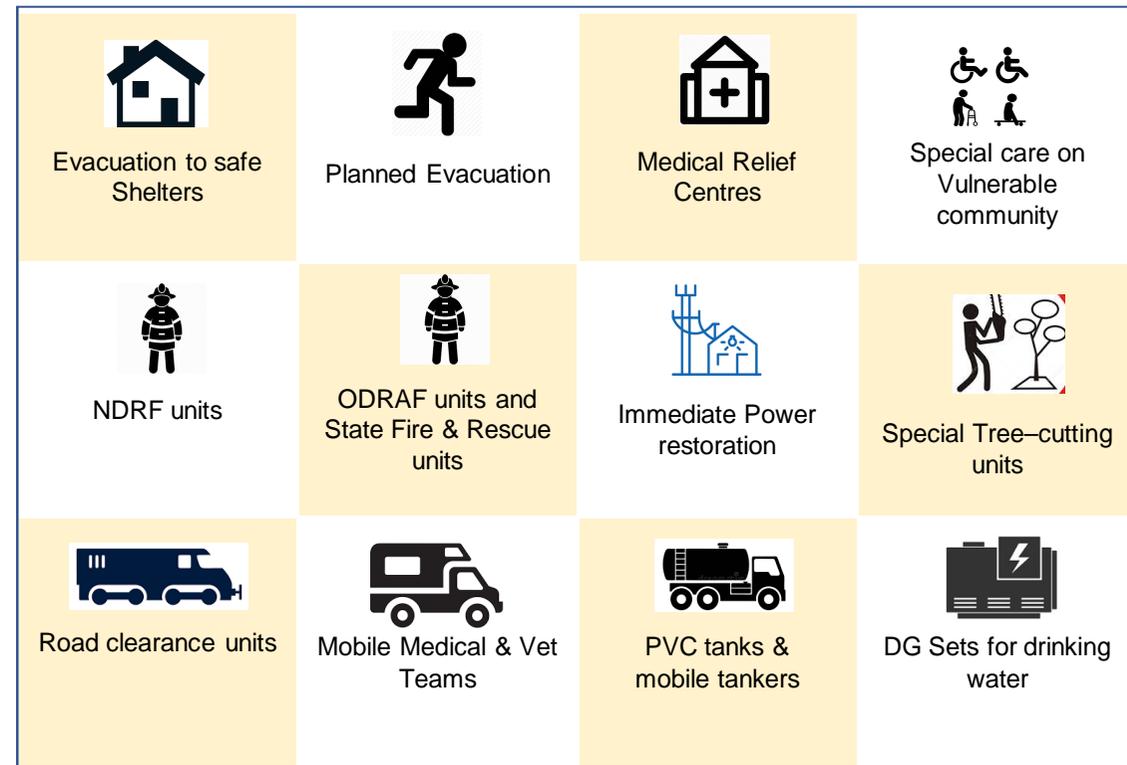
**Community led Disaster Preparedness**

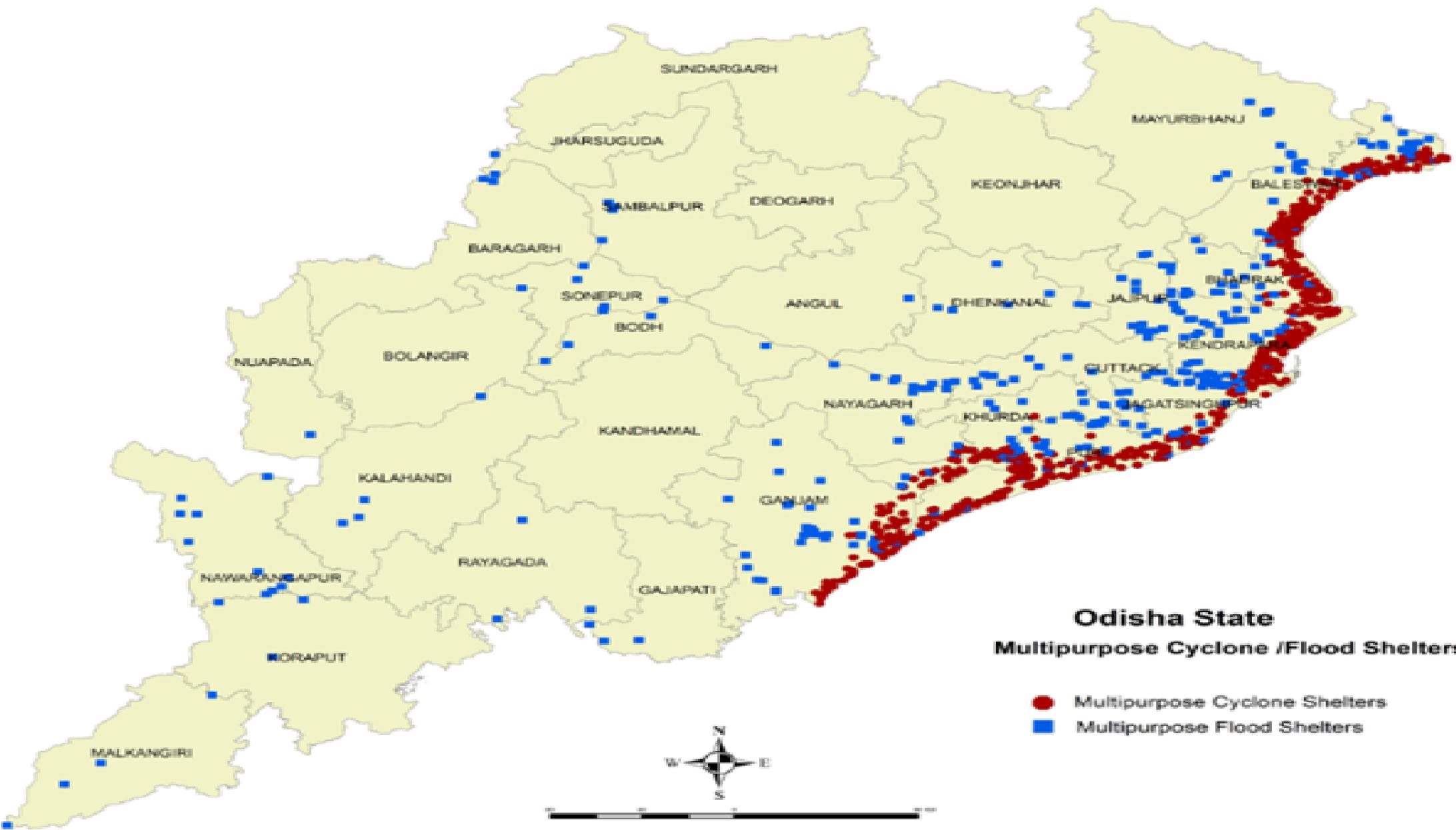


**Disaster Warrior**

# Disaster Management : Odisha Way

- Robust DM Institutional mechanism
- Impact Based Forecasting
- Blanket & Targeted evacuation
- 900 multi-disaster resilient MCS/MFS
- Pre deployment of NDRF/ODRAF/FIRE Services
- Technology centric warning dissemination
- Advanced planning for restoration
- Pre-positioning of men, machine and material
- Organised PRIs and empowered SHGs
- Trained & resilient community





# Shelter Building



**817 MCS and MFS in the State**

**65 Cyclone Shelter of IRCS**

Tilted Structure  
Sanitation facilities  
Separate rooms for Male and Female

Ramps and Staircase for PWDs

32 types of Equipment provided to

38,200 community level volunteers are trained on Disaster Response.

Managed by a community based organization call CSMMC

Shelter level task forces to manage cyclone at community level



# PRI Acts Amended

The Odisha  Gazette  
EXTRAORDINARY  
PUBLISHED BY AUTHORITY

No. 1650, CUTTACK, SATURDAY, MAY 7, 2022/ BAISAKHA 17, 1944

LAW DEPARTMENT  
NOTIFICATION  
The 7th May, 2022

No.5281-I—Legis-05/2022/L.—The following Act of the Odisha Legislative Assembly having been assented to by the Governor on the 8th May, 2022 is hereby published for general information.

ODISHA ACT 06 OF 2022

THE ODISHA PANCHAYAT LAWS (AMENDMENT) ACT, 2022

AN  
ACT

FURTHER TO AMEND THE ODISHA GRAMA PANCHAYATS ACT, 1964,

THE ODISHA PANCHAYAT SAMITI ACT, 1959 AND

THE ODISHA ZILLA PARISAD ACT, 1991.

Be it enacted by the Legislature of the State of Odisha in the Seventy third Year of the Republic of the India as follows:-

CHAPTER I  
PRELIMINARY

Short title and commencement.

- (1) This Act may be called the Odisha Panchayat Laws (Amendment) Act, 2022.
- (2) It shall be deemed to have come into force on 24th December, 2021.

The Odisha  Gazette  
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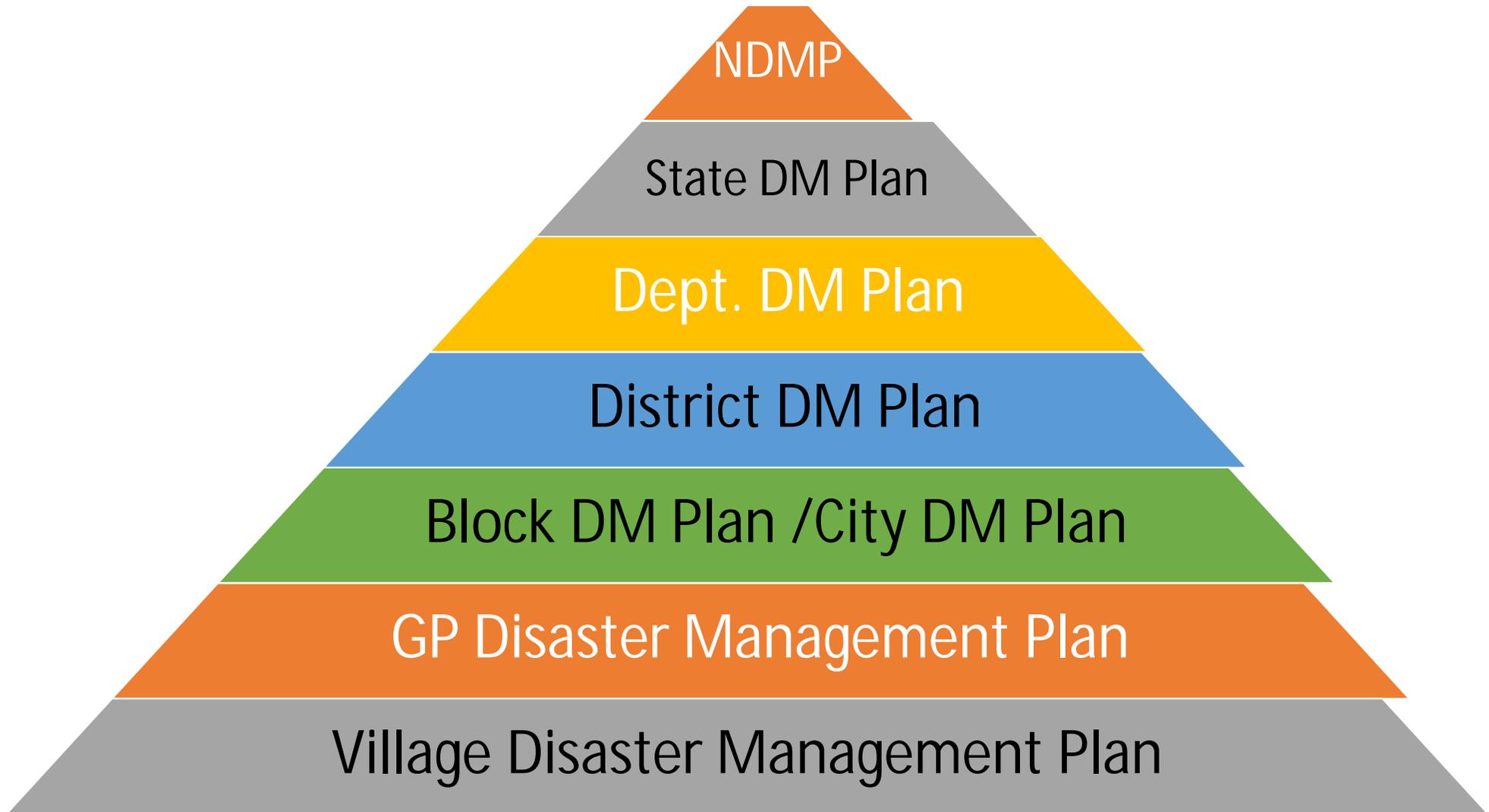
CHAPTER I  
PRELIMINARY

Short title and commencement.

- (1) This Act may be called the Odisha Panchayat Laws (Amendment) Act 2022.
- (2) It shall be deemed to have come into force on 24th December, 2021.

# Bottom up DM Planning

---



# Community led Disaster Preparedness (CBDP)

---

Community  
knows the best  
to address a  
problem

Community  
stands by with  
each other

Community is  
the teacher &  
mentor

Community is  
the first  
responder



Community Based  
Disaster Plan is  
prepared & owned  
by the community

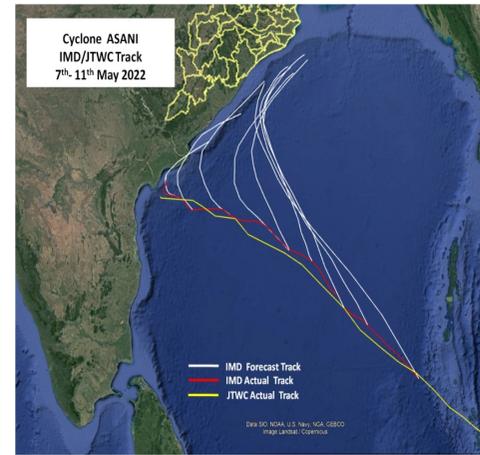
## Climate Change induced Relocation



Odisha's first resettlement and rehabilitation initiative for sea-erosion-hit villagers in Kendrapara.

# Impact Based Forecasting

- State of art communication network
- Round the clock on 24x7 basis.
- Observation-Decision making-Dissemination
- Disseminate information relating to the natural calamities
- Responds immediately during an emergency situation.
- Various communication equipments / Tools / Disaster Management Applications



- SATARK
- DSS
- National Database for Emergency Management (NDEM)
- India Disaster Resource Network (IDRN)
- Common Alerting Protocol (CAP)
- Web DCRA
- NDMIS
- SFDRR
- DAMS

# Response Teams In Readiness



CSMMC members & Volunteers



66 units of Civil Defense



Community volunteers created



Aapada Mitra



Teachers, Students, YRC, NSS & NCC



Govt. officials



ODRAF/Fire Services



Engineers & Masons

# SAMRTH : Online Web Portal Database of Biparjaya Yodhha(Disaster Warriors)

ODISHA STATE DISASTER MANAGEMENT AUTHORITY  
ଓଡ଼ିଶା ରାଜ୍ୟ ବିପର୍ଯ୍ୟୟ ପରିଚାଳନା କର୍ତ୍ତୃପକ୍ଷ

## Login

USERNAME

PASSWORD

[Forgot Password?](#) [Sign In](#)

**Shri Naveen Patnaik**  
Hon'ble Chief Minister

The site has been designed, developed by NIC.  
However, the information has been provided and updated by Odisha State Disaster Management Authority, Government of Odisha.

OSDMA  
Jayrajat Sahu(OSD)  
(XXX) XXX-6988  
Odisha State Disaster Management Authority (OSDMA)

- Training
  - Create Training
  - Enter Training Details data
- Dashboard
  - View Dashboard

| Metric                    | Value |
|---------------------------|-------|
| No. of Training Conducted | 91    |
| No. of Shelter Covered    | 43    |
| Total No. of Participants | 1108  |

Shelter Mgmt Traine: 326  
First Aid: 407  
Search & Rescue: 375

### Location Map geo-presentation

Map Satellite

India

Map data ©2023 Google



**OSDMA**

Striving for a Disaster Resilient Odisha



**PRE EVENT - NATIONAL PLATFORM ON DISASTER RISK REDUCTION (NPDRR)**



**NATIONAL MEET ON "DISASTER RISK MANAGEMENT - TRENDS AND TECHNOLOGIES"**

**DISASTER RISK MANAGEMENT – BEST PRACTICES**



**27.02.2023**

**International  
Convention Centre  
(HICC), Hyderabad**

**LEVERAGING GEOSPATIAL TECHNOLOGY  
IN DISASTER MANAGEMENT**

**Dr. Manoj Rajan  
Commissioner  
KSDMA  
Govt. of Karnataka**



# ROLE OF GEOSPATIAL TECHNOLOGY IN DISASTER RISK MANAGEMENT

## GEOSPATIAL TECHNOLOGY

**“An emerging field of study that includes Geographic Information System (GIS), Remote Sensing (RS) and Global Positioning System (GPS)”**

**Geospatial technology enables us to acquire data that is referenced to the earth and use it for analysis, modelling, simulations and visualization**

**Data  
Storage**

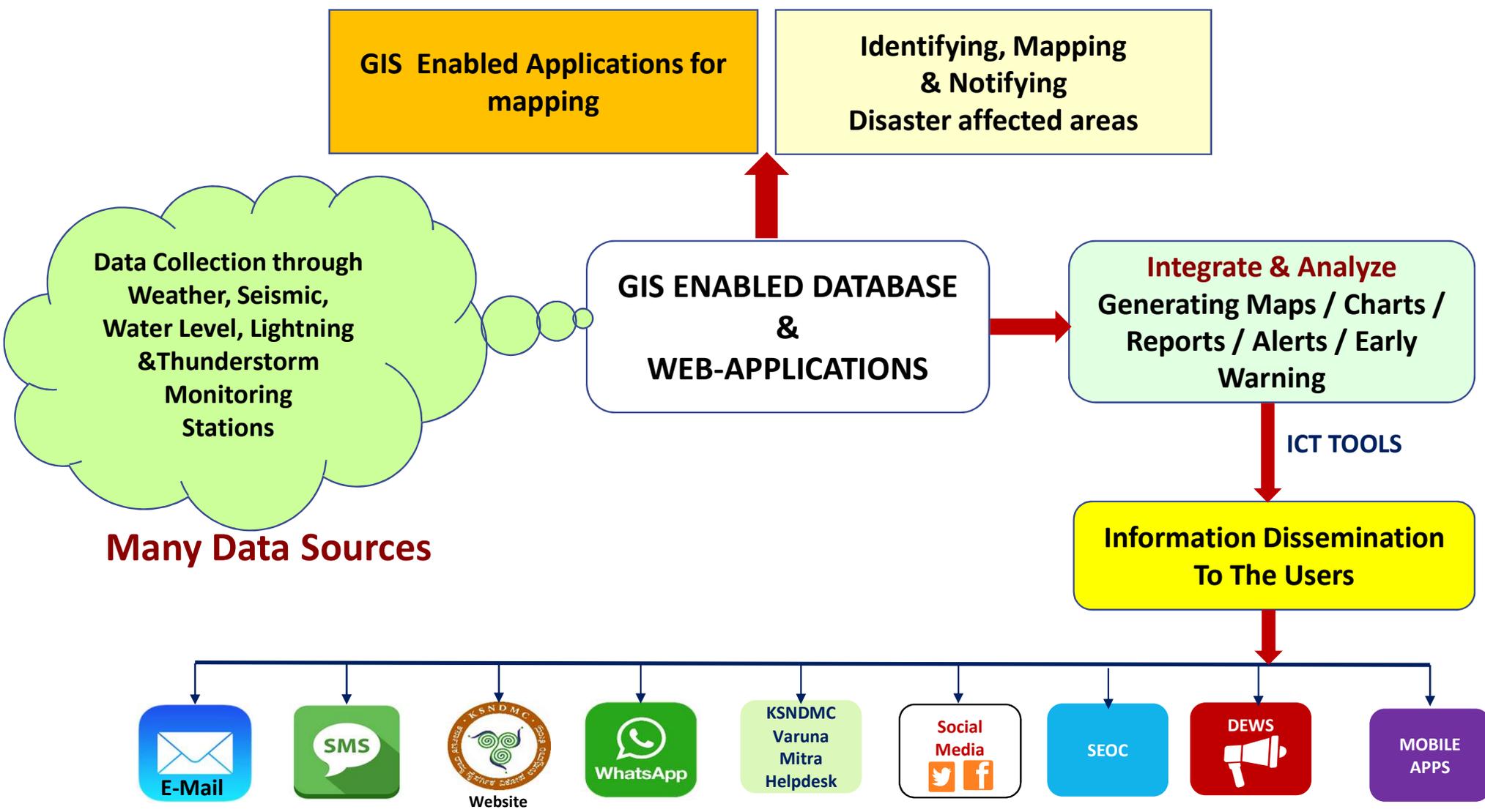
**Data  
Analysis**

**Planning**

**Decision  
Making**



# GEOSPATIAL TECHNOLOGY APPLICATIONS IN DISASTER MANAGEMENT



Data Collection through Weather, Seismic, Water Level, Lightning & Thunderstorm Monitoring Stations

Many Data Sources

GIS Enabled Applications for mapping

Identifying, Mapping & Notifying Disaster affected areas

GIS ENABLED DATABASE & WEB-APPLICATIONS

**Integrate & Analyze**  
Generating Maps / Charts / Reports / Alerts / Early Warning

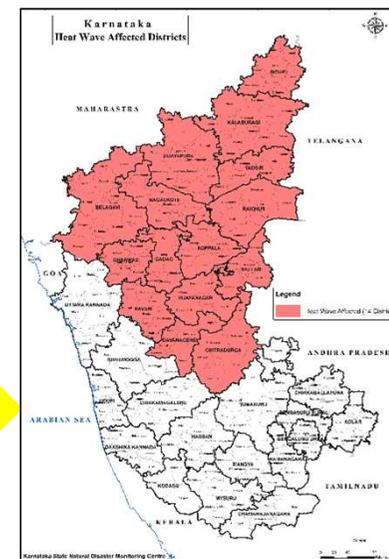
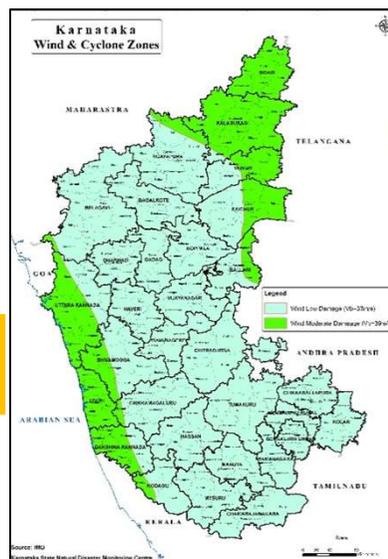
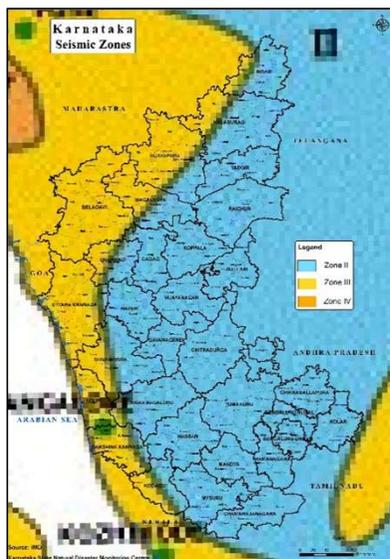
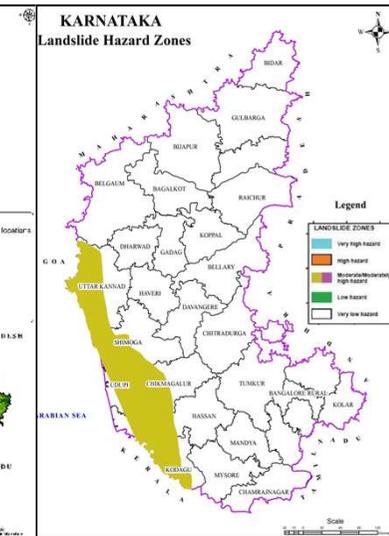
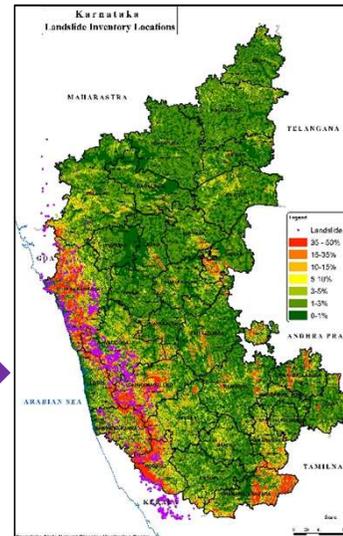
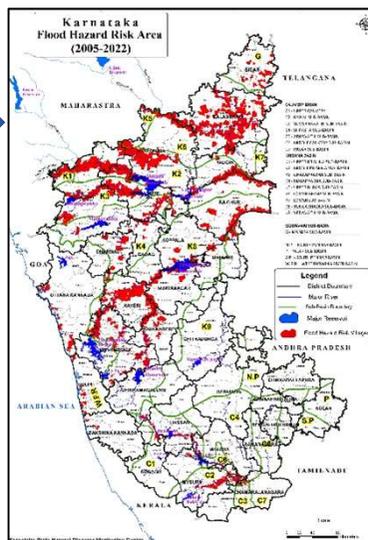
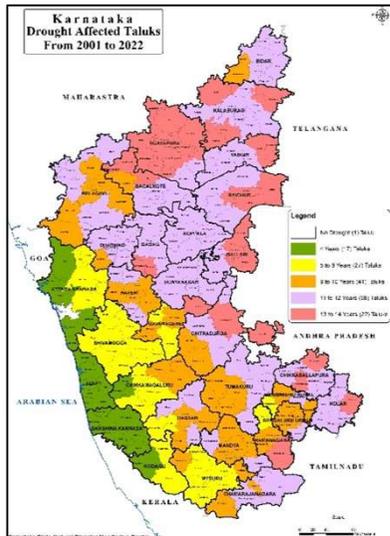
ICT TOOLS

Information Dissemination To The Users



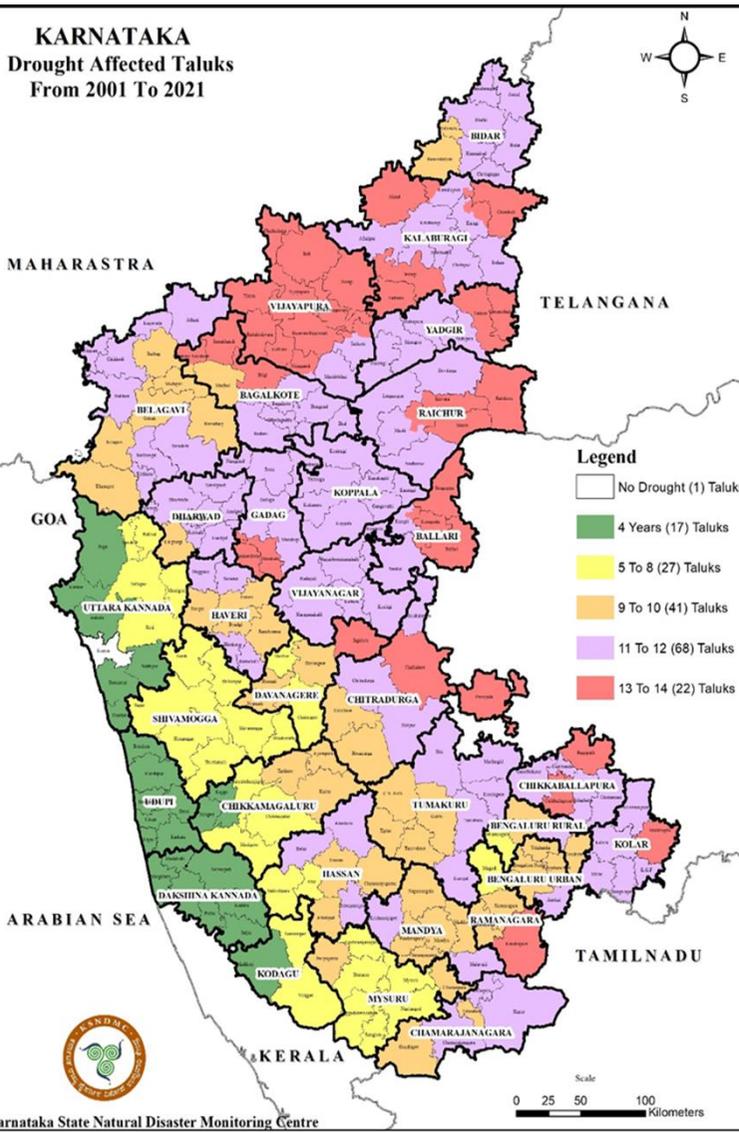


# VULNERABILITY OF KARNATAKA IN NATURAL DISASTERS MAPS

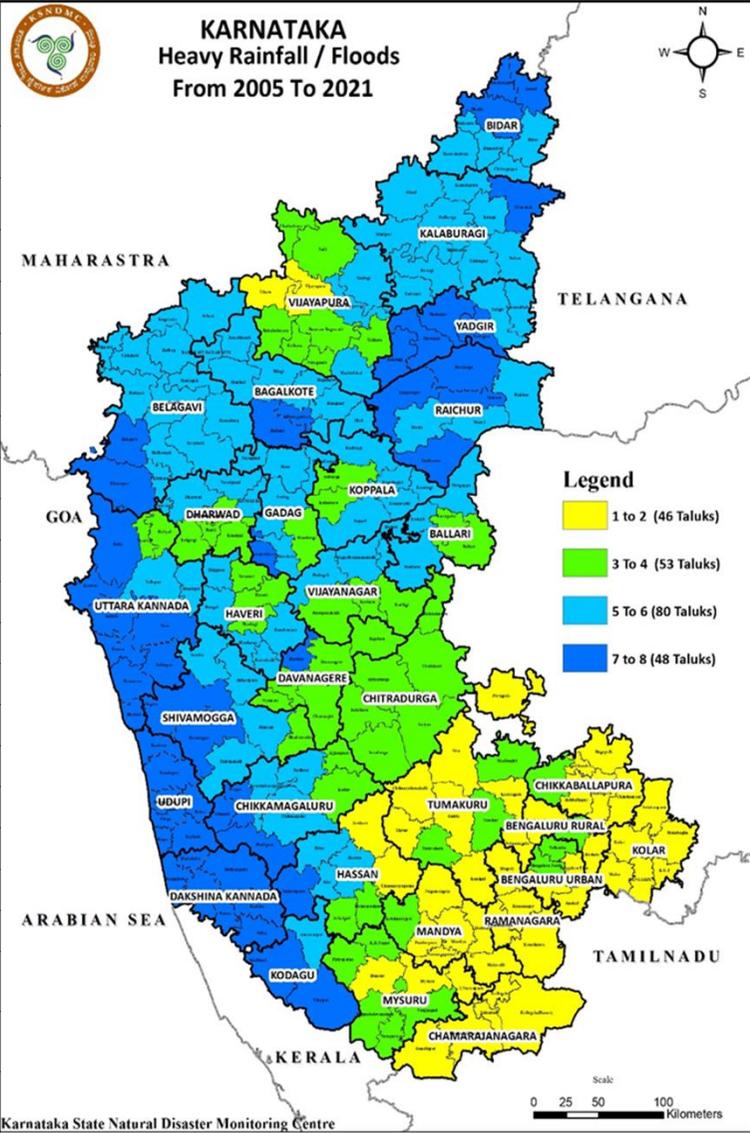




# DROUGHT AND FLOODS/HEAVY RAINFALL

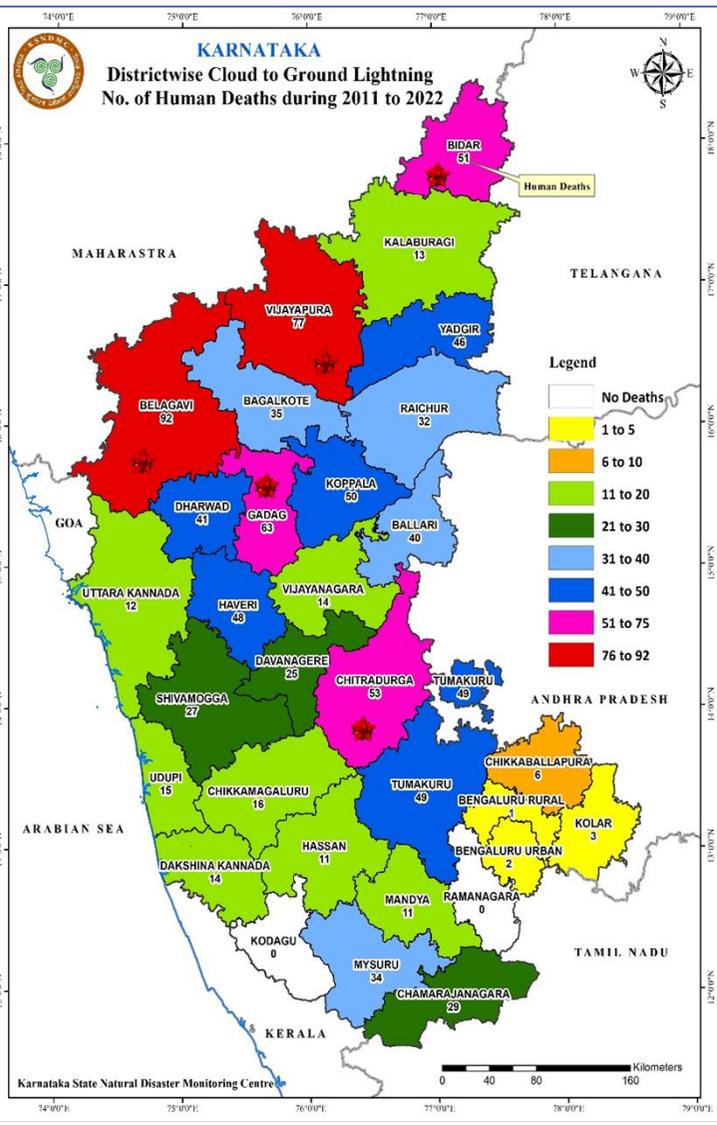
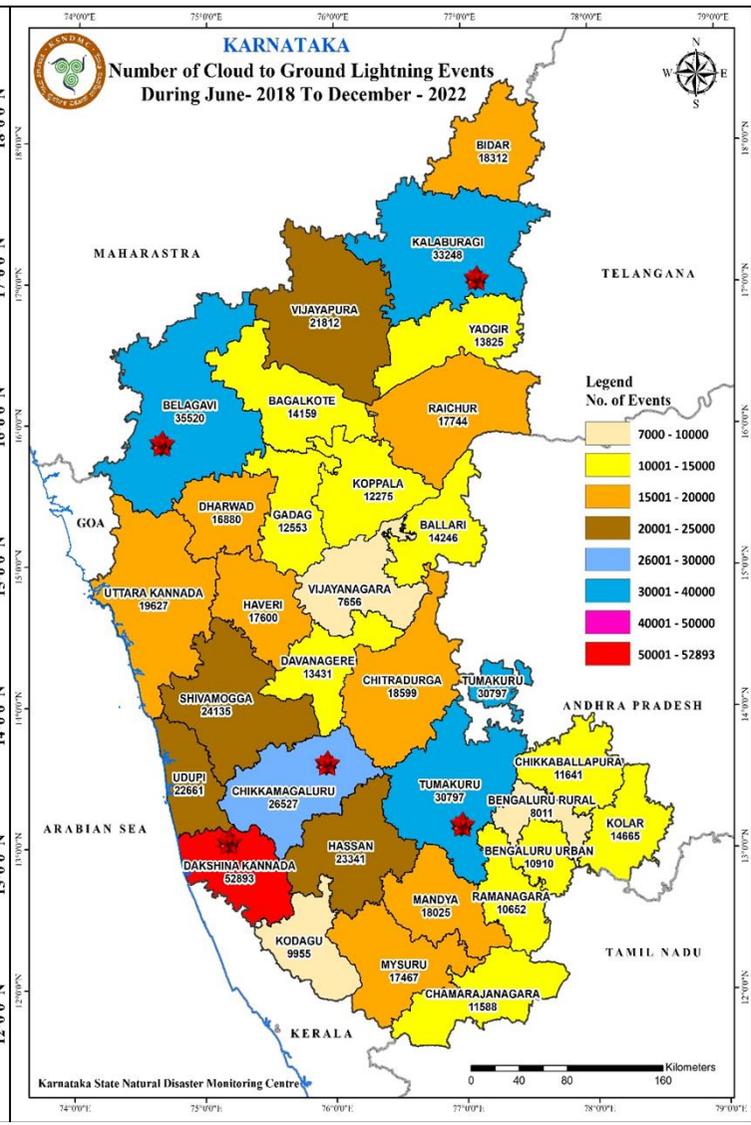
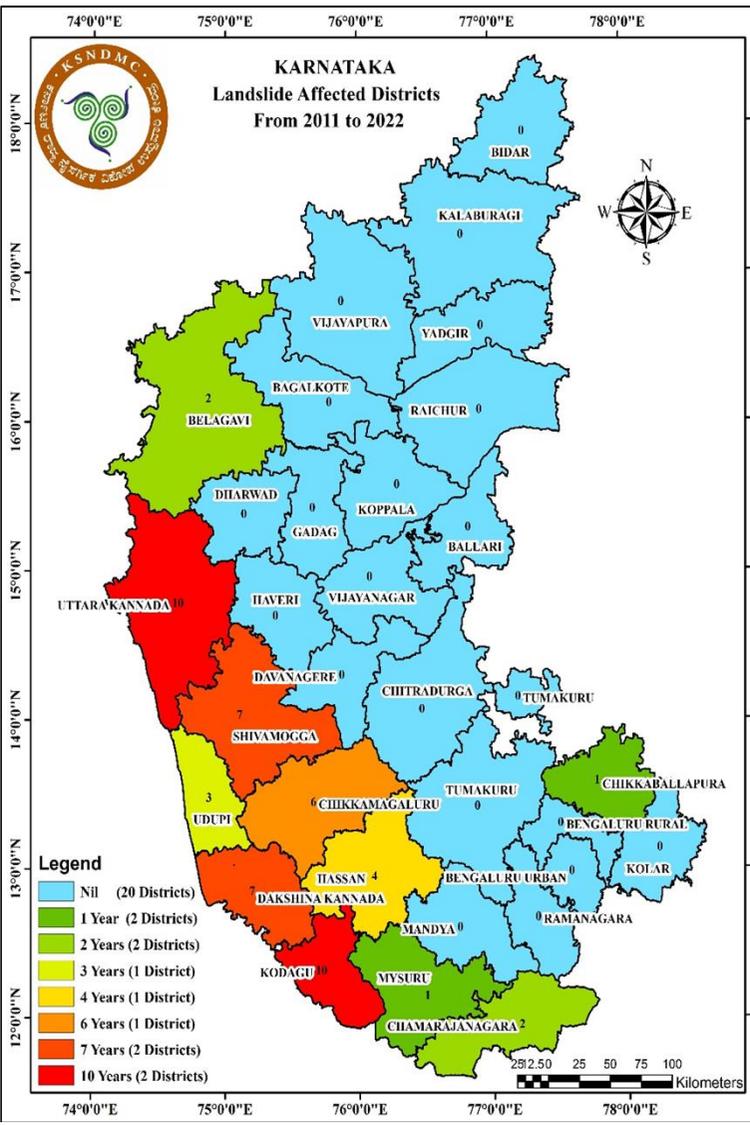


| YEAR | Drought affected districts | Floods/Heavy rainfall affected districts |
|------|----------------------------|--|
| 2001 | 12                         | Nil                                      |
| 2002 | 28                         | Nil                                      |
| 2003 | 28                         | Nil                                      |
| 2004 | 22                         | Nil                                      |
| 2005 | Nil                        | 19                                       |
| 2006 | 26                         | 24                                       |
| 2007 | Nil                        | 25                                       |
| 2008 | 23                         | 20                                       |
| 2009 | 21                         | 15                                       |
| 2010 | Nil                        | Nil                                      |
| 2011 | 24                         | Nil                                      |
| 2012 | 28                         | Nil                                      |
| 2013 | 28                         | 8  |
| 2014 | 9                          | 8  |
| 2015 | 27                         | Nil                                      |
| 2016 | 30                         | 6  |
| 2017 | Nil                        | Nil                                      |
| 2018 | 30                         | 8  |
| 2019 | 18                         | 23                                       |
| 2020 | Nil                        | 25                                       |
| 2021 | Nil                        | 28                                       |
| 2022 | Nil                        | 31                                       |





# LANDSLIDES, THUNDERSTORM & LIGHTNING





# GEOSPATIAL CAPABILITIES - DSS



- **Location - Where is it...?**
- **Condition - What is at...?**
- **Trends - What has changed since...?**
- **Patterns - What spatial patterns exists...?**
- **Modelling - What if...?**
- **Routing - Which is the best way...?**
- **Spatial Questions**

- **Geospatial Intelligence**
- **Geospatial Authentication**
- **Geospatial Analytics**
- **Age of Virtual reality**
- **Need for Spatial Relations-**



# GEOSPATIAL INFRASTRUCTURE

## PRE DISASTER

DISASTER MANAGEMENT PLAN

PREPAREDNESS

RISK & VULNERABILITY  
ASSESSMENT

SOPs

ROLES & RESPONSIBILITY

MITIGATION

## DURING DISASTER

DISASTER RESPONSE

CHECKLISTS

ACTION PLAN

SEARCH & RESCUE

RELIEF

EOC

## POST DISASTER

REHABILITATION

RECONSTRUCTION AID

DAMAGE ASSESSMENT

CLAIMS PROCESSING

LESSONS LEARNT

PLANNING

GEDDMP

KSDMIS



# LEVERAGING TECHNOLOGY IN DISASTER MANAGEMENT

**GEOSPATIAL ENABLED  
DISTRICT DISASTER  
MANAGEMENT PLAN  
(GEDDMP)**

**KARNATAKA STATE  
DISASTER MANAGEMENT  
INFORMATION SYSTEM  
(KSDMIS)**

**EOC AND DSS  
MECHANISMS**



# GEOSPATIAL DDMP- INTRODUCTION

**Disaster management in India is mostly paper-based**

**Limited Access** to real-time, authentic, quantifiable information **leads to communication gaps** or even miscommunication

**Complex analysis using multiple sources** and layers of data is effort, time and resource intensive

**Difficult to connect Standard Operating Procedures (SOPs)** with the ground reality unless real-time, up-to-date information is readily available in machine readable format



## GEOSPATIAL - DDMP

State-of-the-art disaster management **technology with real-time wireless infrastructure** to collect, store, analyze, communicate, co-ordinate and present, **authentic field information that is geo-stamped** (with GPS location & time)

The **system auto-generates District Disaster Management Plan (DDMP)** using field resource and personnel information with geo-mapped resources

From an earlier paper based DDMP



## **OBJECTIVES OF GEDDMP**

**A formal planning for managing disaster**

**Effective management of resources**

**To remove arbitrary response to a disaster**

**Preplanning of proper sequence of response actions**

**Defined response structure, allocation of responsibilities to the participating agencies**

**Developing codes and Standard Operating Procedures for coordination**



# STRATEGY

**Mapping resource  
and resource  
personal to a  
Village/ ward**

**Geo-positioning all  
resources**

**Capturing  
Experiences and  
Lessons Learnt**

**Building database**

**Documentation and  
action taken reports**

**What if scenarios**

**Action plan and  
checklist**

**Faster  
communication**



# ADVANTAGE GEOSPATIAL ENABLED DDMP

**Accurate, Authentic & tamper-proof data**

**Field friendly Hand-held devices & data processing to handle complex field operations**

**Action plan, Checklist, roles auto-generation based on real-time field data – ground reality taken into account**

**Readiness based on comprehensive, accurate, up-to-date information**

**Real-time event capture including photo, voice, hand-written notes, forms & status**

**Field level information transferred wirelessly**

**Improved communication & Co-ordination among departments**

**Auto-generation of analysis reports, statistics saving manual labour, human errors, paper trails**

**Auto-generation of reconstruction, restoration, compensation**

**Database Archive for future disaster mitigation, accountability, traceability**



# LIVE DEMO

<https://ddmp.karnataka.tech>



# GEDDMP- Screenshots

GE-DDMP System ☰ 🔔 Manoj Rajan

**Manoj Rajan**  
Online

Navigation

- Dashboard
- Statistics >
- Reports >
- DDMP Create >
- Document Tools >
- Survey Management >
- Survey Associates >
- Districts Wards Villages etc >
- Appda Mitra >
- User Management
- Departments
- Mobile Management >
- System Maintenance >
- Surveys TEST
- Custom Validations
- Map Icons
- QR Report

## GE-DDMP Surveys Information

Select GE-DDMP Module

- District GE-DDMP Surveys
- Resource-wise Map and Data Reports
- Resource Filter Based on Events
- What if Decisions
- Statistics
- District Submissions

| Volume 1         | Volume 2 (Detailed Resources) |
|------------------|-------------------------------|
| Dakshina Kannada | Dakshina Kannada Vol 2        |
| Raichur          | Raichur Vol 2                 |
| Udupi            | Udupi Vol 2                   |
| Uttara Kannada   | Uttara Kannada Vol 2          |

**DASHBOARD**



# GEDDMP- SCREENSHOTS

GE-DDMP System 🔔 👤 Manoj Rajan

**Resources for Events** [← Back to Main menu](#) 🏠 Home > Resources for Events

Select Disaster   Meters

Enter address

Leaflet | © OpenStreetMap contributors

2

GE-DDMP System 🔔 👤 Manoj Rajan

**Resources for Events** [← Back to Main menu](#) 🏠 Home > Resources for Events

Select Disaster   Meters

Enter address

Leaflet | © OpenStreetMap contributors

- Select Disaster
- Earthquake
- Floods
- Landslide
- Drought
- Cyclone
- Fire
- Mob violence
- War
- Nuclear disasters
- Industrial
- Heat wave
- Epidemic outbreaks
- road accident
- rail accident
- riots
- oil Spill
- boat capsized
- stampede
- forest fire
- pipeline failure
- hailstorm
- heavy rain
- air crash
- tsunami
- dam burst
- gusty winds
- bomb blast threat
- building collapse

Resource Form  Search:

Total Available Resources GPS Tagged Resources

No Data Available

Total Available Resources GPS Tagged Resources

Showing 1 to 1 of 1 entries

Previous  Next

Total rows : 0 to 0 of 0

SELECT DISASTER TYPE



# GEDDMP- SCREENSHOTS

The screenshot displays the GE-DDMP System interface. At the top, the system name "GE-DDMP System" is visible on the left, and the user profile "Manoj Rajan" is on the right. A navigation sidebar on the left lists various menu items: Dashboard, Statistics, Reports, Map Reports, Resources for Events (highlighted), What If Decisions, and DDMP Create. The main content area is titled "Resources for Events" and includes a "Back to Main menu" button. Below this, there is a search bar with a dropdown menu set to "Floods", a text input field containing the coordinates "12.834604194208843,74.88591841422023", a "5000" value, a "Meters" dropdown, and a "SELECT" button. A map of the region is shown below the search bar, with a blue location pin placed over Mangaluru. A search box with the placeholder "Enter address" is overlaid on the map. The map shows various taluk boundaries and names such as Mangaluru taluk, Bantwal taluk, Uppinangadi, Sakaleshpura taluk, Aluru taluk, and Channarayapattana. The map is powered by Leaflet and OpenStreetMap contributors.

**SELECT LOCATION**



# GEDDMP- SCREENSHOTS

GE-DDMP System
☰
🔔
👤 Manoj Rajan

**Manoj Rajan**  
Online

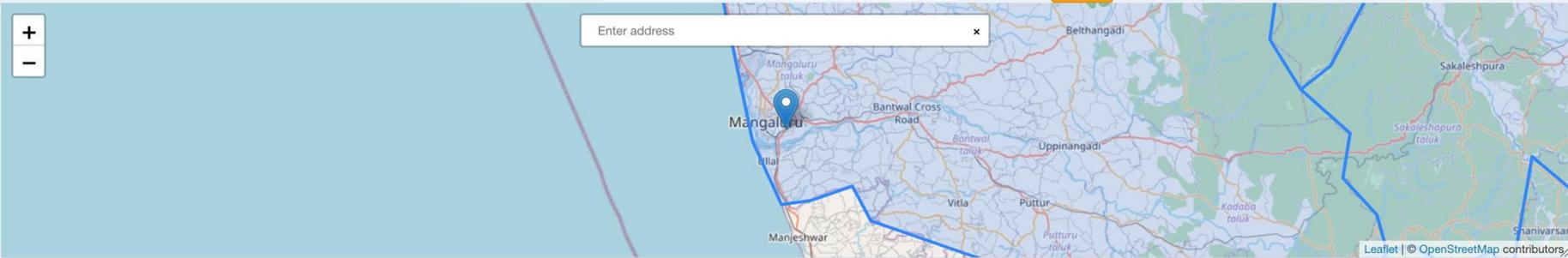
Navigation

- Dashboard
- Statistics >
- Reports >
- Map Reports
- Resources for Events**
- What If Decisions
- DDMP Create >
- Document Tools >
- Survey Management >
- Survey Associates >
- Districts Wards Villages etc >
- Appda Mitra >
- User Management
- Departments
- Mobile Management >
- System Maintenance >
- Surveys TEST
- Custom Validations

🗄 Resources for Events
← Back to Main menu

Floods


Meters
SELECT

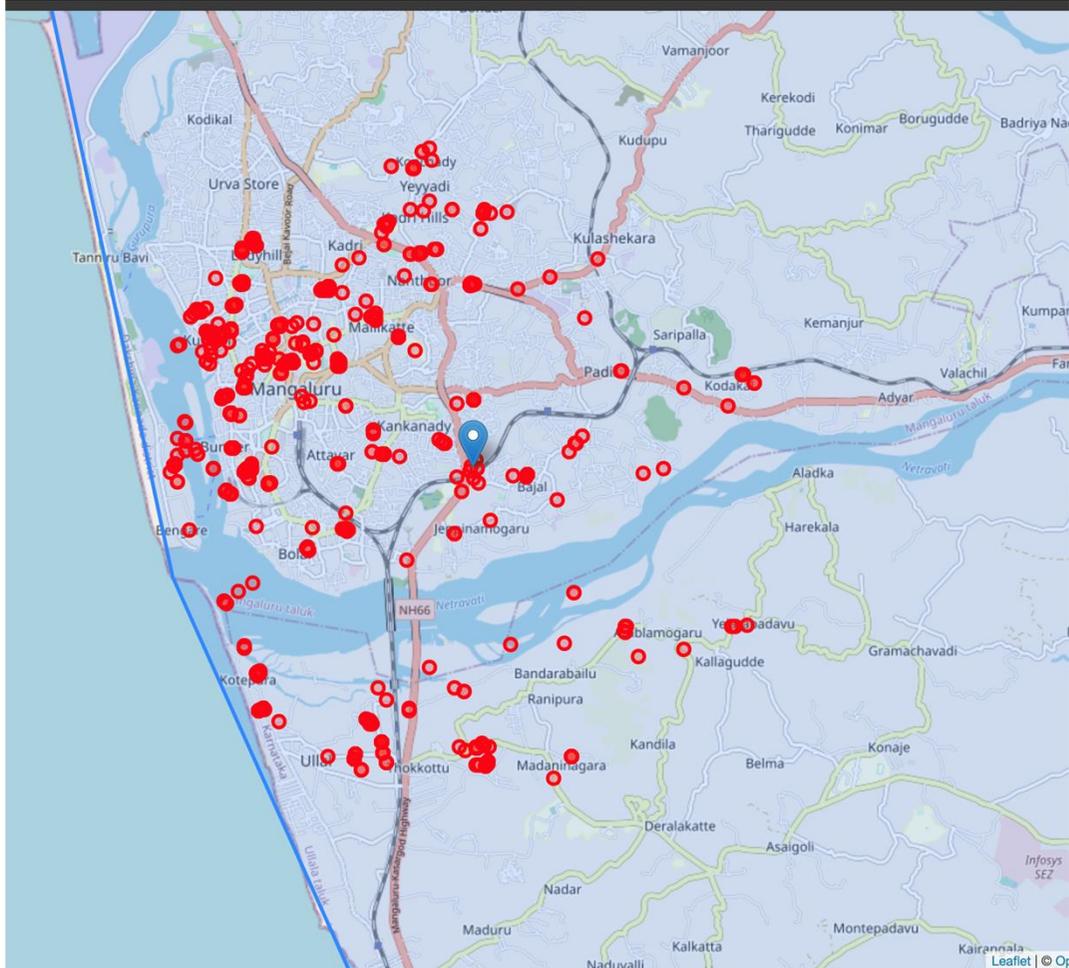
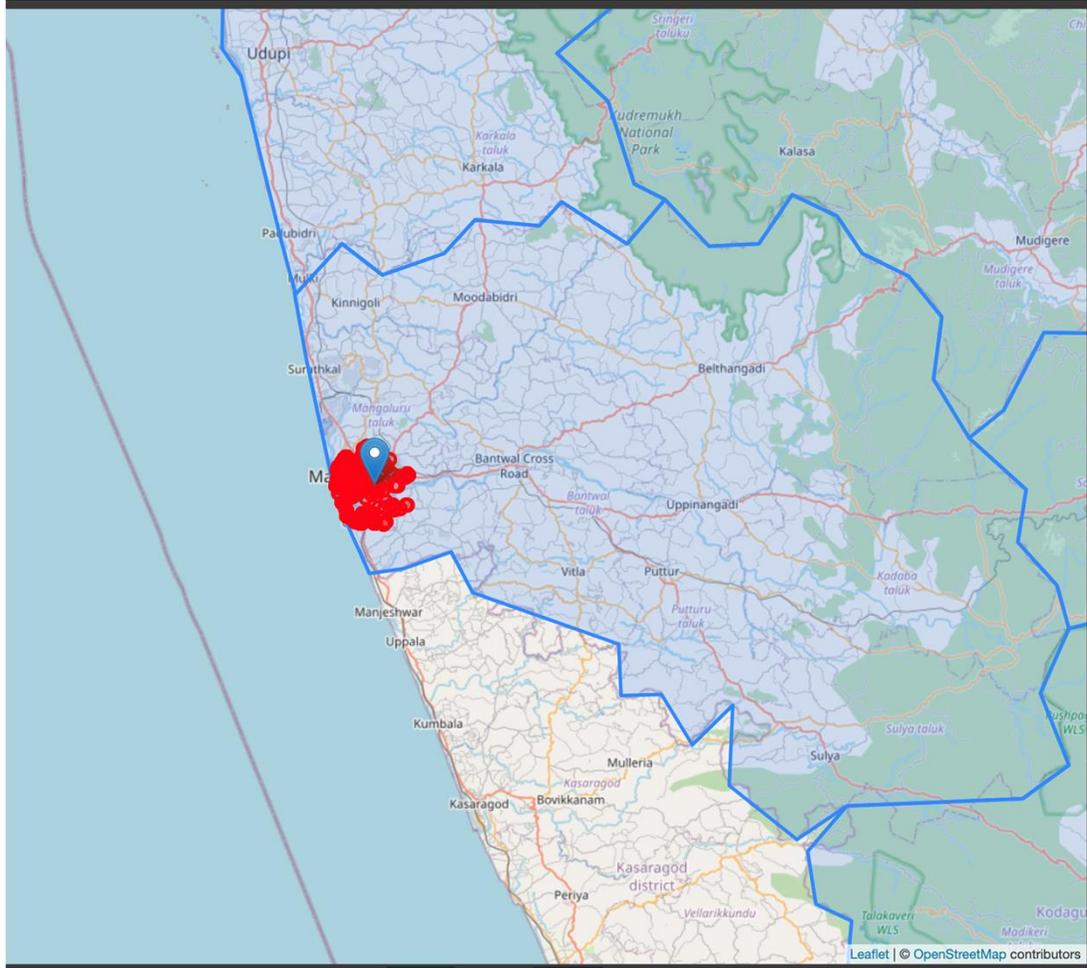


## LOCATION SPECIFIC RESOURCES

| Resource Form  | Map                      | View Resources            | Total Available Resources | GPS Tagged Resources |
|--|--------------------------|---------------------------|---------------------------|----------------------|
| Personnel  | <a href="#">View Map</a> | <a href="#">View Data</a> | 1031                      | 1031                 |
| Building   | <a href="#">View Map</a> | <a href="#">View Data</a> | 145                       | 145                  |
| Department Office  | <a href="#">View Map</a> | <a href="#">View Data</a> | 106                       | 106                  |
| EducationalInstitution(School,College,Hostels,CoachingCenters) | <a href="#">View Map</a> | <a href="#">View Data</a> | 83                        | 83                   |
| Vehicle  | <a href="#">View Map</a> | <a href="#">View Data</a> | 48                        | 48                   |
| Search and Rescue Equipments                                   | <a href="#">View Map</a> | <a href="#">View Data</a> | 33                        | 33                   |
| Hospital   | <a href="#">View Map</a> | <a href="#">View Data</a> | 20                        | 20                   |
| Ambulance  | <a href="#">View Map</a> | <a href="#">View Data</a> | 19                        | 19                   |
| Food   | <a href="#">View Map</a> | <a href="#">View Data</a> | 12                        | 12                   |



# GEDDMP- SCREENSHOTS



**MAP VIEW OF RESOURCE LOCATION**



# GEDDMP- SCREENSHOTS

These are details :

| property                  | value                          |
|---------------------------|--------------------------------|
| Name                      | Shivaprasad L                  |
| Designation               | Forest Guard                   |
| Date of birth             | 1995-02-28                     |
| Gender                    | Male                           |
| Job Description/Skills    | Forestry work                  |
| Service Experience        | 5                              |
| Exp. In DM                | Good experience                |
| Office landline           | 08242425167                    |
| Mobile 1                  | 9845323969                     |
| Residential Landline      |                                |
| Physically challenged     | No                             |
| Email                     | poojaryshiva95@gmail.com       |
| Mobile 2                  |                                |
| Employment/Department     | Government                     |
| ID                        | 2637543                        |
| Disaster Types Applicable | Earthquake Floods Cyclone Fire |
| Signature                 |                                |
| Photo                     |                                |
| Specify Others            |                                |

**HR LOCATION & DETAILS**



# GEDDMP- SCREENSHOTS

| Building /shelter name(relief camp) ⇅        | Address ⇅  | Area in units ⇅ | Built up area ⇅ | Open area ⇅ | No.of rooms ⇅ | No of bathrooms ⇅ | No of toilets ⇅ | Water connection ⇅ | Specify Others ⇅ | Water storage tank Capacity ⇅ | Other Facilities/Equipments ⇅ |
|--|--|-----------------|-----------------|-------------|---------------|-------------------|-----------------|--------------------|------------------|-------------------------------|-------------------------------|
| CWD-1879 Post atric Girls hostel, athabeedhi | Mizaz Complex, Mizaz Cottage, Amruth Nagar, Pandeshwara, Mangalore | Sq.Feet         | 18000           | 18000       | 22            | 7                 | 13              | Tank-pipe          |                  | 4000                          | inveter, C.C. Tv              |
| ost Metric Girl's hostel Maryhill CWD 1871   | near shivarmkar nth Layout Maryhill mangalore 575008               | Sq.Feet         | 4263            | 395         | 22            | 24                | 25              | Tubewell           |                  | 5000                          | no                            |
| CWD 1875                                     | Mizaz Complex, Mizaz Cottage                                       | Sq.Feet         | 9000            | 9000        | 22            | 7                 | 12              | Tank-pipe          |                  | 4000                          | Inveter                       |

| No. of Lights ⇅ | Cooking facility ⇅ | Number of floors ⇅ | Nearest busstop ⇅ | Nearest Railway station ⇅ | Nearest Village1 - name ⇅ | Distance Village1- Km ⇅ | Nearest Village2 - name ⇅ | Distance Village2- Km ⇅ | Photo ⇅   | GPS Latitude ⇅ |
|-----------------|--------------------|--------------------|-------------------|---------------------------|---------------------------|-------------------------|---------------------------|-------------------------|---|----------------|
| 27              | Yes                | 4                  | Yes               | Yes                       | Attavara                  | 3                       | Pandeshwara               | 3                       |   | 12.8542536     |
| 44              | Yes                | 2                  | Maryhill          | no                        | Maryhill                  | 1                       | konchady                  | 2                       |  | 12.9031993     |
| 26              | Yes                | 4                  | yes               | yes                       | Attavara                  | 3                       | Pandeshwara               | 3                       |  | 12.8544528     |

## BUILDING DETAILS



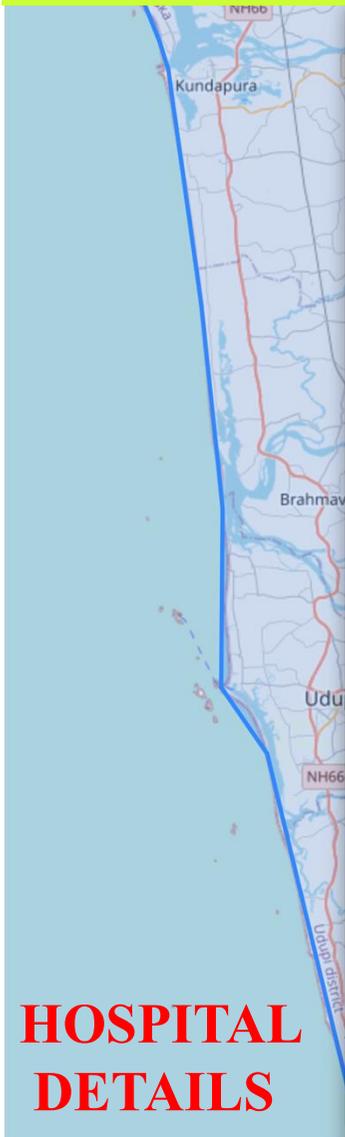
# GEDDMP- SCREENSHOTS

|           |   |            |      |                          |   |  |   |                                     |
|-----------|---|------------|------|--------------------------|---|--|---|-------------------------------------|
| Fire      | Floods Fire   | Government |      | Portable Pump            | 4 | used for priming / output while flood and fire incident                                |    | Karnata state fire emerger services |
| Fire      | Floods Cyclone heavy rain                               | Government |      | OBM (outboard motor)     | 2 | used in rescue operation during disaster   |    | Karnata state fire emerger services |
| Fire      | Floods heavy rain tsunami                               | Government |      | rubber boat              | 2 | rescue purpose while flood   |    | Karnata state fire emerger services |
| Fire      | Floods Landslide building collapse                      | Government |      | resue ropes              | 5 | used during getting down in well or from higher place for rescuing person or an animal |    | Karnata state fire emerger services |
| Fire      | Floods Cyclone boat capsiz heavy rain tsunami dam burst | Government |      | Out Board Motor          | 3 | To run inflatable boat in flood rescue operations                                      |  | Karnata state fire emerger services |
| Fisheries | Floods Cyclone  | Private    | 4102 | Traditional Fishing boat | 1 | to rescue of people during heavy rain  |  |                                     |
| Fisheries | Floods Cyclone  | Private    | 1621 | traditional fishing boat | 1 | to rescue people during heavv rain   |  |                                     |

## RESCUE EQUIPMENT DETAILS

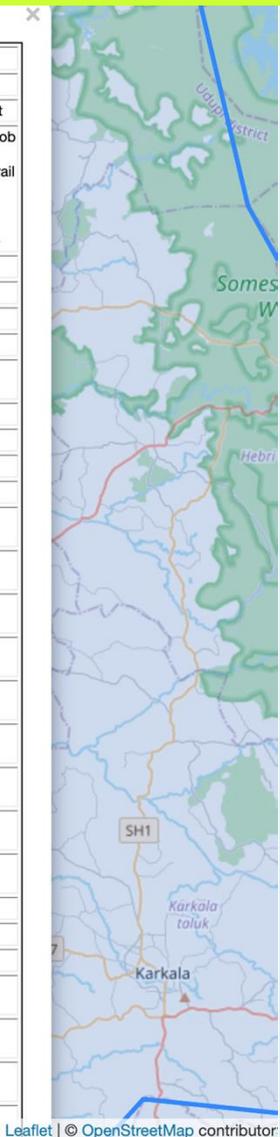


# GEDDMP- SCREENSHOTS

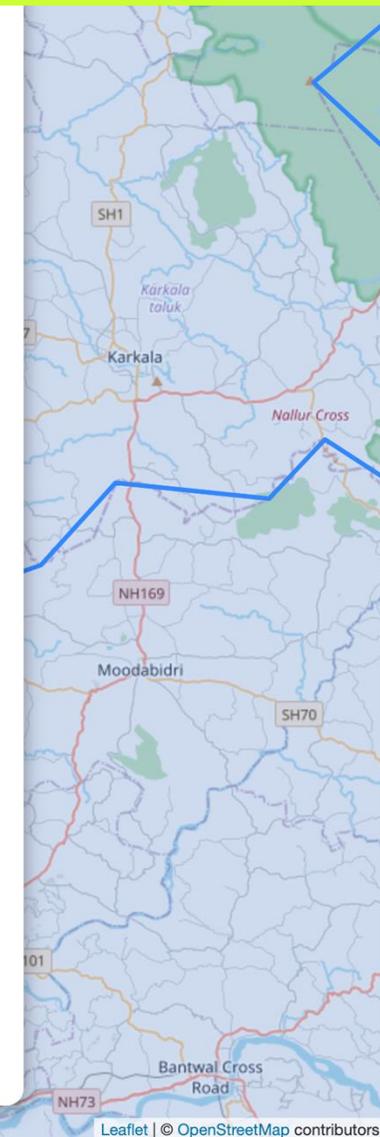


These are details :

| property                              | value  |
|---------------------------------------|--|
| Category                              | Medical College  |
| Resource Name                         | Medical Superintendent   |
| Disaster Types Applicable             | Earthquake Floods Fire Mob violence Epidemic outbreaks road accident rail accident riots pipeline failure heavy rain air crash bomb blast threat building collapse |
| No of beds                            | 470  |
| 24X7?                                 | Yes  |
| No of Doctors                         | 118  |
| No of medical Staff                   | 412  |
| Internet connection Available?        | Yes  |
| Is PC available                       | Yes  |
| No. of ICU beds                       | 23   |
| ECG vailable?                         | Yes  |
| First Aid Available?                  | Yes  |
| Pharmacy Attached?                    | Yes  |
| Radiology facility Available?         | Yes  |
| Operation Theatre facility Available? | Yes  |
| Labor Room facility Available?        | Yes  |
| Physiotherapy facility Available?     | Yes  |
| Pathology facility Available?         | Yes  |
| Blood Bank facility Available?        | No   |
| No of Working Oxygen Cylinders        | 85   |
| Other Treatment Facilities            | Day Care   |
| Built up area                         | 107735   |
| Open area                             | 20000  |
| Nearest busstop                       | Attavar  |
| Nearest Railway station               | Mangalore Central  |
| Nearest Village1 - name               | Attavar  |
| Distance Village1-Km                  | 0  |
| Nearest Village2 - name               | -  |
| Distance Village2-Km                  | 0  |
| Type of Hospital                      | Private  |
| Address                               | KMC Hospital, Attavar, Mangaluru-575001  |
| Area in units                         | Sq.Feet  |
| Oxygen Generation/Storage?            | yes  |
| Photo                                 |  |
| No Of Gynecologist                    | 5  |
| No Of Pediatrician                    | 10   |
| No Of Ventilators                     | 23   |
| No Of General physician               | 14   |
| No Of Anesthetist                     | 5  |
| No Of Lab technician                  | 8  |
| No Of Burn ward                       | 0  |



|                                   |   |
|-----------------------------------|---|
| Physiotherapy facility Available? | Yes                                     |
| Pathology facility Available?     | Yes                                     |
| Blood Bank facility Available?    | No                                      |
| No of Working Oxygen Cylinders    | 85                                      |
| Other Treatment Facilities        | Day Care                                |
| Built up area                     | 107735                                  |
| Open area                         | 20000                                   |
| Nearest busstop                   | Attavar                                 |
| Nearest Railway station           | Mangalore Central                       |
| Nearest Village1 - name           | Attavar                                 |
| Distance Village1-Km              | 0                                       |
| Nearest Village2 - name           | -                                       |
| Distance Village2-Km              | 0                                       |
| Type of Hospital                  | Private                                 |
| Address                           | KMC Hospital, Attavar, Mangaluru-575001 |
| Area in units                     | Sq.Feet                                 |
| Oxygen Generation/Storage?        | yes                                     |
| Photo                             |   |
| No Of Gynecologist                | 5                                       |
| No Of Pediatrician                | 10                                      |
| No Of Ventilators                 | 23                                      |
| No Of General physician           | 14                                      |
| No Of Anesthetist                 | 5                                       |
| No Of Lab technician              | 8                                       |
| No Of Burn ward                   | 0                                       |



## HOSPITAL DETAILS

Leaflet | © OpenStreetMap contributors

Leaflet | © OpenStreetMap contributors



# GEDDMP- Screenshots

**Manoj Rajan**  
Online

Navigation

- Dashboard
- Statistics**
- Submission Statistics
- District Wise Reporting
- Reports
- DDMP Create
- Document Tools
- Survey Management
- Survey Associates
- Districts Wards Villages etc
- Appda Mitra
- User Management
- Departments
- Mobile Management
- System Maintenance
- Surveys TEST
- Custom Validations
- Map Icons

## Submissions

Home -> Statistic Builder

**71340**  
Total Submissions  
More info

**61821**  
Total Phone Submissions  
More info

**9519**  
Total Web Submissions  
More info

### Survey wise submissions

| Category          | Submissions |
|-------------------|-------------|
| Department        | 35000       |
| Building          | 10000       |
| Hospital          | 5000        |
| Private Ambulance | 1000        |
| Helipad           | 1000        |
| Relief material   | 1000        |
| Administration    | 5000        |
| Wireless          | 1000        |
| Drug              | 1000        |
| Food              | 1000        |
| Animal            | 1000        |
| Historical Data   | 1000        |
| Fire Station      | 1000        |
| Factory Details   | 1000        |

### Submissions Date Wise

| Date       | Submissions |
|------------|-------------|
| 2021-11-17 | 35000       |
| 2021-12-24 | 10000       |
| 2022-01-12 | 38000       |
| 2022-02-19 | 15000       |
| 2022-03-10 | 45000       |

## DASHBOARD UPLOAD DETAILS



# MOBILE APP

Urban  Rural

Select District

Bellary

Select Town

Bellary

Select Ward

Ward No - 1

Cancel Proceed

Photo

Vehicle ID

Vehicle Type

Driver/Owner Name

Driver Phone Number

Registration No

Goods, Passenger, Other

This is Mandatory \*

Vehicle ID

123

Syntax is OK

Vehicle Type

Bus

Syntax is OK

Driver/Owner Name

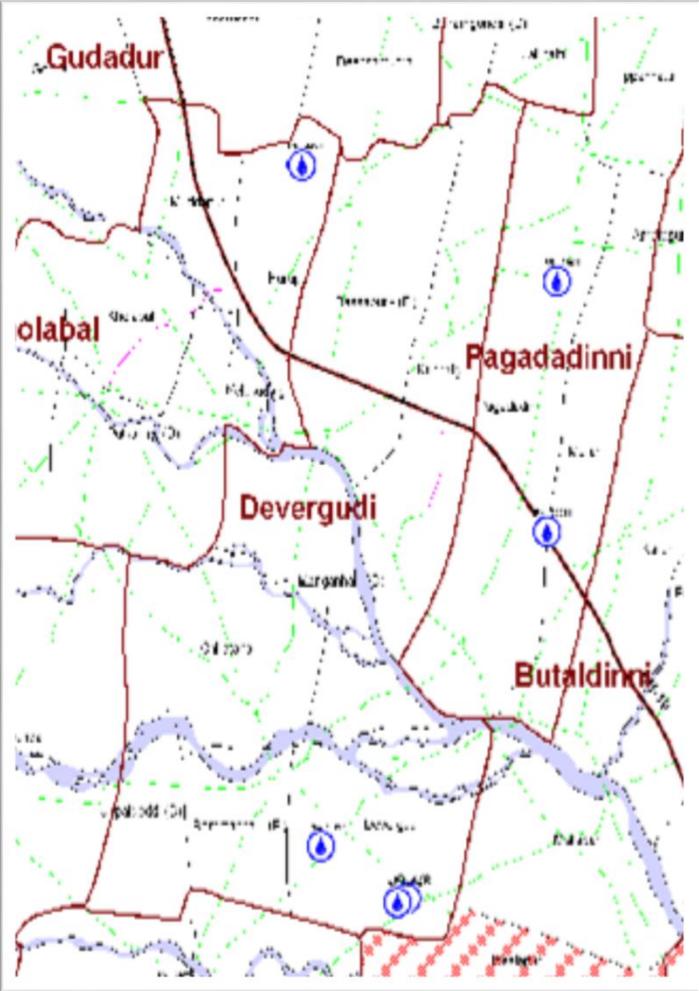
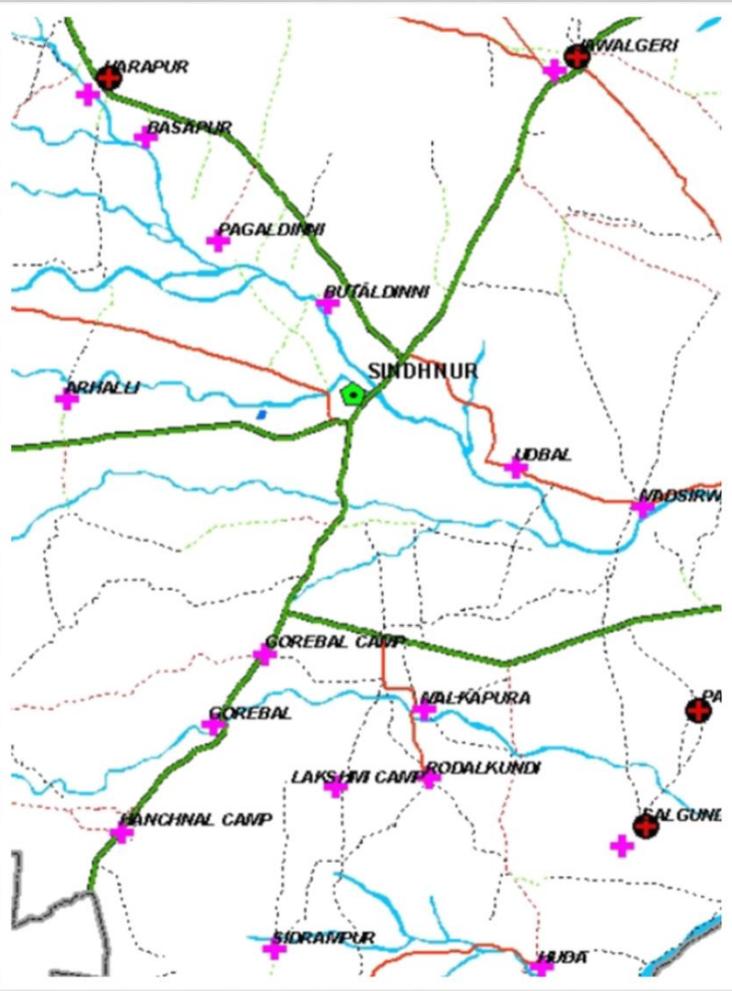
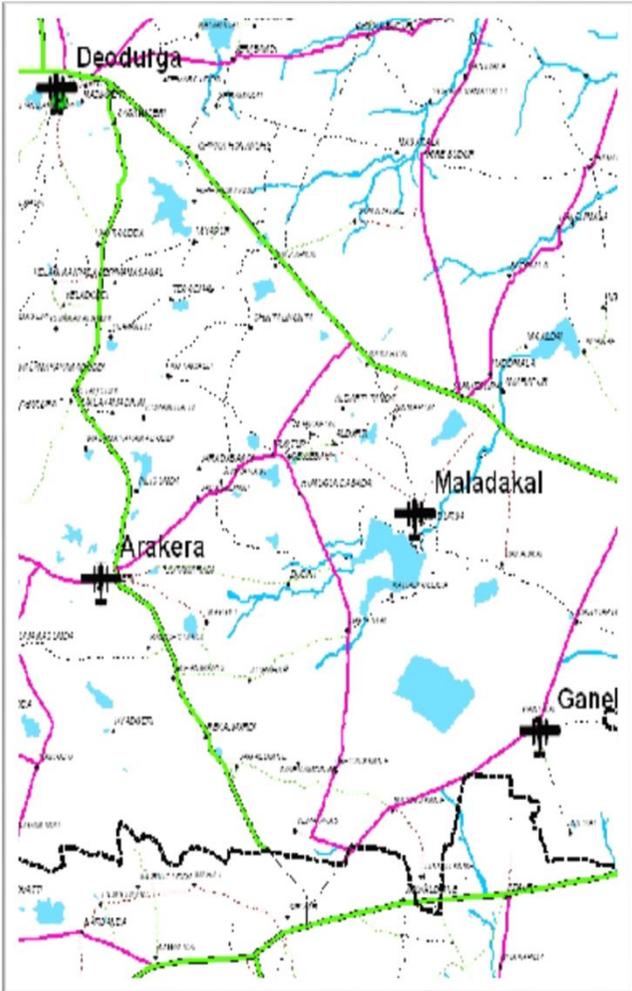
Driver Phone Number

Registration No

Goods, Passenger, Other



# GEOSTAMPED LOCATIONS ON MAP





# KSDMIS - POST DISASTER

## FIELD DATA COLLECTION THROUGH MOBILE APP BY 18 DEPARTMENTS

|                      |            |                  |                |
|----------------------|------------|------------------|----------------|
| Revenue              | PWD        | RDPR             | PRED           |
| Irrigation           | ULB        | Agriculture      | Horticulture   |
| Animal Husbandry     | Veterinary | WCD              | Health         |
| Hand looms (Textile) | ESCOM      | Fisheries        | Panchaytha Raj |
|                      | Education  | Zilla Panchayath |                |

## DATA COLLECTION TEMPLATES

|                              |                       |                         |                    |
|------------------------------|-----------------------|-------------------------|--------------------|
| Human & Animal Loss          | House Damage          | Crop Loss               | Road Damage        |
| Bridges and Culverts Damages | Primary School & PHC  | Handicraft              | Fisheries          |
| Private Properties           | Relief Camp Details   | Search And Rescue       | Crop Input Subsidy |
| Goshala And Fodder           | Drinking Water Supply | Monitoring Repair Works | Other Templates    |



# KSDMIS PORTAL

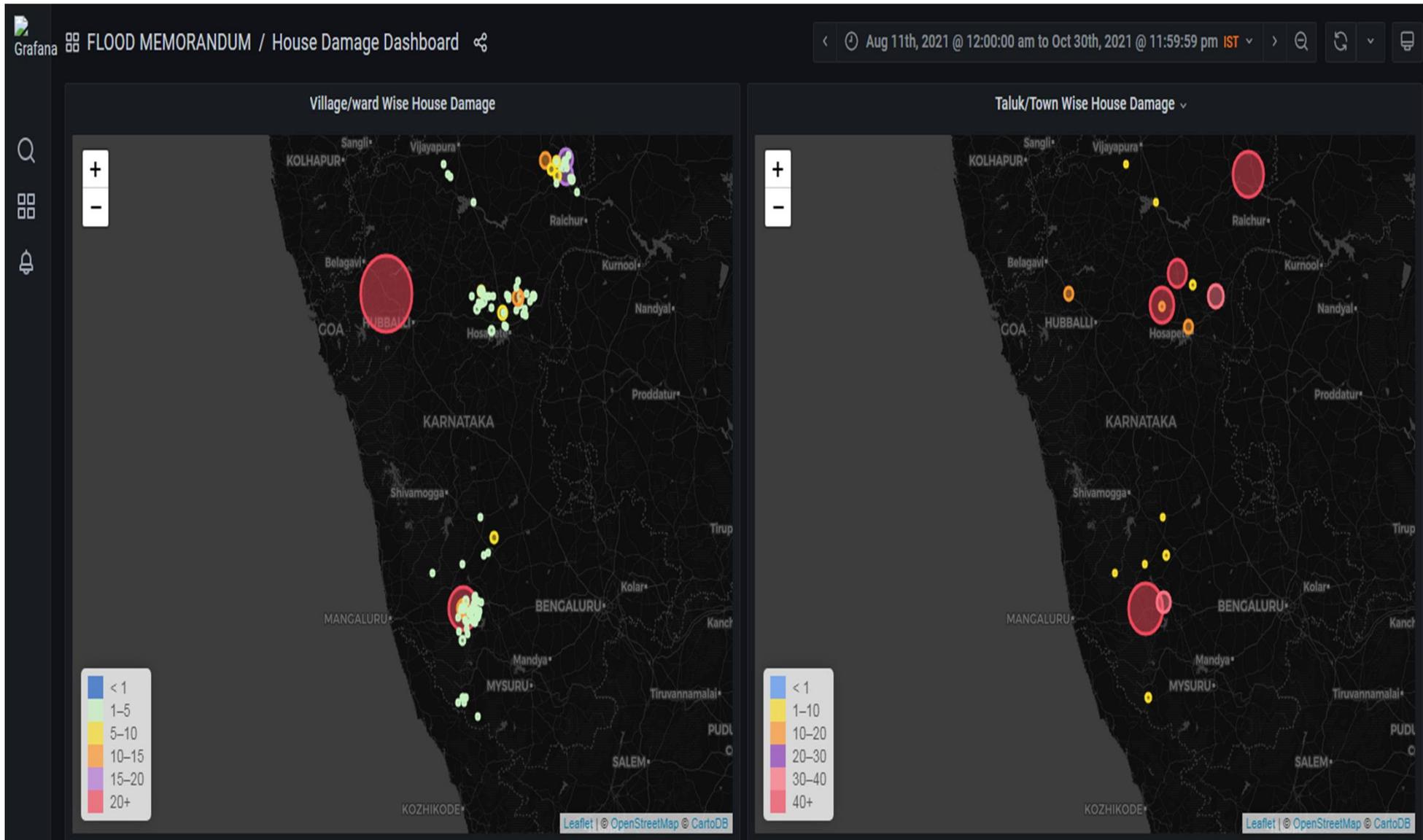


| House No. ↕ | Complete Address survey no and Geo-stamped photo ↕ | Whether the house constructed on authorized land ↕ | Type of house ↕ | House in Hill area ↕ | Category of Damage ↕       | Cause of House damage ↕ | Date of damage ↕ | Certification of damage by the competent authority (uploading) ↕ | Assistance paid ↕ | Mode of payment ↕ | Name of house owner ↕         | Contact number of house owner ↕ | Aadhaar no of house owner ↕ | Whether financial assistance has been paid for house damage during earlier instance of calamity ↕ | Details of Financial assistance receiver ↕ |
|-------------|--|--|-----------------|----------------------|----------------------------|-------------------------|------------------|--|-------------------|-------------------|-------------------------------|---------------------------------|-----------------------------|---|--|
| 401         |  | yes  | pucca           | No                   | Partially damaged - 15-25% | Heavy rain              | 2021-10-04       |  |                   |                   | durugappa ramanna bapura      | 8277753971                      | 734957403056                | no  |  |
| 252         |  | no   | kuccha          | No                   | Severely damage - 25-75%   | Heavy rain              | 2021-07-19       |  |                   |                   | Channavva gudneppa devaramani | 9380204907                      | 481262396490                | no  |  |
| 03          |  | no   | kuccha          | No                   | Partially damaged - 15-25% | Heavy rain              | 2021-08-17       |  |                   |                   | Mallappa Erappa Tondihal      | 8904406403                      | 433108684912                | no  |  |
| 250         |  | no   | kuccha          | No                   | Severely damage - 25-75%   | Heavy rain              | 2021-07-19       |  |                   |                   | Jalavva Nyamappa karabhari    | 9880297727                      | 996025824608                | no  |  |





# GIS DASHBOARD





# DATA INPUT TO DM & EOC

## NATIONAL AGENCY REPORTS/ FORECASTS

IMD, SAC & SDSC-SHAR – ISRO, MOES, NCEP-NCAR, SDSC-SHAR, CWC, CGWB & NCMRWF

## PUBLIC ENQUIRY/ COMPLAINT/ ERSS

## TV CHANNELS/ MEDIA

## SWD SENSORS WATER LEVEL IN SWD

## WATER LEVEL SENSORS RESERVOIR STORAGE & WATER FLOW

## 6500 TRG RAINFALL DATA

## 950 TWS TEMPERATURE, WIND SPEED, WIND DIRECTION & HUMIDITY

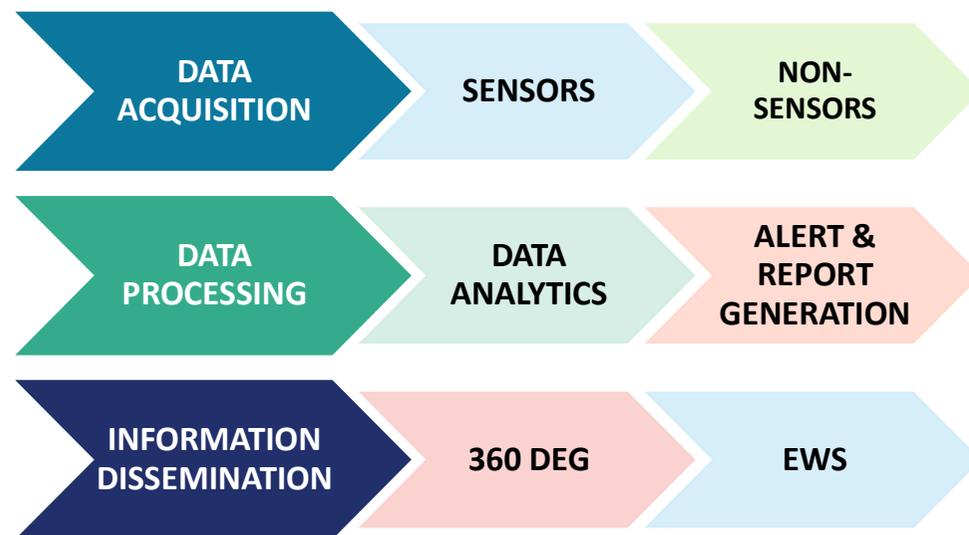
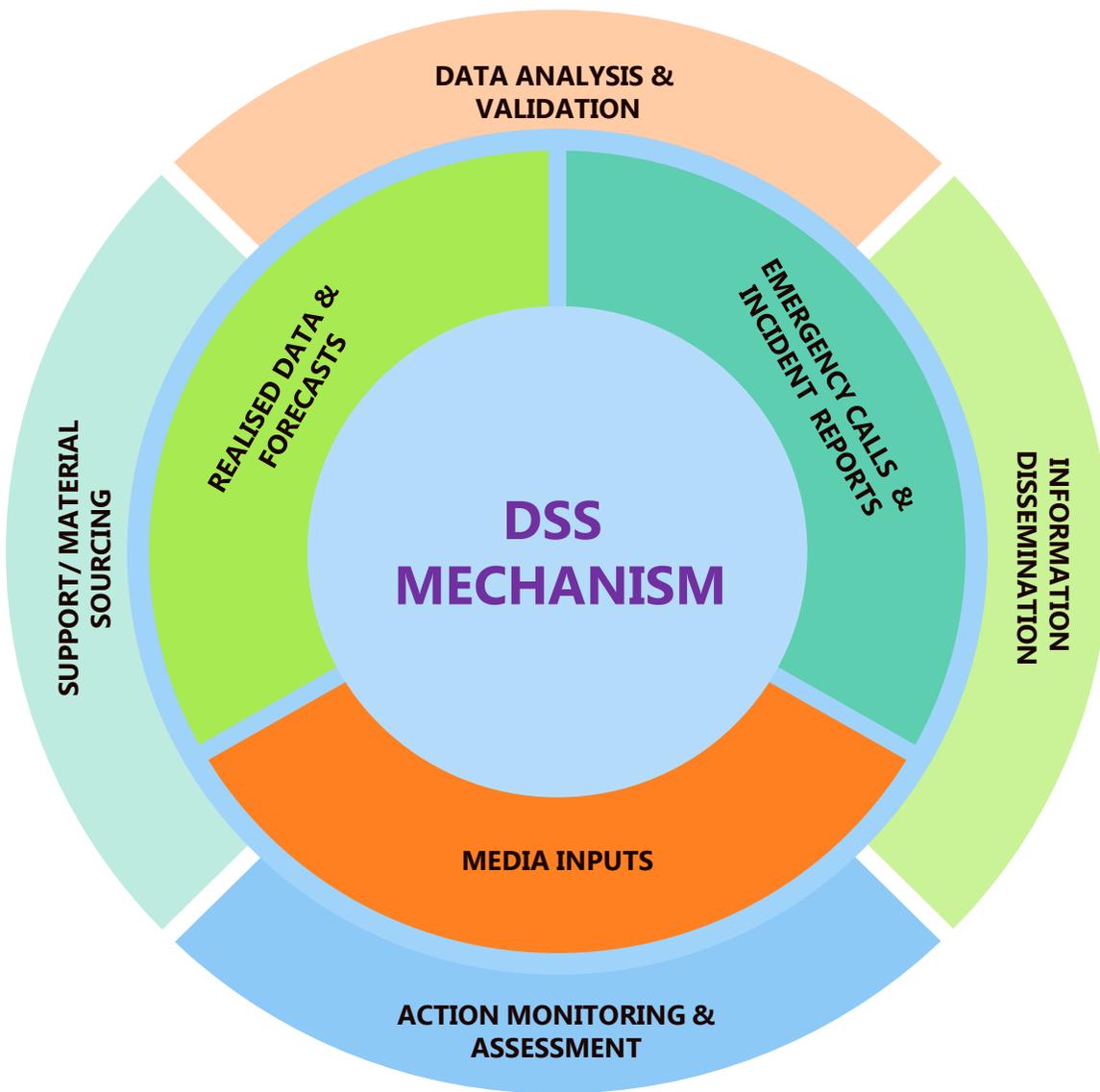
## 14 SEISMIC STATIONS SEISMIC SIGNATURES

## 11 LIGHTENING SENSORS LIGHTENING & THUNDERSTORMS

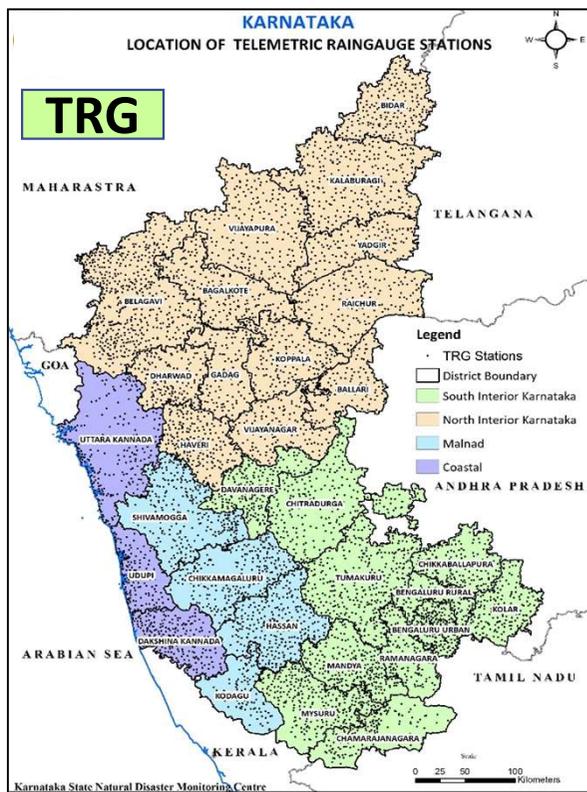




# DSS MECHANISMS



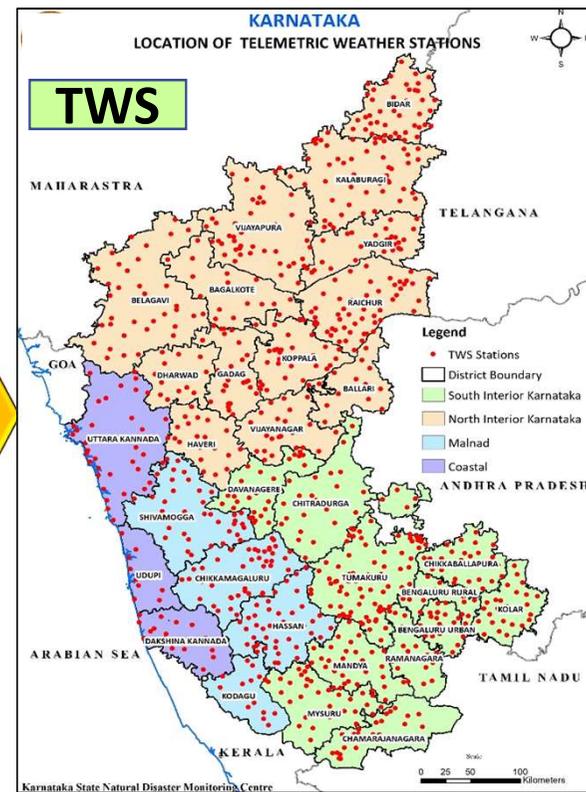
# WEATHER MONITORING NETWORK



**TELEMETRIC RAINGAUGE STATION**



**DENSITY OF WEATHER MONITORING NETWORK IS FIRST OF ITS KIND**

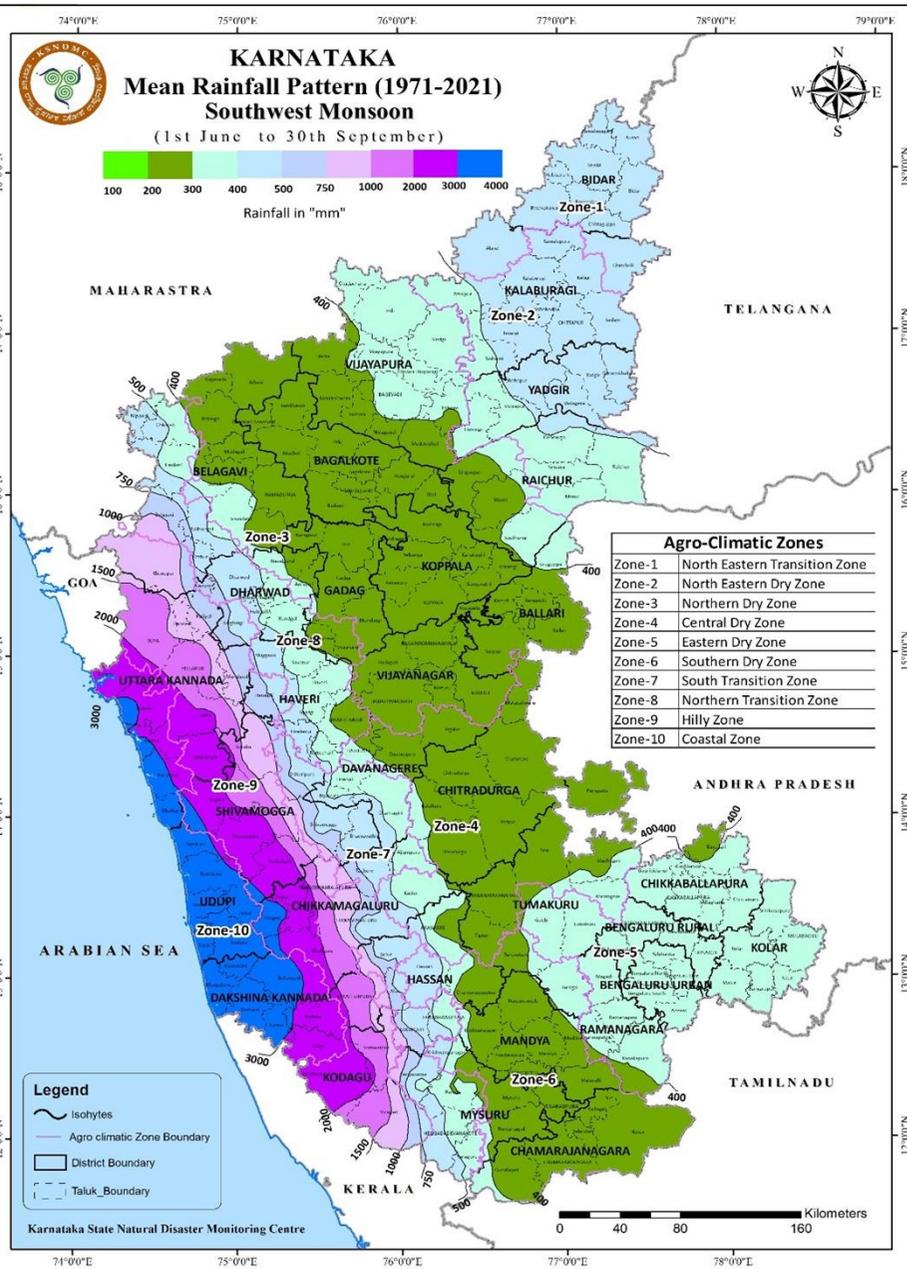


**TELEMETRIC WEATHER STATION**



**7400 stations X 96 data points per day is the density of data coming to GIS enabled server**

# MEAN RAINFALL SW MONSOON SEASON



## Karnataka State Seasonal Normal Rainfall (mm)

| Season                           | Rainfall<br>% Contribution |
|----------------------------------|----------------------------|
| <b>Winter</b><br>Jan' – Feb'     | 4                          |
| <b>Pre-Monsoon</b><br>Mar' – May | 115 mm<br><b>(10%)</b>     |
| <b>South-West</b><br>June – Sep' | 852 mm<br><b>(74%)</b>     |
| <b>North-East</b><br>Oct' – Dec' | 182 mm<br><b>(16%)</b>     |
| <b>Annual</b><br>Jan' to Dec'    | 1153 mm                    |

Spatial distribution and amount of rainfall during the south-west monsoon (June-September) mainly determines the occurrence of drought

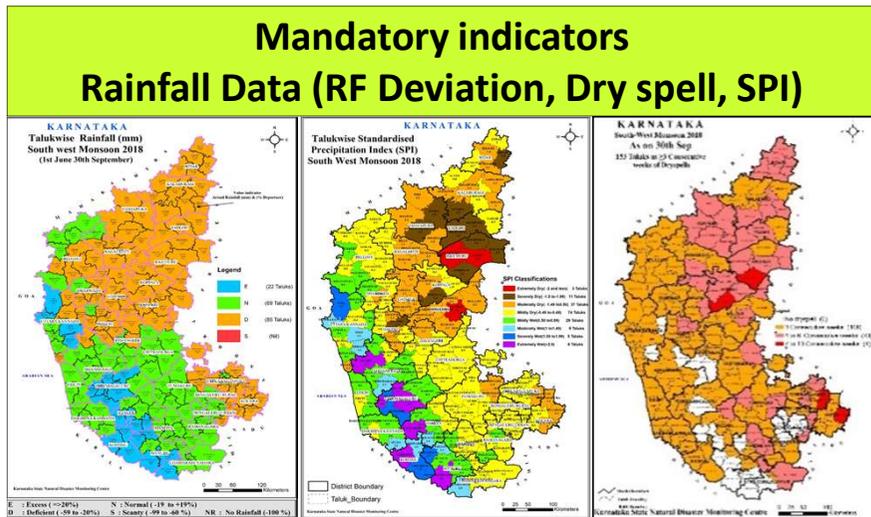
> 70% of Normal Annual Rainfall occurs during SW Monsoon Season

Spatial Rainfall distribution varies between ~300 mm – 4000 mm

Spatial and Temporal distribution of Rainfall is Erratic



# DROUGHT ASSESSMENT



Drought Trigger 1

No

Drought Assessment  
No Drought

Yes

Assess any 3 impact Indicators

Socio-Economic Indicators

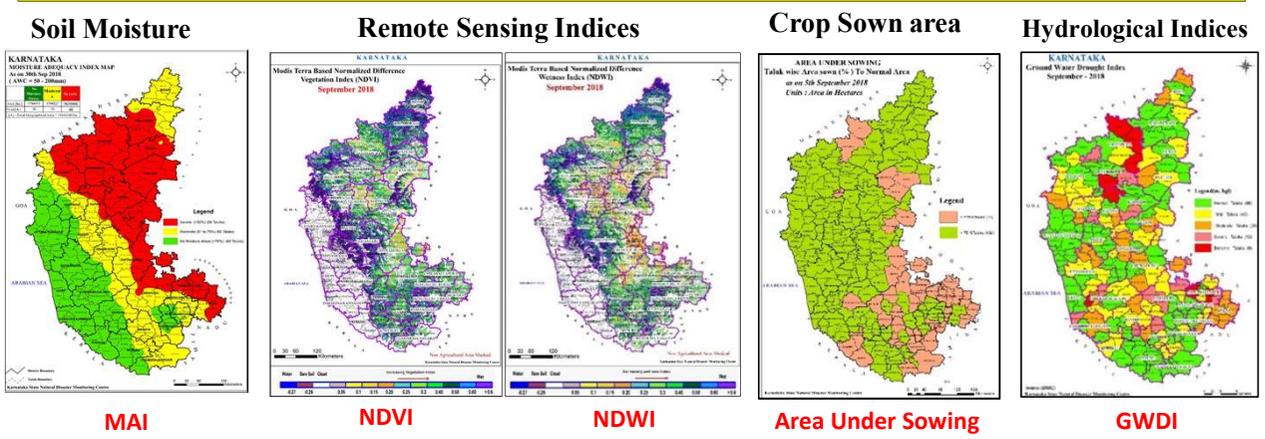
Drought Assessment  
Drought Category (Severe, Moderate, Normal)

Drought Trigger 2

Yes

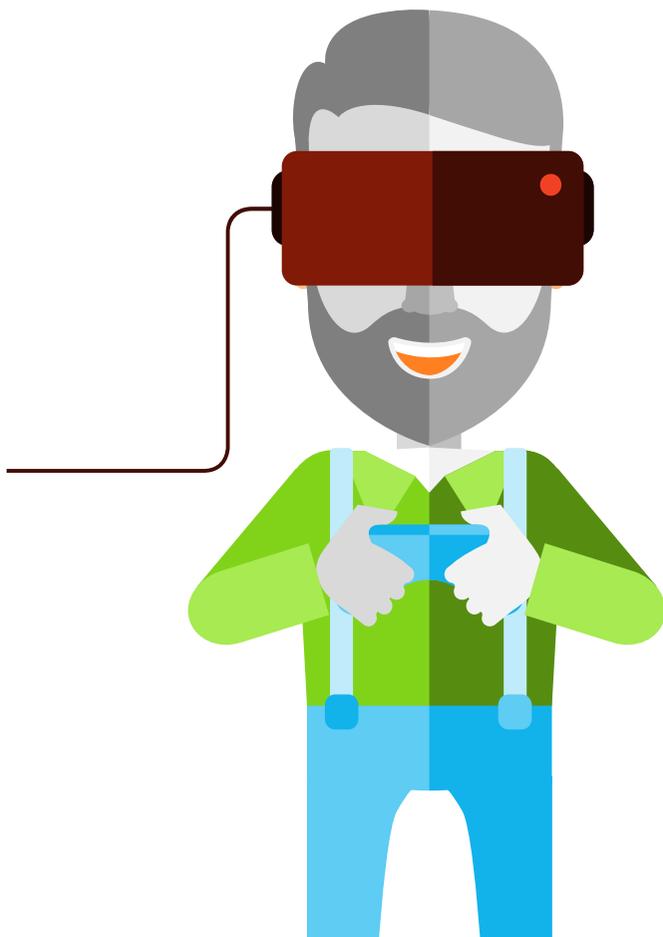
Ground Truthing

### Impact Indicators (MAI, Crop Sown area, Remote Sensing Indices, Hydrological Indices)





# DATA ANALYSIS & INFORMATION GENERATION



## REAL TIME INFORMATION



RAINFALL, INTENSITY, LIGHTENING, TEMPERATURE, THUNDERSTORM, HAILSTORMS, WATER RELEASES & RESERVOIR LEVELS, SWD LEVELS, FLOOD FORECAST MODELS,

## THRESHOLD ALERTS



- a. HEATWAVE- TEMPERATURE
- b. RAINFALL
- c. LIGHTENING
- d. SEISMIC

## DEWS, ERSS, CAP. CRM



MULTI HAZARD, MULTI LINGUAL EWS

## SPECIALISED CELLS



FLOODS, EARTHQUAKES, HEATWAVE, DROUGHT CELLS



# INFORMATION DISSEMINATION

**VARUNAMITRA HELP DESK/ CALL CENTRE**



**DISTRICT ADMINISTRATION**

**DASH BOARDS**

**STATE, BBMP, SMART CITIES**



**E MAILS**



**WHATSAPP GROUPS**

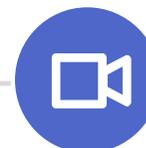
**FOCUSSED GROUPS,  
BASIN WISE GROUPS**



**DEWS/ MOBILE APP**



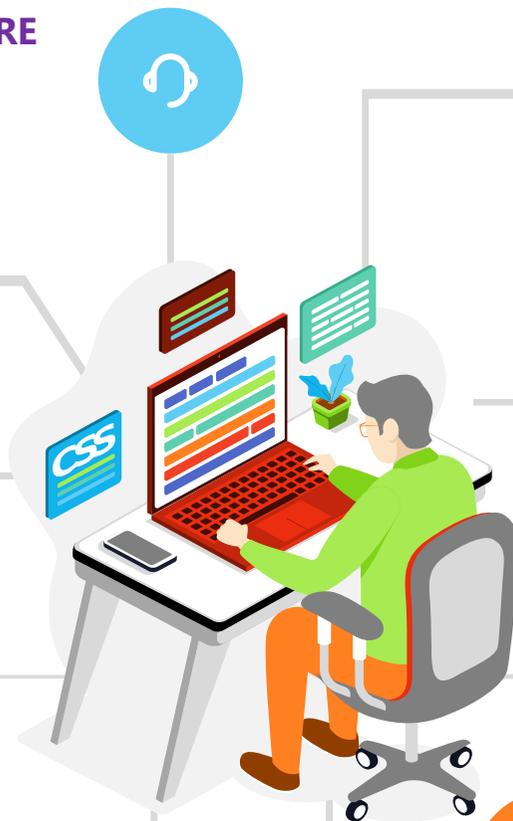
**MHA/ NDMA/SDMA**



**MEDIA/ SOCIAL MEDIA**



**DOCUMENTATION**



# DATA RECEPTION AND PROCESSING AT EOC

SENSORS

GPRS

SERVER

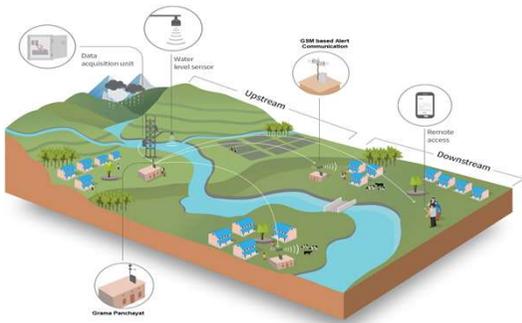
Tipping Bucket Raingauge



Weather Warnings



WEATHER FORECAST



LEGEND

|            |
|------------|
| 16.1 to 20 |
| 20.1 to 24 |
| 24.1 to 28 |
| 28.1 to 32 |
| 32.1 to 36 |
| 36.1 to 38 |



# EOC - KSNDMC

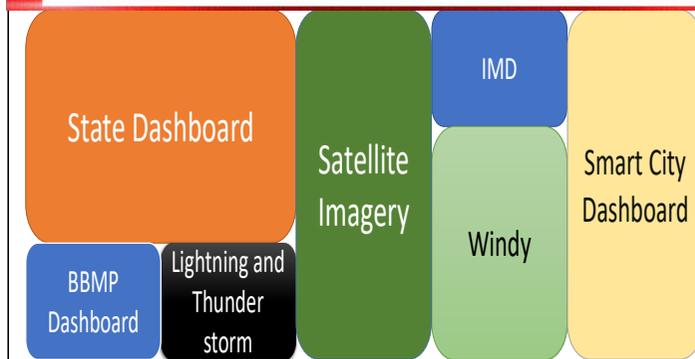


## TEMPLATES FOR THE EOC VIDEO WALL

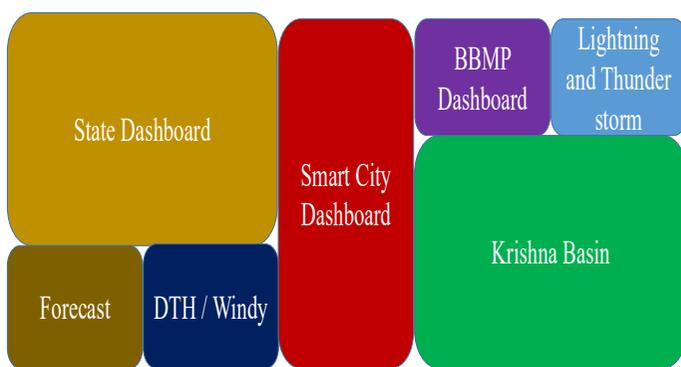
### Flood Event - Template 1



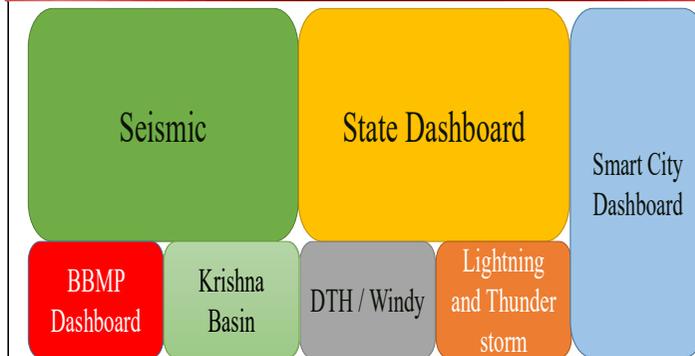
### Cyclone Event - Template 3



### Krishna Basin Flood Event - Template 2



### Seismic Event - Template 4



THANK YOU

Dr. Manoj Rajan  
Commissioner,  
KSDMA, GoK

 [manoarya@gmail.com](mailto:manoarya@gmail.com)

