Web enabled Geospatial Portal

NATIONAL DATABASE FOR EMERGENCY MANAGEMENT (NDEM)

April, 2017

URL : http://ndem.nrsc.gov.in

National Remote Sensing Centre
ISRO, Department of Space
Hyderabad – 500 037

Background

Government of India has envisaged a policy to build a safer and disaster resilient India by developing a holistic, multi disaster and technology driven strategy for disaster management. Ministry of Home Affairs (MHA) has translated this approach into National Database for Emergency management (NDEM) for taking up ameliorative measures for providing timely information and decision making. National Remote Sensing Centre (NRSC), Indian Space Research Organisation (ISRO) is the lead agency to implement and operationlized NDEM project.

NDEM essentially serves as national repository of GIS based data for entire country coupled with set of Decision Support System tools to assist the disaster managers in decision making during emergency situations.

NRSC/ISRO implemented NDEM v1.0 on satellite based Virtual Private Network (VPN). Subsequently NDEM v2.0 with improved features was launched on internet domain with secured access.

In order to enhance NDEM features & services, NDEM version 3.0 is designed & developed using FOSS technologies powered with open layer 3,bootstrap & Model/View/Controller (MVC) framework. It enables :

- Enhanced rendering capabilities and high level vector display.
- Compatibility across multiple devices
- Decoupling of modules to increase flexibility and reuse.

NRSC/ISRO implemented NDEM services for all 36 States/UTs with multi-institutional support from Central/State departments. Value added products are hosted on NDEM portal for major disaster events since 2013 onwards.

Concept & Objectives

The concept of NDEM emphasizes on the database organisation from various nodal agencies with spatial integration procedures, hosting of services for situation assessment, development of decision support tools for effective decision making.

NDEM Concept

MITIGATION
Flood Hazard Maps
Capacity Building

PREPAREDNESS
Current Disaster News
Alerts & warnings
Flood Hazard Zonation Maps
Training & Mock drill Exercises
Interaction Services

RECOVERY
Damage Assessment
Interaction Services

RESPONSE
Incident Report
Flood Inundation map
Decision Support Tools
Resource management
Interaction Services

Objectives

- Organization of multi-scale geospatial database for entire country at 1:50,000 scale; for 350 Multi-hazard prone districts at 1:10,000 scale; for 5 Mega-cities at 1:2,000 scale (Delhi, Mumbai, Kolkata, Bangalore and Hyderabad)
- Development of Decision Support System (DSS) tools for addressing disaster/ emergency management.
- Establishing computer infrastructure to facilitate network connectivity, data ingest, validation, GIS databases organization, data dissemination and services hosting.

NDEM Milestones

2017 Version 3.0

- ✓ Version 2.0 features + improved geospatial data visualization with meta data & user friendly GUI.
- ✓ Device and browser independent geoportal.
- ✓ Bilingual portal services i.e., English and Hindi
- ✓ Resource Management & Audio/Video live chat.
- ✓ Swipe tool & Improved geospatial data search.
- ✓ Improved network analysis tool with obstacles & location search option.
- ✓ Incident Reporting and integrated Mobile app for Relief mgmt.
- ✓ Integration of near-real time social media inputs on disaster.

2015 Version 2.0

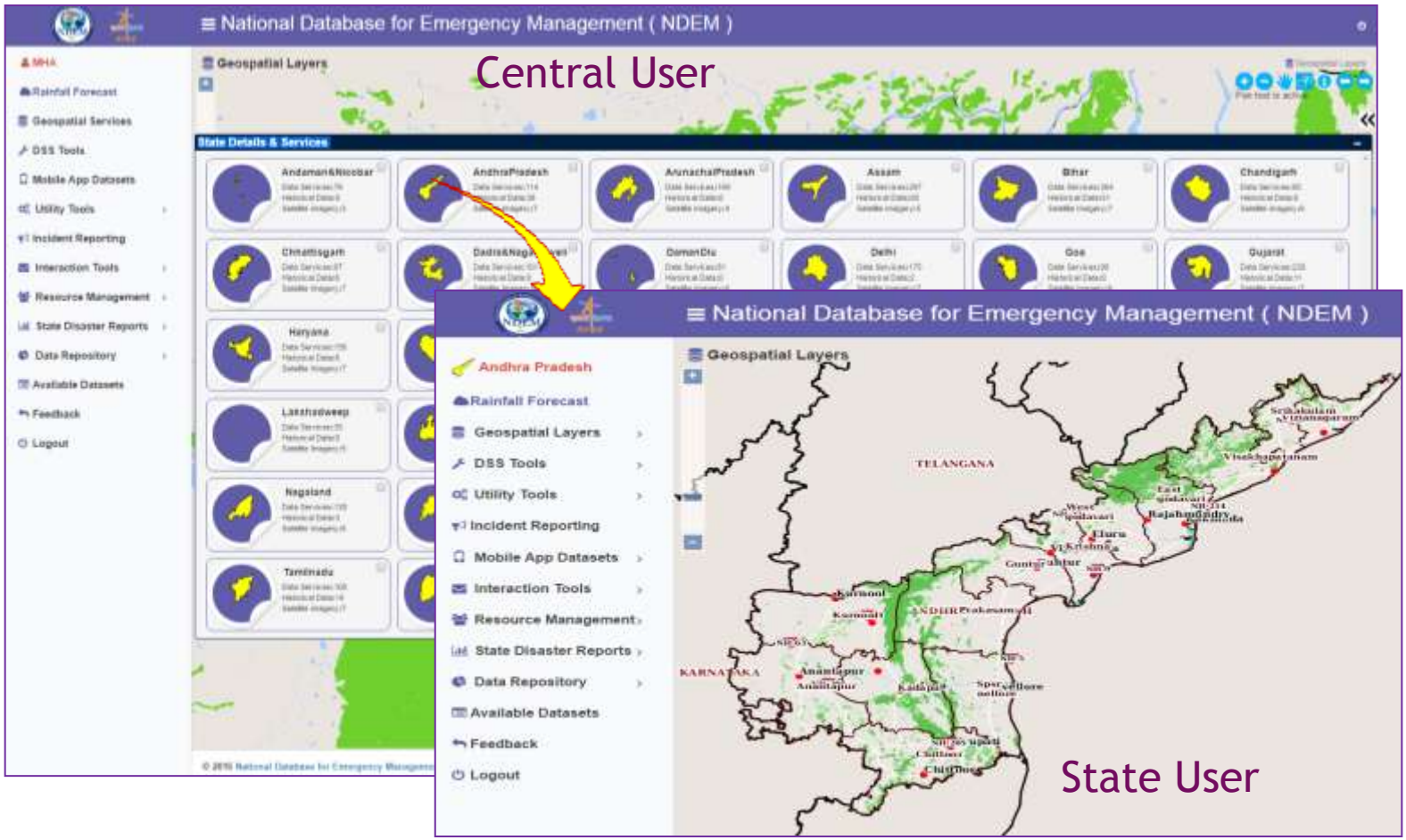
- ✓ Version 1.0 features + Multi scale geo-spatial data services for entire country.
- ✓ Deployment of services through Internet domain.
- ✓ Disaster Dashboard.
- ✓ Integration of historical disaster specific datasets.
- ✓ Current News.
- ✓ Decision support tools.
- ✓ Interaction Services (SMS, Circular, Mailbox).
- ✓ Mobile apps for Relief Management & Geo-Tagging of facilities.
- ✓ Online data submission modules for State/Central depts.

2013 Version 1.0

- ✓ Deployment of services through VPN.
- ✓ Geo-spatial data visualization.
- ✓ Standard GIS tools
  - Opacity, PAN
  - Identification
  - Area and distance measurement
- ✓ Integration of India Disaster Resource Network (IDRN), CENSUS 2011 data with Query builder.
- ✓ Deployment of near real time Disaster specific layers and reports

NDEM Version 3.0

In addition to NDEM version 2.0 features, NDEM version 3.0 provides improved geospatial data visualization with meta data & user friendly GUI, Resource Management, live audio video chat etc.



Device Independent Geo-portal

Portal Features

The geoportal is equipped with comprehensive geo-spatial data inventory for visualization, analysis & decision making, integrated mobile app for field data transmission. The important features are:

Disaster Dashboard

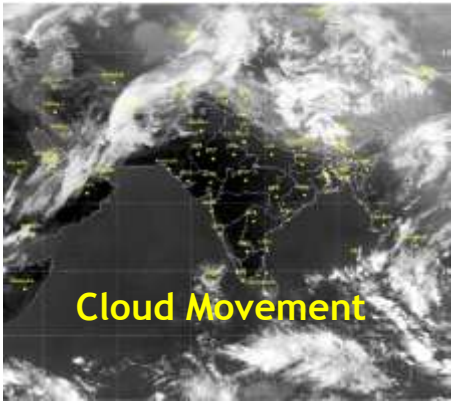
Portal provides disaster related current & historical news, alerts/warnings obtained from the authorised sources. Information about daily rainfall, river water levels, city weather etc., are integrated into dash board as a service.

Cloud Movement : Cloud motion is derived from IR images. This information is a valuable input to short-range weather prediction.

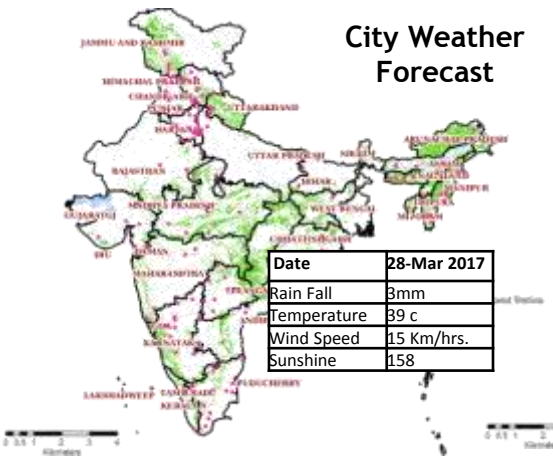
IMD (Indian Meteorological Department) Rainfall: This information is used for assessing the weather situation. and the data is generated by taking meteorological observations through rain gauge stations.

CWC Water Levels: This is the water level data of major river basins, helps us to get advance knowledge of incoming floods.

City Weather Forecast: It provides the weather prediction of a city (rainfall, temp etc.,) for next seven days

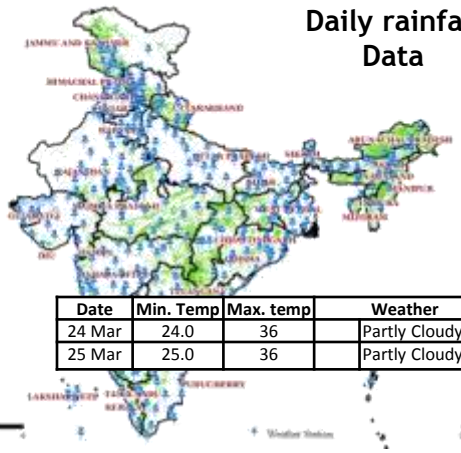


City Weather Forecast



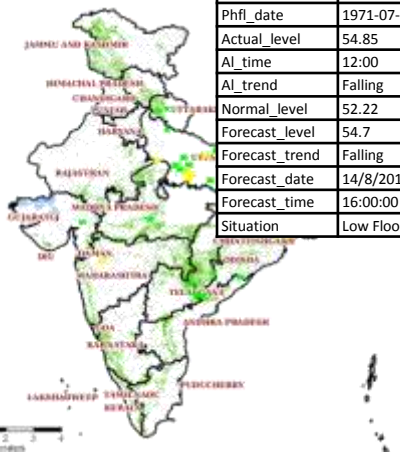
Date	28-Mar 2017
Rain Fall	3mm
Temperature	39 c
Wind Speed	15 Km/hrs.
Sunshine	158

Daily rainfall Data



Date	Min. Temp	Max. temp	Weather
24 Mar	24.0	36	Partly Cloudy Sky
25 Mar	25.0	36	Partly Cloudy Sky

River Water levels



Name_of_river	Sone
Forecasting site	Koelwar
District	Patna
State	Bihar
Date	Aug 14, 2016 12:00
Sub_division	Bihar
Warning_level	54.52
Danger_level	55.52
Highest_flood	58.88
Phfl_date	1971-07-20
Actual_level	54.85
Al_time	12:00
Al_trend	Falling
Normal_level	52.22
Forecast_level	54.7
Forecast_trend	Falling
Forecast_date	14/8/2016
Forecast_time	16:00:00
Situation	Low Flood Situation

Current News: This feature provides the information about the latest disaster related news across the country as reported by news sources

Social media info: It provides disaster related information/news reported in social media.

Database organization

Database elements are pooled from various sources. The entire database is integrated and organized in vector & raster format. This database is served as secure geospatial Web Map Services (WMS).

Base Layers	
1	State
2	District
3	Taluk
4	Village Boundaries
5	Road
6	Rail
7	Drainage
8	Canal
9	Coastline
10	River

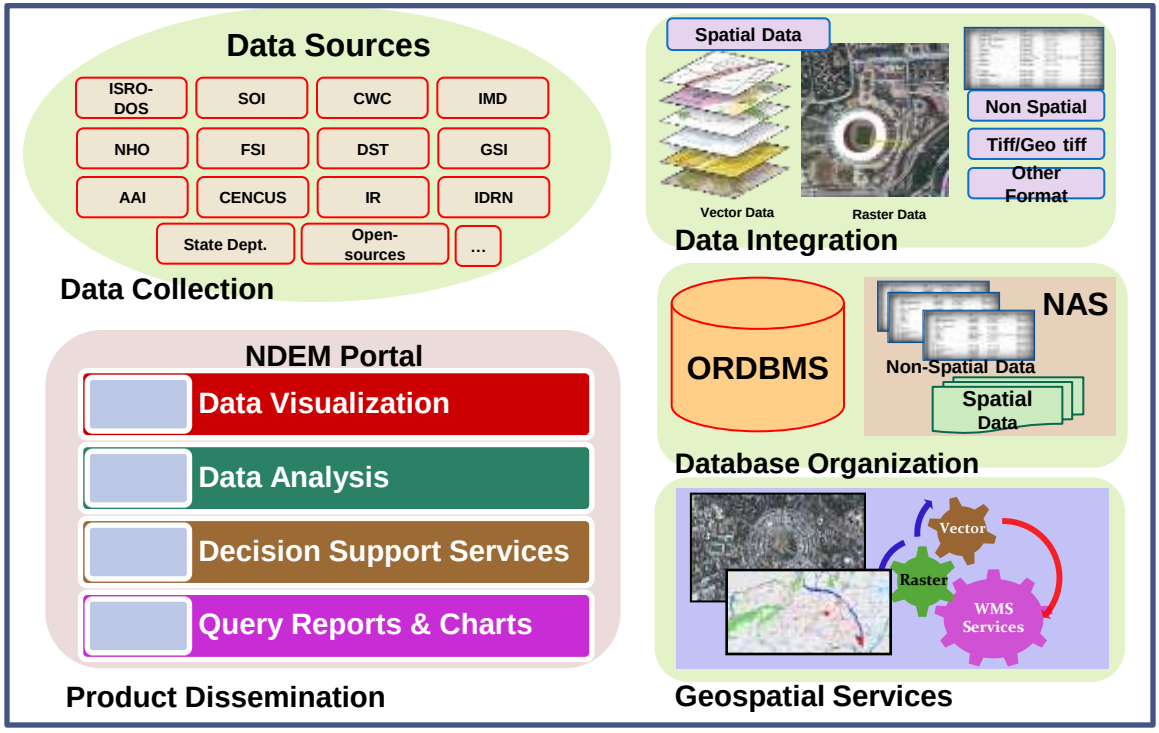
Thematic Layers	
11	Land use / land cover
12	Settlement-area
13	Mining Area
14	Surface water bodies
15	Forest Boundaries
16	Settlement-Point
17	Slope
18	Meteorological data

Infrastructure Layers	
19	Railway stations
20	Hospitals
21	Airports
22	Helipads
23	Ports
24	River Gauge Stations
25	Ponds & Tanks
26	Dams(Point)
27	Reservoir
28	Power plants
29	Point of Interest

Raster	
30	Carto2 DEM
31	ACE2 DEM
32	SRTM DEM
33	LISS IV MX
34	CARTOSAT – 1 PAN
35	CARTOSAT – 1 PAN + MX
36	CARTOSAT – 2 PAN
37	CARTOSAT – 2 PAN + MX

Disaster Specific Data	
38	Flood
39	Cyclone / Tsunami
40	Forest Fire
41	Earthquake
42	Drought
43	Landslide

Non- Spatial Database	
44	Socio Economic
45	Census 2011
46	IDRN 2014
47	Health Data



Point of Interest(POI)

More than 5.2 million point of interests (POI) along with location & attribute have been integrated into the portal, which plays a vital role during emergency situation for necessary planning.

Community centers	
1	Banquet & Marriage Hall
2	Crematorium, Burial Ground
3	School
4	Embassies & Consulates
5	Fire Station
6	Gas Stations
7	Government Office
8	Administrative Offices
9	Library
10	Police Station/ Chowki
11	Parks and gardens
12	Post and Telegraph Office
13	University or College
14	Play School, Day care
15	Stadium
	Court House
	Worship Places
	Town Hall

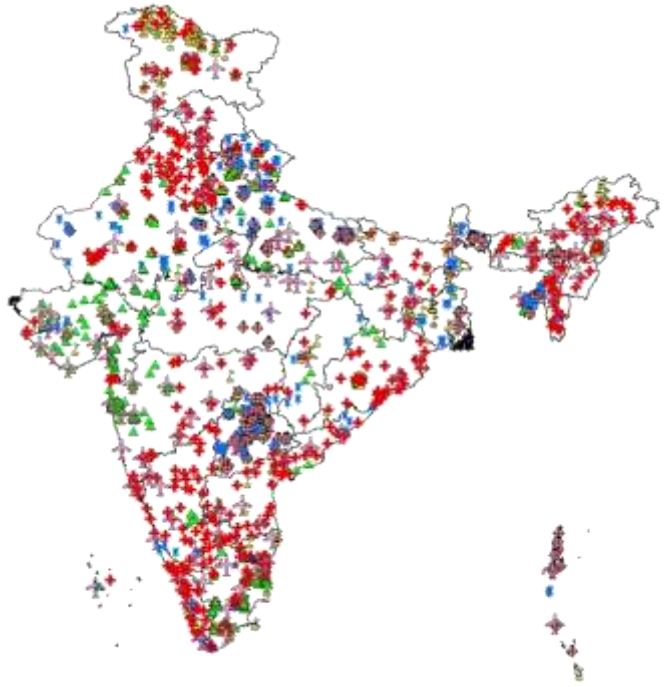
Transportation	
19	Bus Stop
20	Car Rental
21	CNG Station
22	Petrol Pump
23	Parking
24	Other - Transportation Group
25	Rest Area
26	Open Parking Areas
27	Bus and Truck Parking
28	Bus Stop

Residential places	
30	Apartment
31	Individual Housing - Famous
32	Individual House Not Famous
33	SRTM DEM

Tourist spots	
1	Forts & Palaces
2	Historical Monument
3	Museums
4	Hill Station
5	Forest
6	Tourist Information Centre
7	Beach, Lake, water fall
8	Wildlife Sanctuary

Health services	
1	Hospitals & Nursing Homes
3	Blood bank
4	Clinic, Dispensary, Health Cetres
5	Gym
6	Pathological Labs
7	Medical Store
9	Eye bank
10	Dental hospital
	Eye hospital
	Homeopathic hospital
	Heart hospital
	Mental hospital
	Orthopaedic hospital
	Veterinary hospital
	Spa
	Ambulance Service
	Ayurveda & Yoga

Commercial services	
1	Commercial Building
2	BPO
3	Industrial Centres
4	Oil & Petroleum
5	Telecom
6	Automotive Dealer
7	Mandi - Sabzi mandi
8	Shopping Malls
9	Department Store
10	Retail Shops



Landmarks	
34	Metro Pillar
35	Gates, Pillars, statues
36	Warehouse/ Go downs

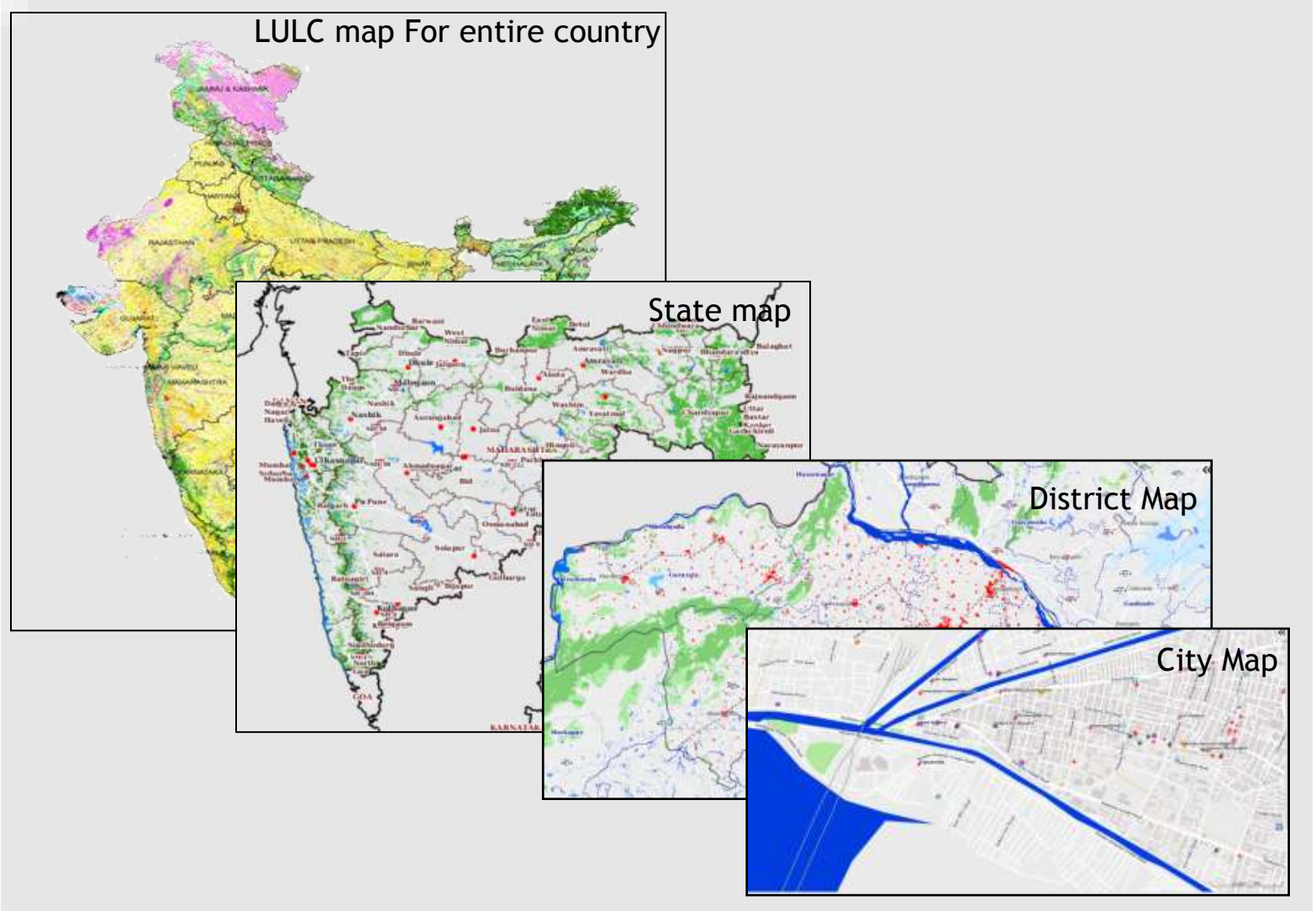
Hotels	
11	Hotels
12	Resorts
13	Indian/ Multicuisine restaurant
14	Coffee Shops
15	Bakery & Desserts
16	Youth hostels

Financial services	
30	ATM
31	Banks & Money Exch.
32	Insurance & Financial

Recreation	
19	Adventure Sports
20	Art Galleries
21	Auditoriums
22	Water Parks
23	Amusement Park
24	Zoo
25	Cinema
26	Swimming Pool
27	Theatre
28	Golf Course
29	Bowling Centre
	Casino

Multi-scale database services

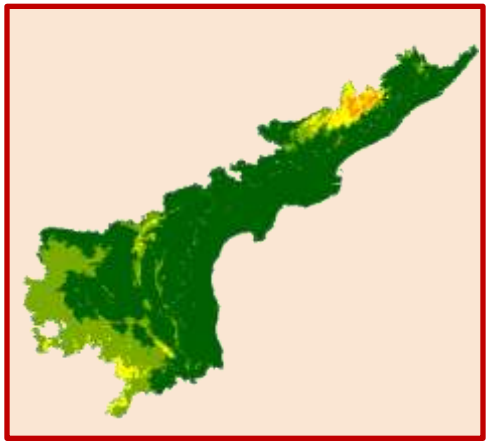
Multi-scale database services from State to Panchayat level are enabled for entire country. State wise data base is served t 1:50,000 scale for 36 States/UTs. At 1:10,000 scale services are integrated for 350 districts consisting of 100 Multi-Hazard Prone and 250 Most Vulnerable districts for detailed disaster preparedness & planning.



Event wise disaster specific services for all major natural disasters are also enabled for effective relief and rescue operations. In addition, historic disaster specific data sets are also integrated to act as knowledge base for preparedness and planning.

Raster Services

The portal consists of satellite imageries with resolution ranging from 5.8 m to sub metre. 5.8 m resolution multispectral imagery and 2.5 m resolution fused color imagery, covering entire country is available for complementing with vector data. Very High Resolution Satellite data i.e., Cartosat-2 of 1m resolution and sub meter resolution data from foreign satellites covering major towns/cities are also available as secure web map services.



CARTO2DEM - 30M

IRS LISS IV - 5.8M

CARTOSAT 1 - 2.5M

CARTOSAT 1 + LISS IV - 2.5M

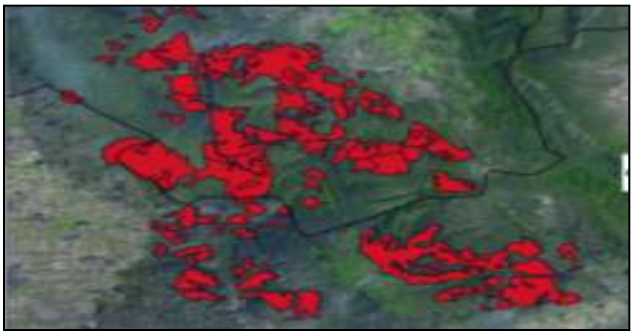
CARTOSAT 2 + LISS IV - 1M

Very High resolution data < 1M

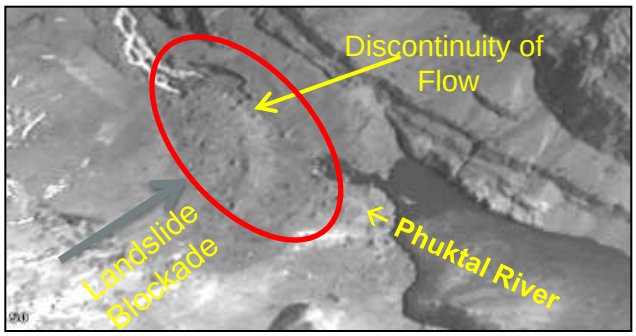
Disaster specific products & services

Portal is enriched with disaster specific products for selected natural disasters. These products are derived from space based inputs generated in near/real time and hosted onto the portal State wise for disseminating to the concerned officials which acts as a ready reckoner for planning and decision making.

Flood Inundation Map -Part of Tamilnadu Dec 2015

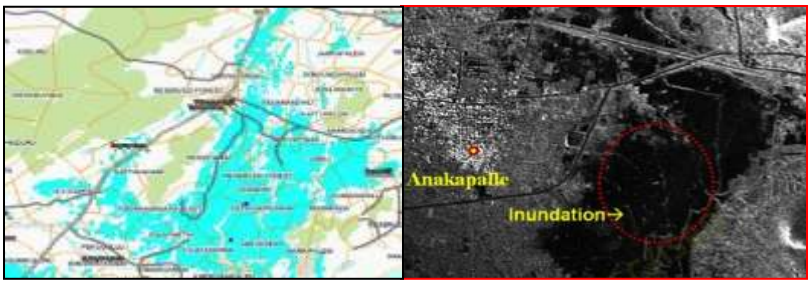


Forest Fire – Tirumala Hills area, Andhra Pradesh, Mar 2014



Phuktal Landslide 2015

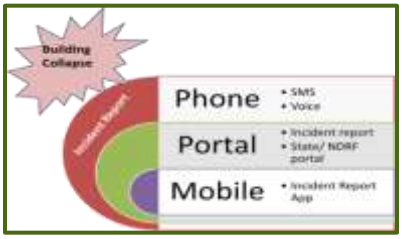
Nepal Earthquake Apr 2015

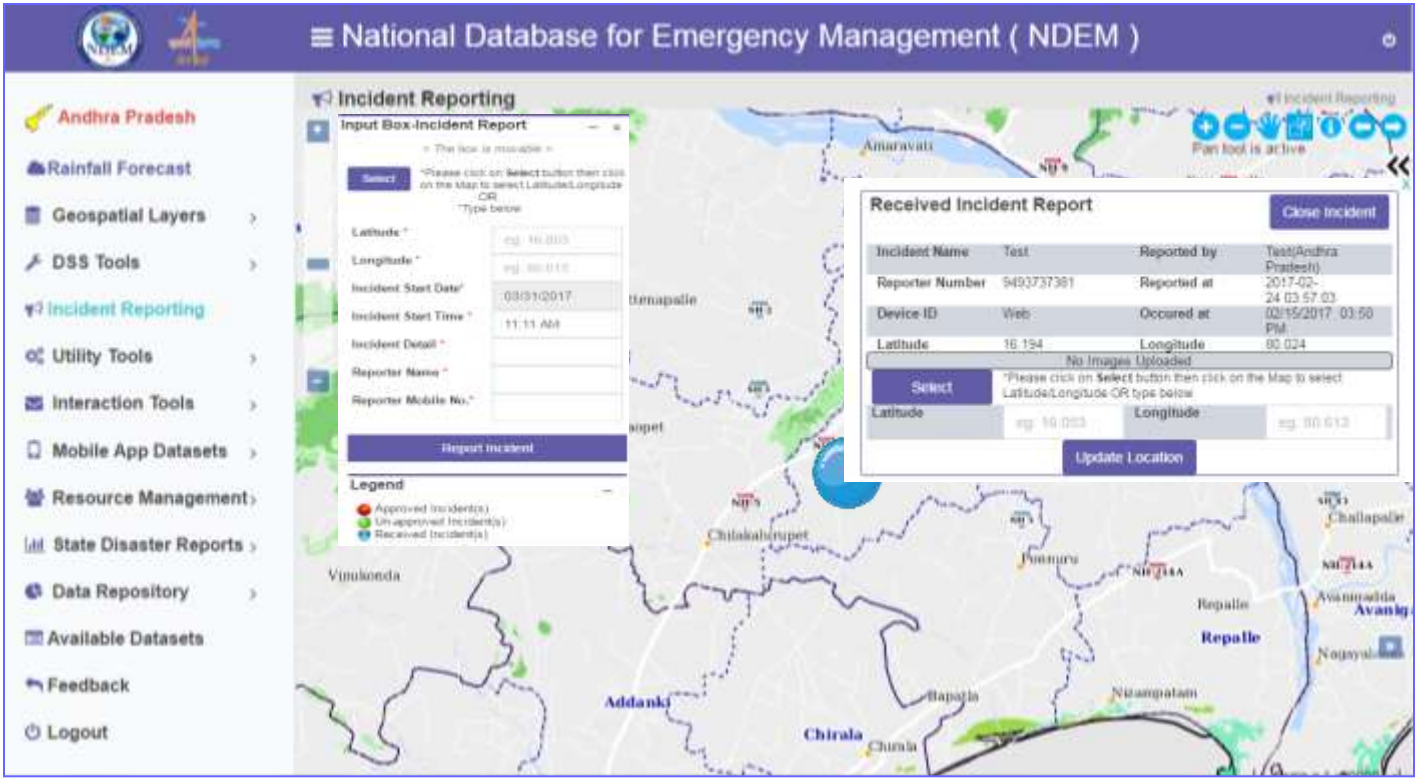


Vishakhapatnam, Srikakulam & East Godavari were severely affected due to strong gale winds & inundation, Oct 2014

Incident reporting

Incident reporting is the first step to trigger the chain of actions. The portal has three options to report the incident. The incident information is subsequently translated into geospatial platform for necessary action.





The Incident will be reported by authorized State officials.

Reported incident will appear blue in colour.

Respective NDRF battalion will forward incident to HQ for approval.

The forwarded incident will appear green in colour.

NDRF Head Quarter will approve the incident.

The approved incident will appear red in colour on the respective battalion.

Proximity Tool:

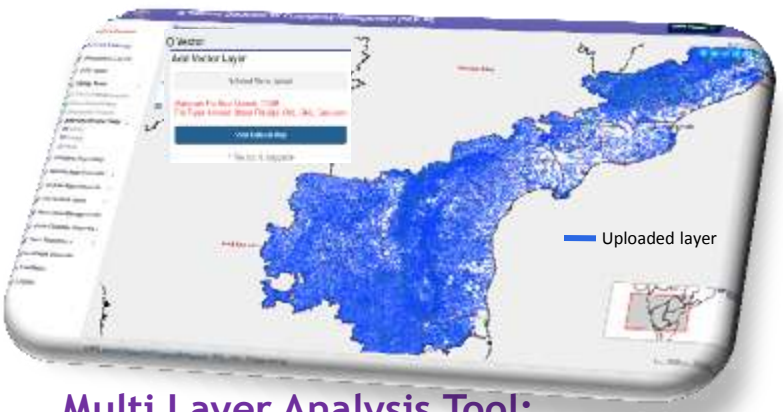
- Proximity tool for identifying emergency facilities.
- It provides optimal search for emergency facilities such as hospitals, shelters, rail/bus stations etc. within the user defined buffer distance.

Route Analysis Tool:

- Route analysis facilitates the user to find out the shortest route between emergency facility and user interested location/disaster site with details of the route.
- The routing tool enables finding out shortest way to locate shelters, hospitals etc. with road network data.

Add user specific data Tool:

- The tool allows users to add specific custom vector data in standard GIS format.
- The user data is overlaid on the NDEM viewer to visualize and analyze for further decision making.



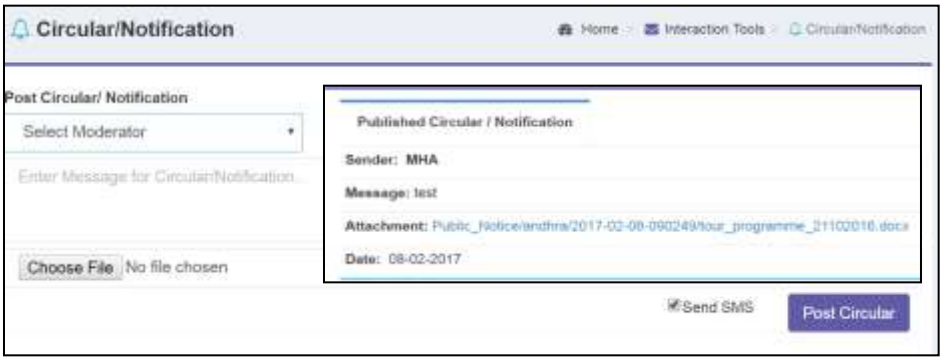
Multi Layer Analysis Tool:

- Spatial analysis tool enables the user to add multiple layers on NDEM Map Viewer for analyzing the features for effective decision making.

Interaction Tools

- ✓ Interaction tools enables dynamic communication & data exchange amongst all battalions and Headquarters.
- ✓ Portal has capability of sending/receiving SMS for quick action.

All communications are enabled with SMS alerts for quick response.



Live Audio/video chat

SMS through portal	
Mobile No.	**Date & Time : Message**
9811311381	31-05-2016 14:48:39 : Distress call attended by neha with action : help
8657873854	31-05-2016 12:52:00 : Required food
7774997467	31-05-2016 12:28:36 : Required food packet and water
8347592465	31-05-2016 10:20:22 : a building collapsed near chiloda please need to help of NDRF

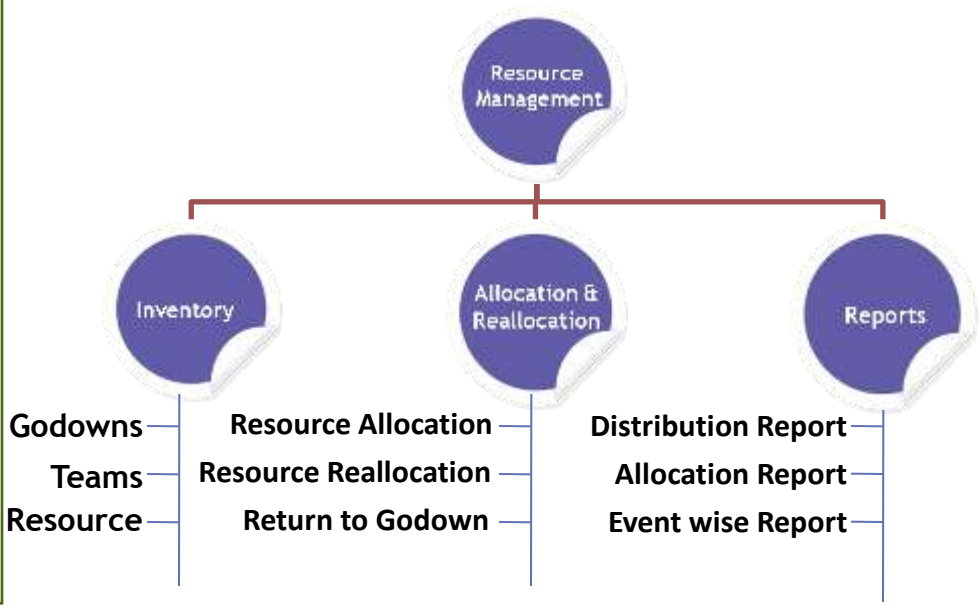
Audio Video live chat System is enabled with:

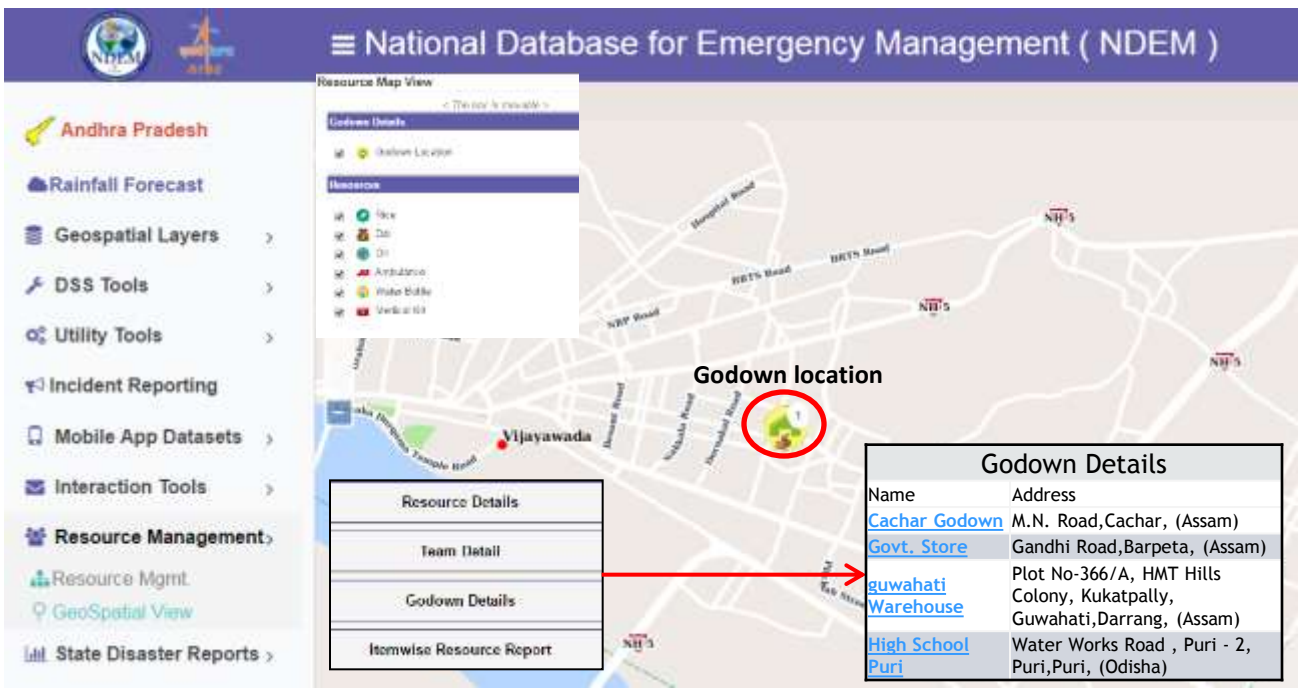
- ✓ Audio and Video conferencing
- ✓ Online Meeting/Conference
- ✓ Screen sharing
- ✓ Co-browsing
- ✓ Application sharing
- ✓ Real time Collaborating documents
- ✓ File sharing

Resource Management

A well planned resource management module is developed to cover inventory,Resource allocation, organisation and tracking of essential commodities/ resources during disaster time.

This modules enables disaster relief operations with optimal use of resources (personnel, facilities, supplies, and equipment) from different organizations and multiple jurisdictions.





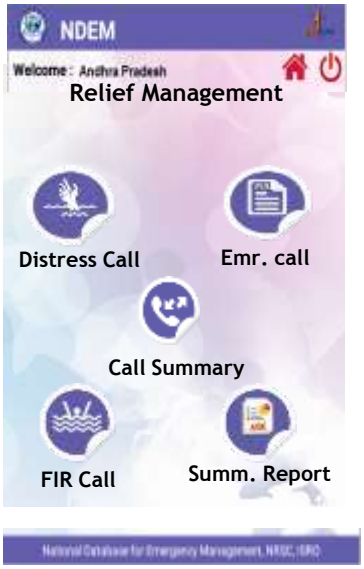
Mobile apps

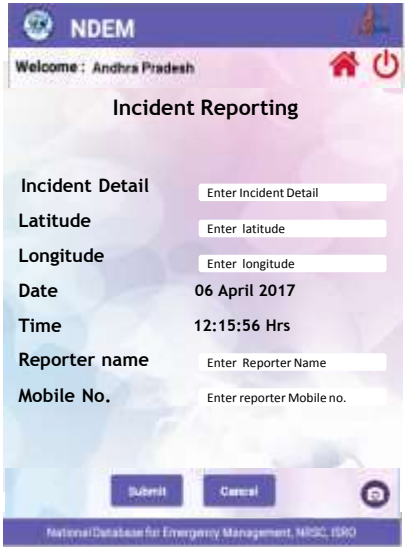
Mobile applications have been customized to collect emergency facilities (hospitals, relief shelters etc.), geo-tagging of information using online maps, performing relief management in near/real time using mobile devices for effective decision making.

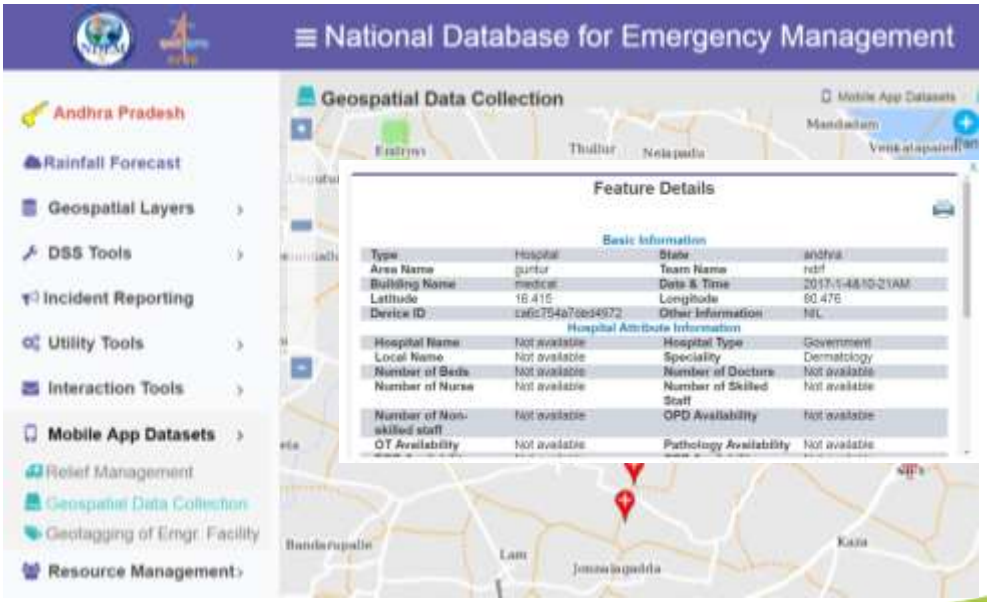
- **Relief Management** – This mobile App helps to collect & transmit field information along with photographs from disaster site in real time to visualize the events on the portal for further decision making.

- **Geospatial data collection**–This mobile app enables collection of emergency facilities along with photograph in real-time and transmit to central server.

- **Geo-tagging of emergency facilities** - This mobile app is developed where a user can tap on any facility on any online map to fetch the geographical coordinates of the facility along with attributes. The received information is integrated into NDEM framework to visualize on the geospatial viewer for effective decision making.







Capacity building

- In order to create awareness about the utilization of NDEM portal products and services for disaster management, Nodal officers meetings and Regional training programmes are conducted.
- Two Regional training programmes are conducted at 6 locations across the country.
- About 210 State/Central department officials were trained in these training programs.
- Apart from regional programmes, Nodal officers meetings were also conducted to familiarize about the latest features and data upload modules of the portal

#	Program	Venue
1	Training Programme to Central/State/NDRF	'6' regions across the country
2	Customized training programmes States	State Disaster Dept
3	One day familiarization pogrammme on NDEM for relief commissioners	NRSC, Hyderabad
4	Nodal officers meeting	MHA, Delhi
5	Training programme for NDMA officials	NDMA, Deihi

NDEM Events

Release of NDEM Version 3.0 Geoportal – May 2017

MoU Signing with Govt. of Andhra Pradesh - March, 2017

Release of NDEM- NDRF Portal- January, 2017

NDEM Training pgm at NDMA, Delhi-August, 2015

Launch of NDEM V 2.0 – May 2015

NDEM training pgm at Kolkata- July, 2015

Project Director , NDEM
National Remote Sensing Centre
ISRO, Dept. of Space, Govt. of India
Hyderabad - 500037

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