

nrsc



NATIONAL DATABASE FOR EMERGENCY MANAGEMENT (NDEM)

Web enabled Geospatial Portal for Emergency Management

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



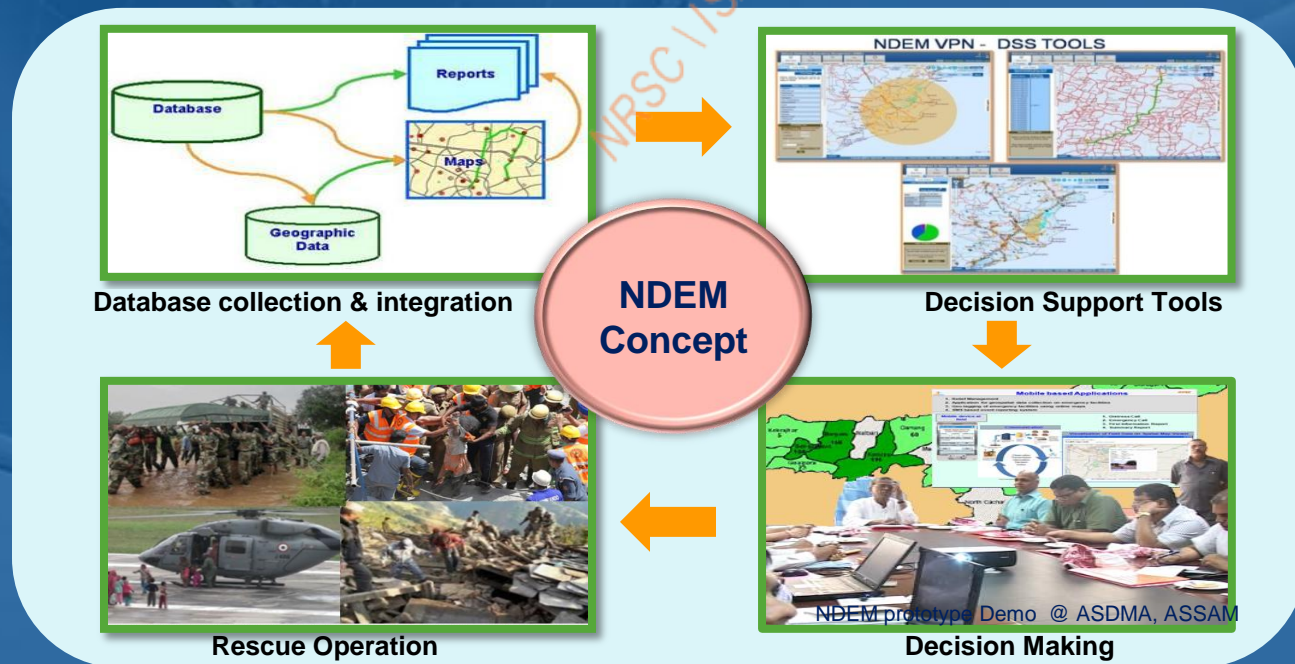
Background

- ❑ National Database for Emergency Management (NDEM) is conceived as a GIS based repository of data to support disaster/emergency management in the country. As the different datasets ingesting into the NDEM are generated by or available with different organizations/agencies, the implementation of NDEM is planned as a multi-institutional coordinated effort.
- ❑ The Committee of Secretaries (CoS) entrusted the task of designing, developing and implementing of NDEM to Indian Space Research Organisation (ISRO), Department of Space (DoS) and from DOS, the National Remote Sensing Centre (NRSC) is the lead agency to implement and operationalize NDEM for Ministry of Home Affairs (MHA).
- ❑ The scope of NDEM encompasses all emergency situations arising out of natural as well technological disasters. It is essentially to serve as a national repository of the country to assist the disaster managers at various levels in decision making for managing emergency situations.

NRSC/ISRO implemented NDEM and launched NDEM portal on satellite based Virtual Private Network (VPN) for secured access and also on ISRO Bhuvan platform for public access. Value added products are hosted on NDEM portals for major disaster events.

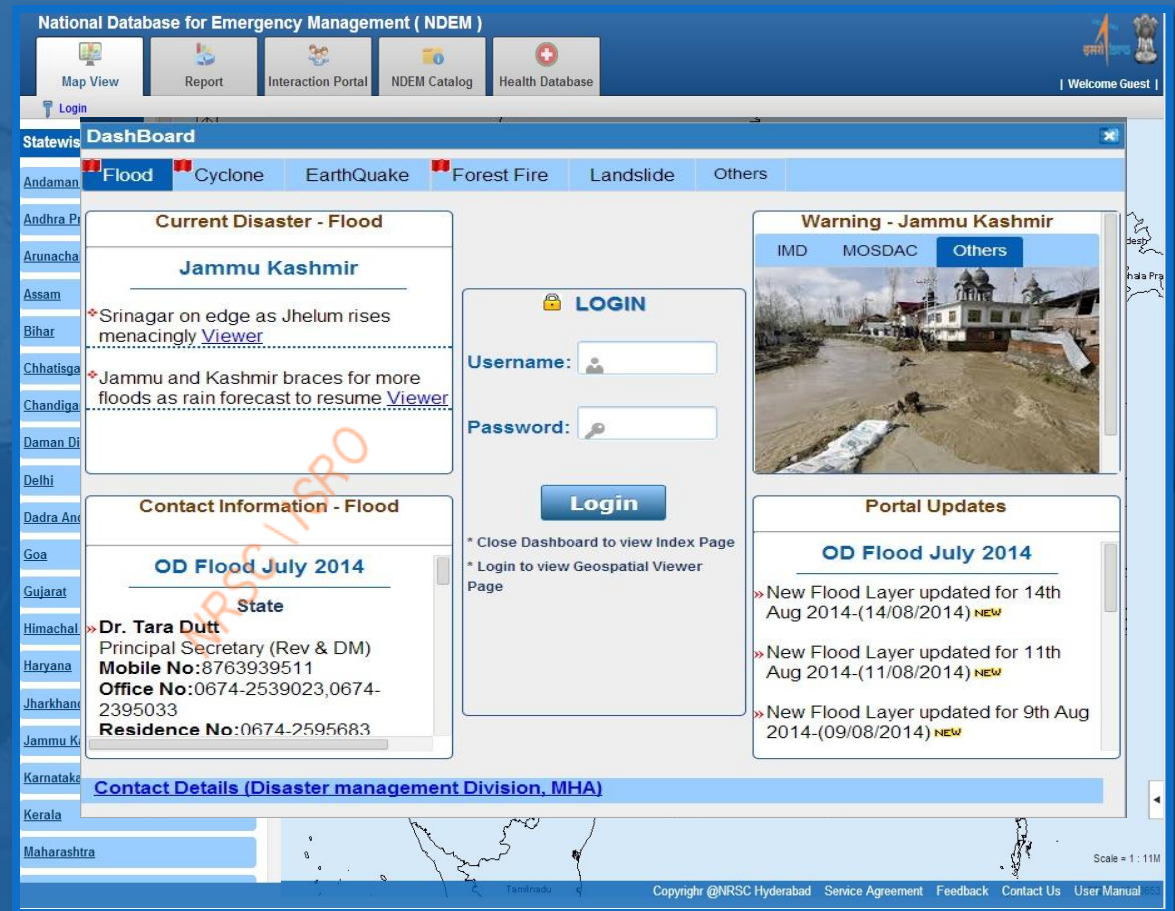
Objectives

- ❑ 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 (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 Version - 2.0

- ❑ To serve the nation with satellite imagery & value added disaster products in secured environment, NDEM web portal was designed and developed using open source tools with multi-level authentication facilities for accessing by concerned State and Central departments.
- ❑ The NDEM portal was enabled on ISRO–DMS satellite based Virtual Private Network (VPN).
- ❑ ISRO established this DMS-VPN at selected State Emergency Control Centers, Nodal departments (CWC, IMD, GSI etc.) and also at important Central departments such as MHA, NDMA, Cabinet Secretariat etc.
- ❑ The disaster products generated under ISRO Disaster Management Support (DMS) Programme are hosted on the portal for downloading for further decision making by States.



The main aim of NDEM is to provide value added products and services to the users at the time of disaster / emergency situation even in the case of terrestrial communication failure.

Geospatial Data Services - NDEM VPN Portal

Core Database

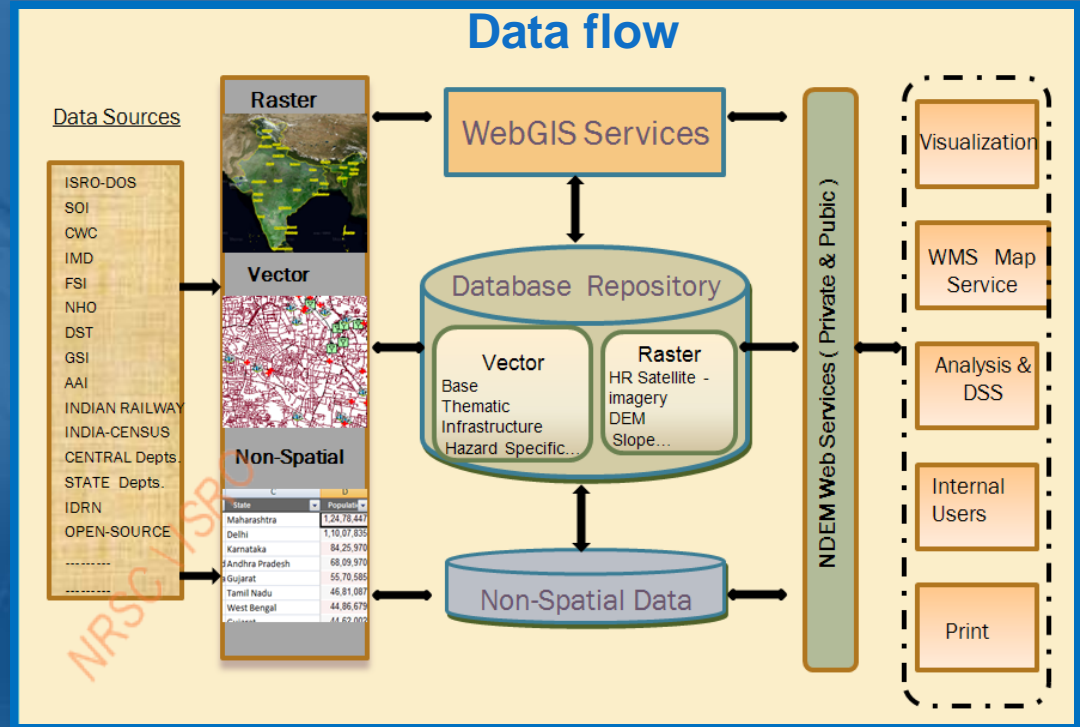
- ✓ Base data
- ✓ Thematic data
- ✓ Infrastructure data
- ✓ Raster data

Hazard Specific Database

- ✓ Flood
- ✓ Cyclone
- ✓ Tsunami
- ✓ Forest fire
- ✓ Earthquake
- ✓ Landslide
- ✓ Drought

Non- Spatial Database

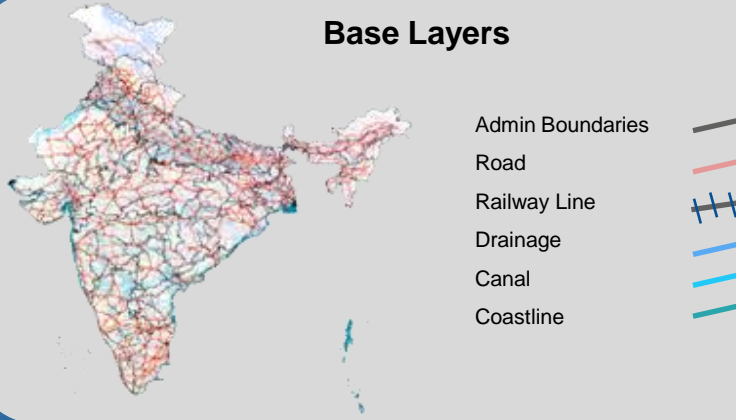
- ✓ Socio Economic
- ✓ Census 2011
- ✓ IDRN 2014
- ✓ Health Data



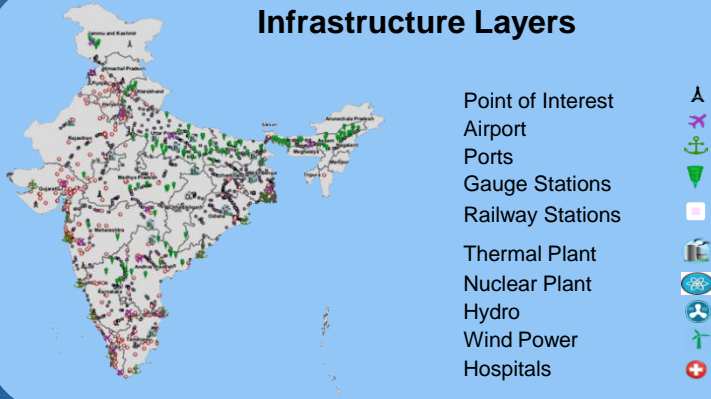
- ❑ The entire database of NDEM is organized in vector and raster formats.
- ❑ The vector files are organized in file model in shape file format. This component enables the vector data to provide geometric features along with attributes to the corresponding geometry. Similarly raster data sets are organized in image format for further visualisation.

Database Details – NDEM VPN Portal

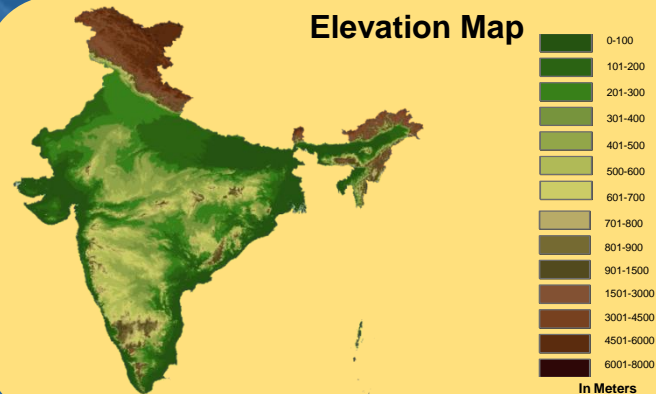
Base Layers



Infrastructure Layers



Elevation Map



State wise at 1:50,000 scale

S. No	Layer
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(Point)
INFRASTRUCTURE	
19	Railway stations
20	Hospitals
21	Airports
22	Helipads
23	Ports
24	River Gauge Stations
25	Ponds & Tanks
26	Dams(Point)
27	Dams(Area)or Reservoir
28	Power plants
29	Point of Interest
DISASTER SPECIFIC LAYERS	
30	Flood
31	Cyclone
32	Forest Fire
33	Earthquake
34	Drought
35	Landslide

RASTER

36	LISS IV MX
37	Carto2 DEM
38	ACE2 DEM
39	SRTM DEM

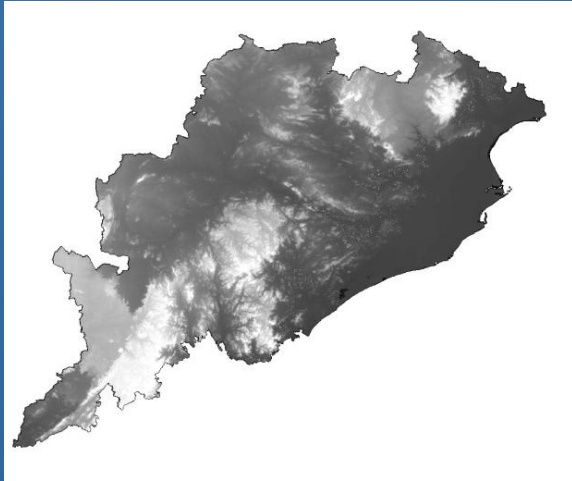
District wise at 1:10,000 scale

S. No	Layer
BASE LAYERS	
1	Administrative Boundary
2	Drainage
3	Road
4	Rail
THEMATIC LAYERS	
5	Land cover
6	Surface water body
7	Settlements
INFRASTRUCTURE	
8	Infrastructure
9	Transport nodes
RASTER	
10	Cartosat – 1(2.5m Ortho)
11	Cartosat -1 + LISSIV MX NCC (2.5m)

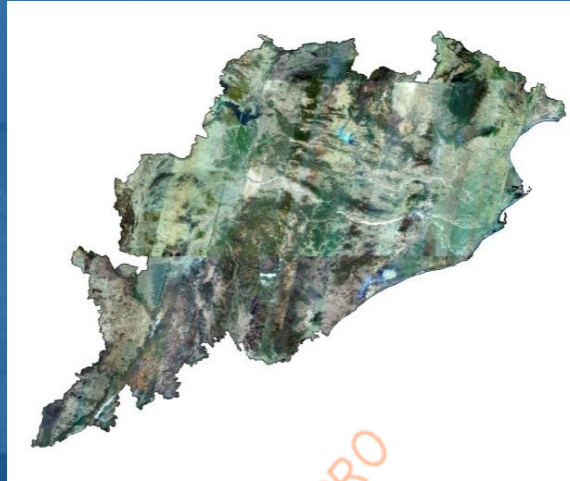
City-wise at 1:2,000 scale

S No.	Content
1	Urban Specific Database <ul style="list-style-type: none"> Hyderabad Bangalore Delhi Mumbai Kolkata
2	Very High Resolution Satellite Imagery (better than 1m)

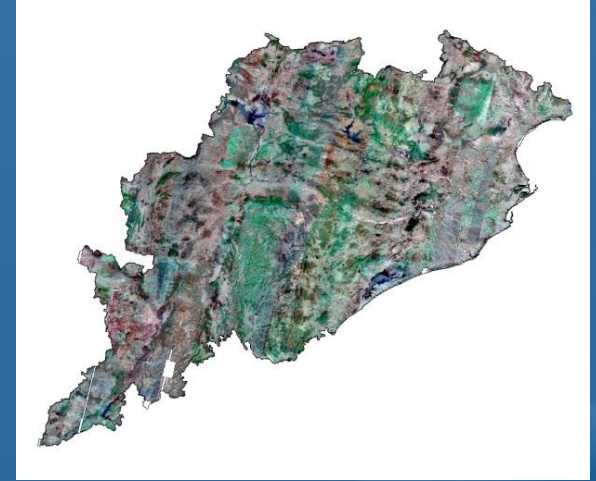
Raster Data Service - NDEM VPN Portal



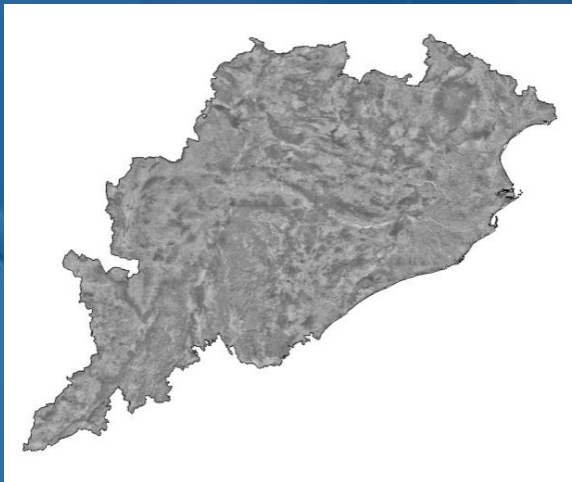
CARTO2DEM - 30M



IRS LISS IV - 5.8M



CARTOSAT 1 + LISS IV - 2.5M



CARTOSAT 1 - 2.5M



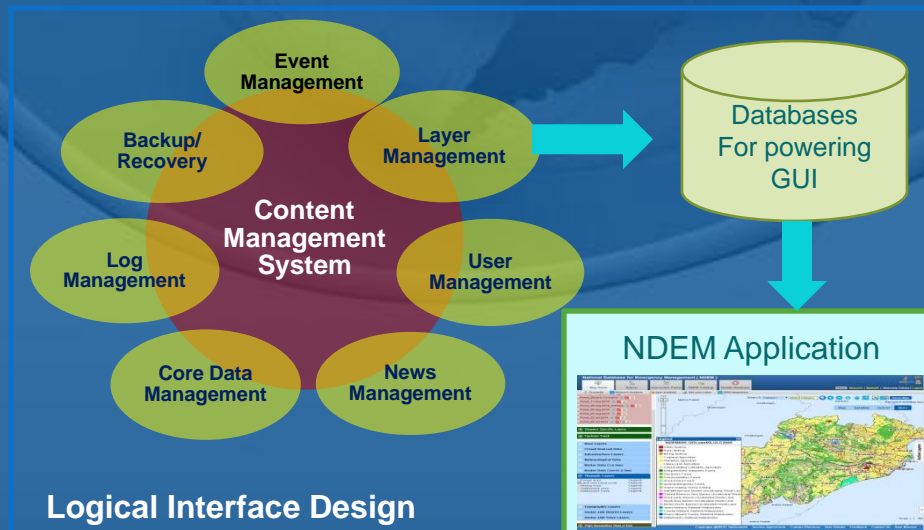
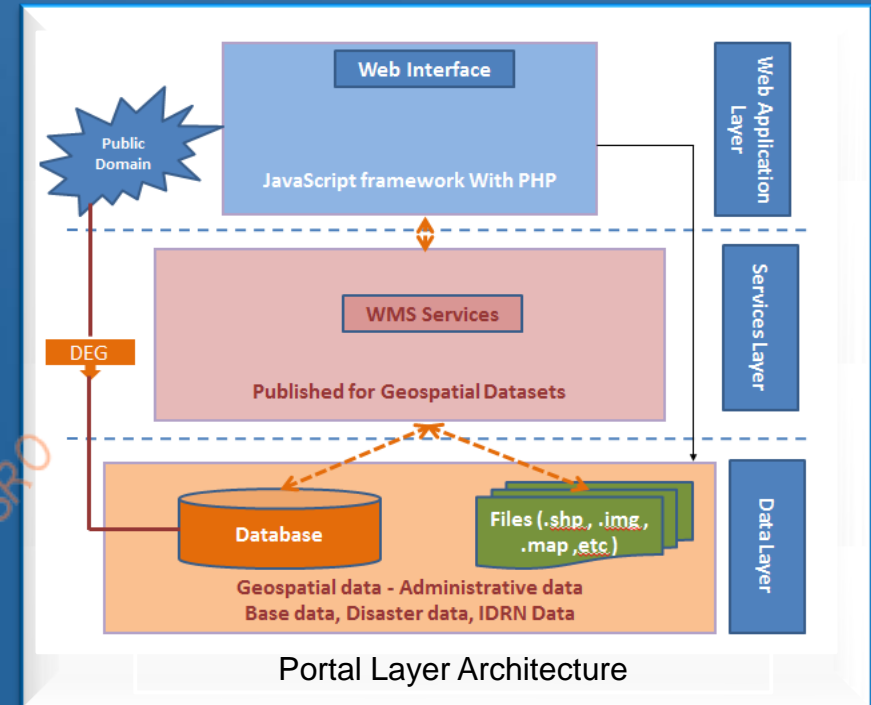
CARTOSAT 2 + LISS IV - 1M



Very High resolution data < 1M
(from foreign satellites)

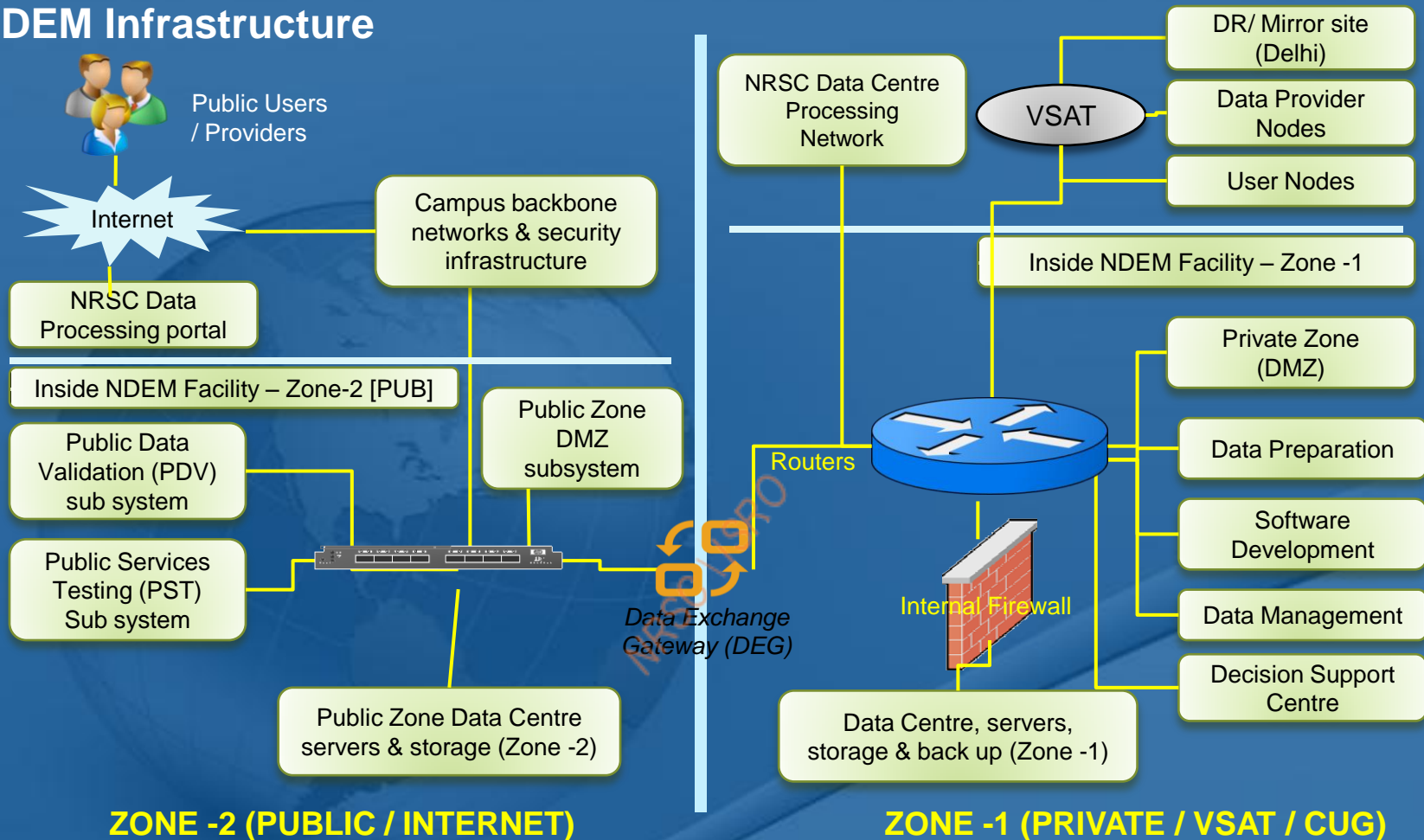
Web Architecture - NDEM VPN Portal

- ❑ NDEM VPN framework is based on 3-tier web architecture consists of *Data, Services & Web application* with appropriate interfaces between them.
- ❑ The technologies being used are JavaScript, PHP, Python, HTML etc.
- ❑ Data layers contain the geospatial and non-spatial data in the form of vector and raster. The database is organized and seamlessly integrated with Geospatial service.
- ❑ Geospatial services are made available to the end users in the form of WMS.
- ❑ Decision Support System (DSS) tools are developed for effective decision making through Web Interface.



NDEM Portal is a database driven application with user friendly GUIs. The content management system store meta data of spatial database contents for managing various disaster specific events. Any updation in content management system automatically reflect in NDEM portal for faster hosting of the disaster specific products in near real time environment.

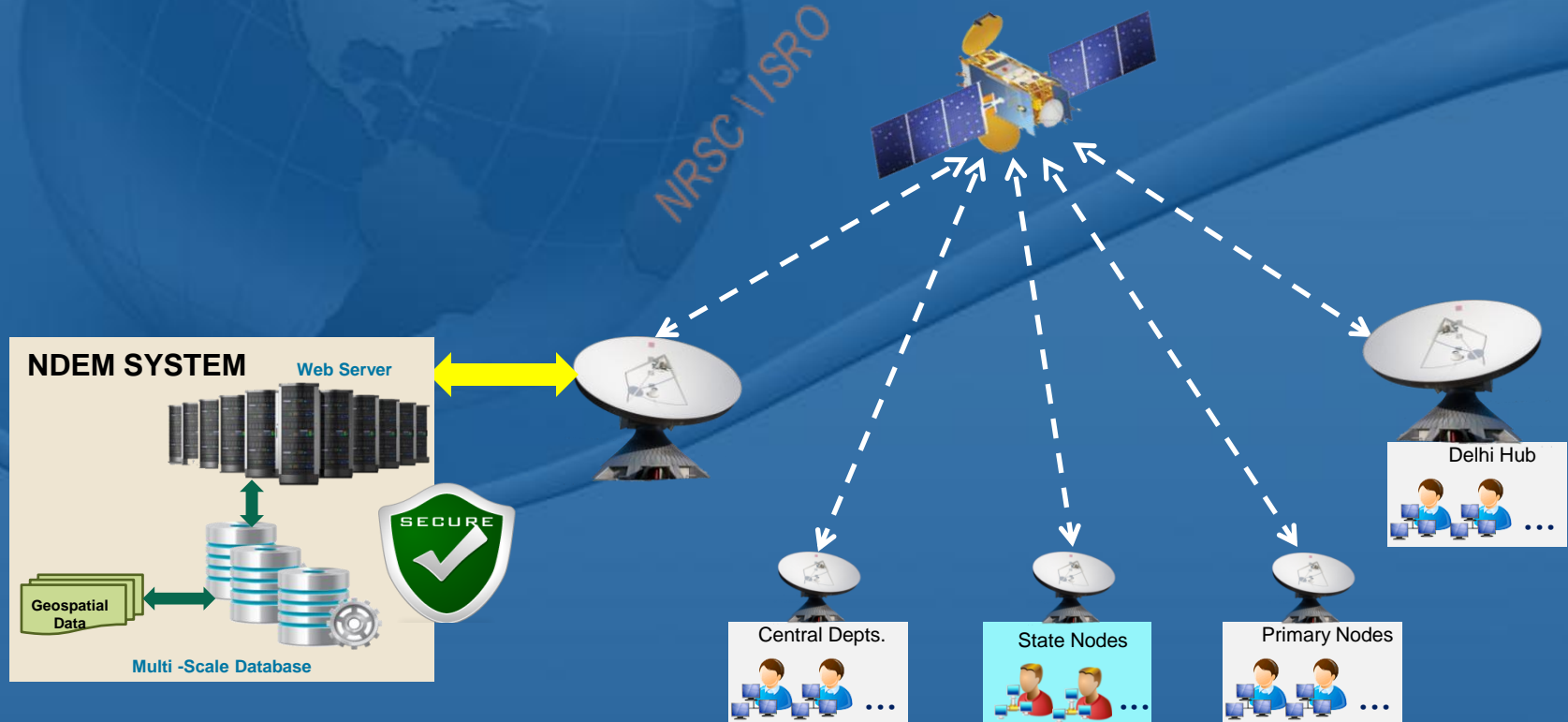
NDEM Infrastructure



- ❑ NDEM system architecture depicts the two zones, Zone-1(Private) and Zone-2(Public) with its various subsystems.
- ❑ Private Zone contains classified & non-classified data and services with VSAT connectivity between Central/State emergency operations centers.
- ❑ Public Zone contains non-classified data sets and relevant public interest application services hosted on internet connectivity.

NDEM VPN – Communication Network

- ❑ ISRO-DMS VPN network operates in Extended C band transponder of GSAT#12 Satellite.
- ❑ Enable two-way Connectivity between National Emergency Operation Centre(NEOC) & State Emergency Operation Centres (SEOCs) for Disaster Management related interactions.
- ❑ Each Node can transfer data in the form of video, data and voice communication simultaneously.
- ❑ The Network operates on demand-based bandwidth allocation to avoid congestion during any major disaster.
- ❑ The State Nodes are located at capital of multi-hazard prone States interconnected with NEOC.



Features - NDEM VPN Portal

News and Alerts

Disaster dashboard highlights current disaster news, disaster warning from available sources, relief manager contact number and portal updates

Active Disaster Details

Shows the details of current disaster occurred with area, geo location on GIS viewer and also available along with reports

Restricted Data Access

For visualization of very high resolution aerial/satellite data for selected disaster situations, restricted access with OTP authentication is enabled.

IDRN and Health Database

India Disaster Resource Network (IDRN) database of MHA and available health database is integrated for planning relief & rescue operations.

Interaction Portal

Dynamic communication & data exchange among relief/disaster manager for better action.

Multi State info Viewer

Information on disaster products of each state, current disaster occurred in States in one viewer.

Historical Disaster Database

Historical disaster database for better understanding of the present situation and act as a knowledge base.

Reports and Maps

Comprehensive outputs of the disaster event in the form of reports and maps for utilization by disaster managers

Mobile Application

A suite for collecting field data for relief management activities, incident reporting etc.

Content Management System

Managing the NDEM administrative activities such as uploading layer, add or delete user, managing event, monitoring the logs and etc.

Homepage - NDEM VPN portal

- ❑ NDEM portal with standard GIS functionalities is developed using open source softwares with multi-level authentication. State wise access is enabled to all States/UTs for accessing disaster services.
- ❑ Decision Support Tools covering optimal routing, proximity of emergency facilities, spatial query for relief operations have been customized and implemented through simple and easy to use GUIs.
- ❑ Dashboard for highlighting the disaster specific events along with various GIS based utility tools such as add User-shapefiles, Search, Query, Analysis, Visualization on Map viewer etc.

State User (Odisha)

National Database for Emergency Management (NDEM)

Map View | Report | Interaction Portal | NDEM Catalog | Health Database

Proximity | Network Analysis | Layer Analysis | Add your Layer | IDRN Integration

Layers | Tools Output

Active Disaster Specific Layers

- Flood_14 Aug 2014
- Flood_28 Jul to 11 Aug 14
- Flood_11 Aug 2014 evening
- Flood_09 Aug 2014 evening
- Flood_05 Aug 2014
- Flood_23 Jul 2014
- Flood_29 Jul 2014

Disaster Specific Layers

Cyclone Track

Base Layers

- Crowd Sourced Data
- Infrastructure Layers
- Meteorological Data
- Raster Data (>2.5m)
- ACE-2 DEM 30m
- CARTOSAT-DEM 30m
- IRS LISS-IV 5.8m

Raster Data (1m to 2.5m)

Thematic Layers

Topographic Layers

Vector 10K District Layers

Vector 10K Town Layers

High Resolution Data (<1m)

Legend

District

- District at 3M to 4.5M scale
- District at 600K to 3M scale

Central Dept. User (MHA)

National Database for Emergency Management (NDEM)

Map View | Report | Interaction Portal | NDEM Catalog | Health Database

Proximity | Network Analysis | Layer Analysis | Add your Layer | IDRN Integration

Layers | Tools Output

Disaster Specific Layers

State Detail

State Data & Services Detail

State	G.L.	D.S.L.	Mail
Andaman And Nikobar	G.L. 25	D.S.L. 0	Mail: 0
Andhra Pradesh	G.L. 44	D.S.L. 21	Mail: 1
Arunachal Pradesh	G.L. 31	D.S.L. 0	Mail: 0
Assam	G.L. 45	D.S.L. 33	Mail: 0
Bihar	G.L. 41	D.S.L. 47	Mail: 0
Chandigarh	G.L. 27	D.S.L. 0	Mail: 0
Chhattisgarh	G.L. 34	D.S.L. 6	Mail: 0
Dadra And Nagar Haveli	G.L. 25	D.S.L. 0	Mail: 0
Daman Diu	G.L. 25	D.S.L. 0	Mail: 0
Delhi	G.L. 29	D.S.L. 2	Mail: 0
Goa	G.L. 33	D.S.L. 0	Mail: 0
Gujarat	G.L. 55	D.S.L. 8	Mail: 0
Haryana	G.L. 41	D.S.L. 6	Mail: 0
Himachal Pradesh	G.L. 39	D.S.L. 12	Mail: 0
Jammu And Kashmir	G.L. 48	D.S.L. 21	Mail: 0
Jharkhand	G.L. 35	D.S.L. 6	Mail: 0
Karnataka	G.L. 39	D.S.L. 11	Mail: 0
Kerala	G.L. 38	D.S.L. 1	Mail: 0
Lakshdweep	G.L. 20	D.S.L. 0	Mail: 0
Madhya Pradesh	G.L. 36	D.S.L. 6	Mail: 0
Maharashtra	G.L. 41	D.S.L. 12	Mail: 0
Manipur	G.L. 33	D.S.L. 0	Mail: 0
Meghalaya	G.L. 35	D.S.L. 1	Mail: 0
Mizoram	G.L. 31	D.S.L. 0	Mail: 0
Nagaland	G.L. 39	D.S.L. 2	Mail: 0
Odisha	G.L. 44	D.S.L. 30	Mail: 0
Pondicherry	G.L. 27	D.S.L. 0	Mail: 0
Punjab	G.L. 39	D.S.L. 11	Mail: 0
Rajasthan	G.L. 32	D.S.L. 6	Mail: 0
Sikkim	G.L. 33	D.S.L. 0	Mail: 0
Tamilnadu	G.L. 37	D.S.L. 7	Mail: 0
Tripura	G.L. 35	D.S.L. 0	Mail: 0
Uttar Pradesh	G.L. 41	D.S.L. 25	Mail: 0
Uttarakhand	G.L. 39	D.S.L. 1	Mail: 0
West Bengal	G.L. 38	D.S.L. 8	Mail: 0

VPN Active State (15) | VPN Available State (19) | VPN Unavailable State (16) | Active Disaster State (4)

G.L.: Geospatial Layer | D.S.L.: Disaster Specific Layer

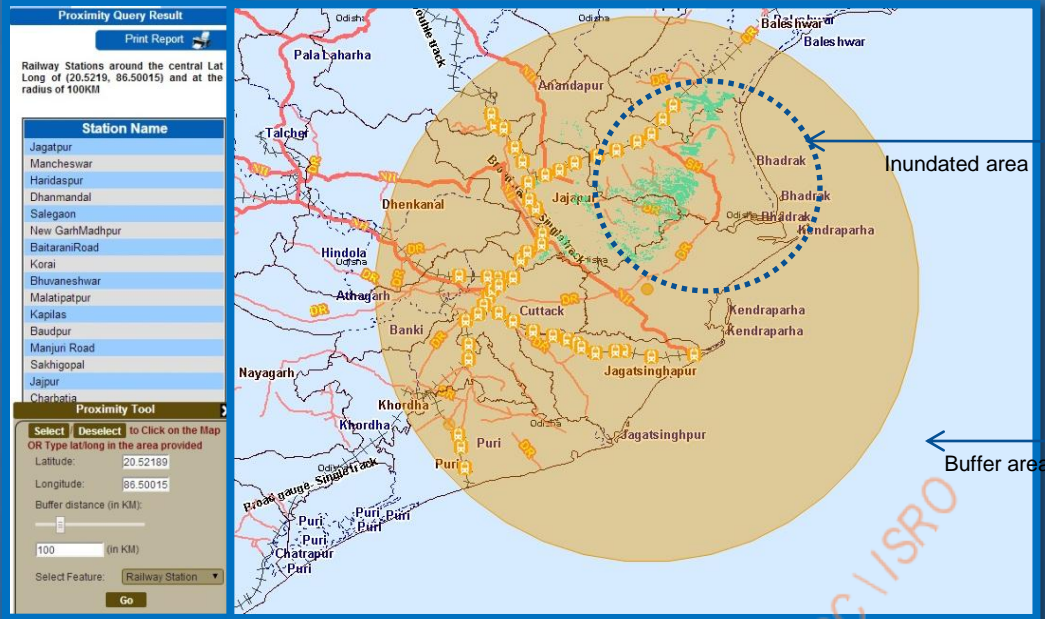
Select the State Checkbox to view Geo-spatial Layers in Left Panel. Click on State Image to view State page.

Scale = 1 : 25 M

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Central department users can visualize multiple State database simultaneously and can navigate to any State.

Decision Support System (DSS) Tools - NDEM VPN Portal

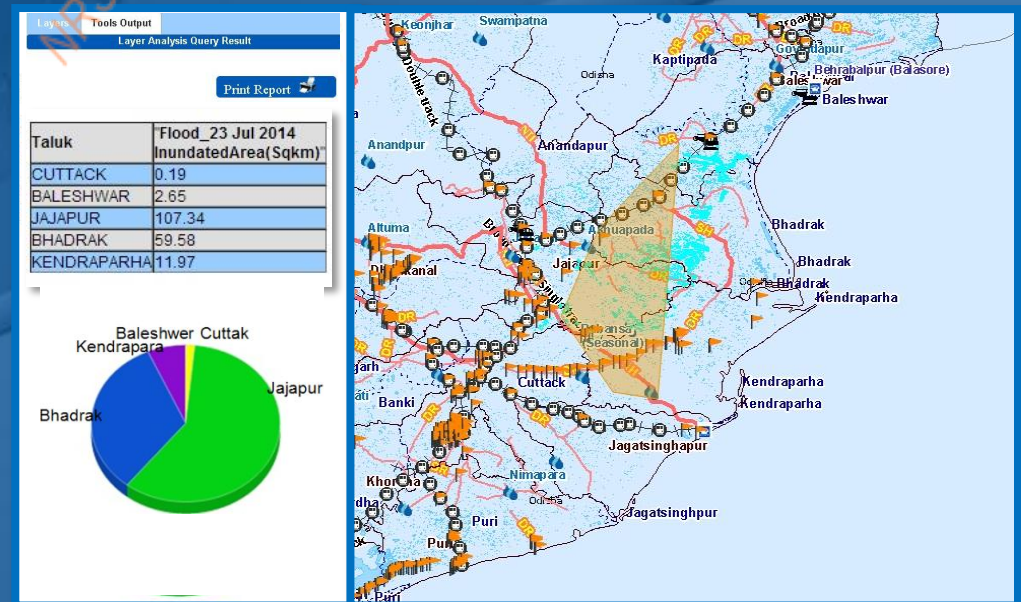


Proximity Tool:

- 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.

Multi Layer Analysis Tool:

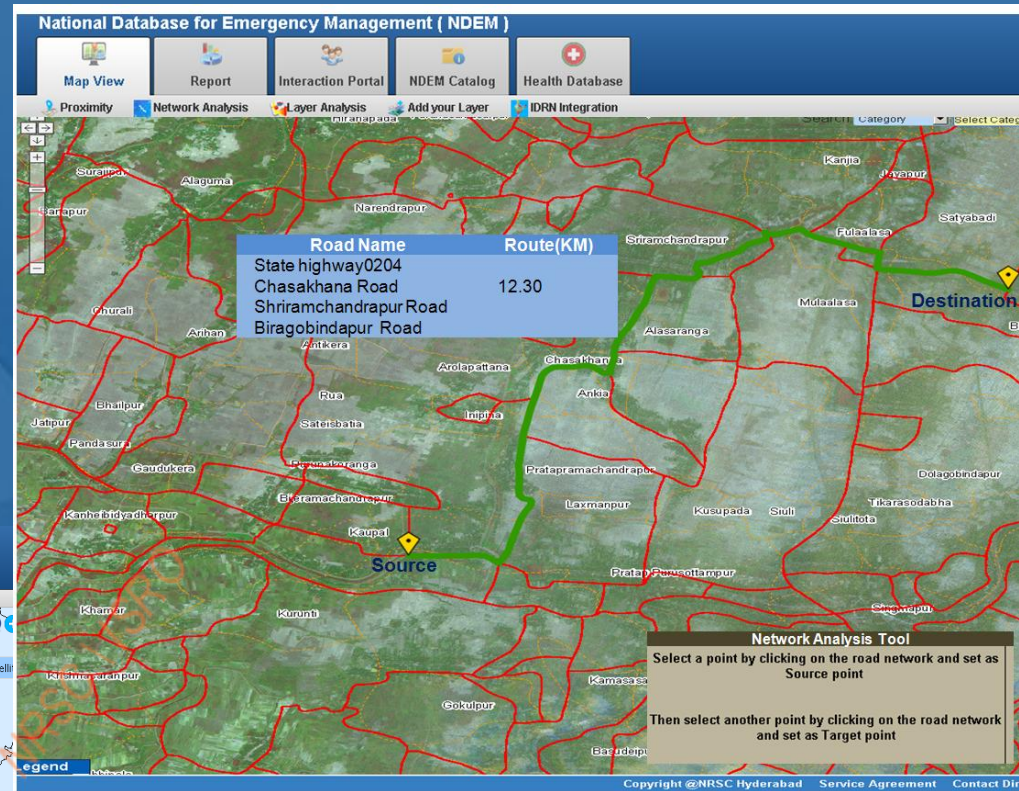
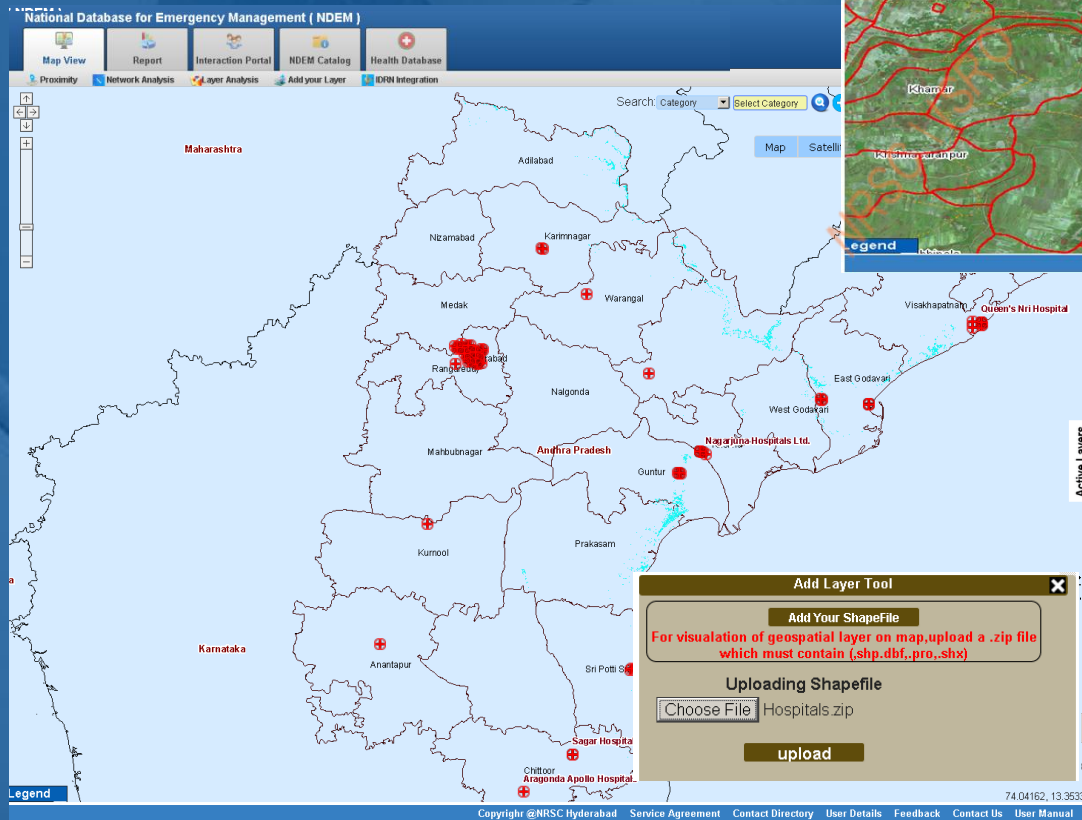
- Spatial analysis tools enables the user to add multiple layers on NDEM Map Viewer for analyzing the features for effective decision making.



DSS Tools (contd..)

Network Analysis Tool:

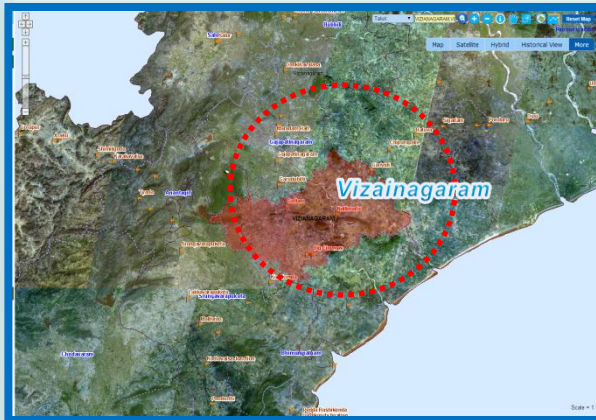
- ❑ Network analysis facilitate the user to find out the shortest route between emergency facility and user interested location/disaster site with details of the route.
- ❑ The routing tool enables finding out shortest way to locate shelters, hospitals etc. with road network data.



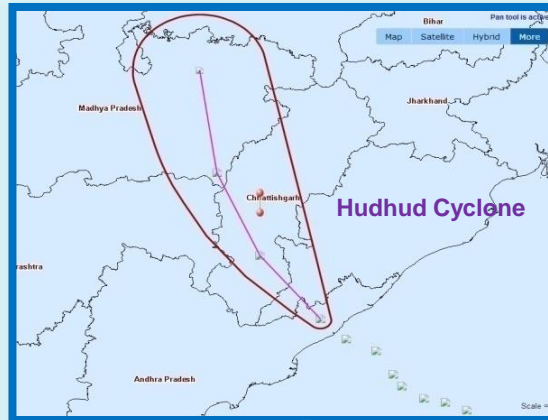
Add user specific data Tool:

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

Other Services - NDEM VPN Portal



Search Tool



Cyclone Track



Indian Disaster Resource Network (IDRN) Data



Reports

National Database for Emergency Management (NDEM)

Map View Report Interaction Portal NDEM Catalog Health Database

Mobile Apps Mobile Application manual

Downloadable Products For Disaster Event

Disaster Category	Layer Name	Layer Report	Downloadable Maps
Cyclone	OCyclone13se102013	Report	Map1 Map2 Map3 Map4
Cyclone	OCyclone14102013	Report	Map1 Map2 Map3 Map4
Cyclone	OCyclone15102013	Report	Map1 Map2 Map3 Map4
Cyclone	OCyclone17102013	Report	Map1 Map2 Map3 Map4
Cyclone	OCyclone1999	Report	Map1 Map2 Map3 Map4
Flood	OCFlood05082014	Report	Map1 Map2 Map3 Map4
Flood	OCFlood09082014	Report	Map1 Map2 Map3 Map4
Flood	OCFlood11082014	Report	Map1 Map2 Map3 Map4
Flood	OCFlood12082014	Report	Map1 Map2 Map3 Map4
Flood	OCFlood14082014	Report	Map1 Map2 Map3 Map4
Flood	OCFlood23072014	Report	Map1 Map2 Map3 Map4
Flood	OCFlood25102013	Report	Map1 Map2 Map3 Map4
Flood	OCFlood29072014	Report	Map1 Map2 Map3 Map4

Dataset catalog

National Database for Emergency Management (NDEM)

Map View Report Interaction Portal NDEM Catalog Health Database

Compose Mail Inbox Sent Mails Trash

Post Public Notice
Select Approving Authority

Public Notice

Sender : Jammu

Message:
Jammu & Kashmir braces for more floods as rain forecast resume.

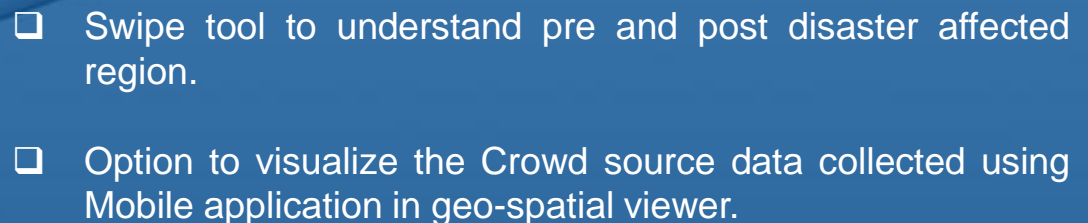
Sender : NRSC

Message:
New flood layer uploaded on 31st March 2015(1800Hrs IST) pertaining to J&K (01/04/2015)

Interaction portal

- NDEM public portal is having non-classified subset of data repository and relevant disaster specific products & services over internet connectivity. This portal is deployed through Bhuvan platform, which is a gateway to Indian Earth Observation Data Products & Services.

- ❑ Event based disaster products such as flood, cyclone, forest fire, landslide, earthquake, and drought layers are provided for decision making.

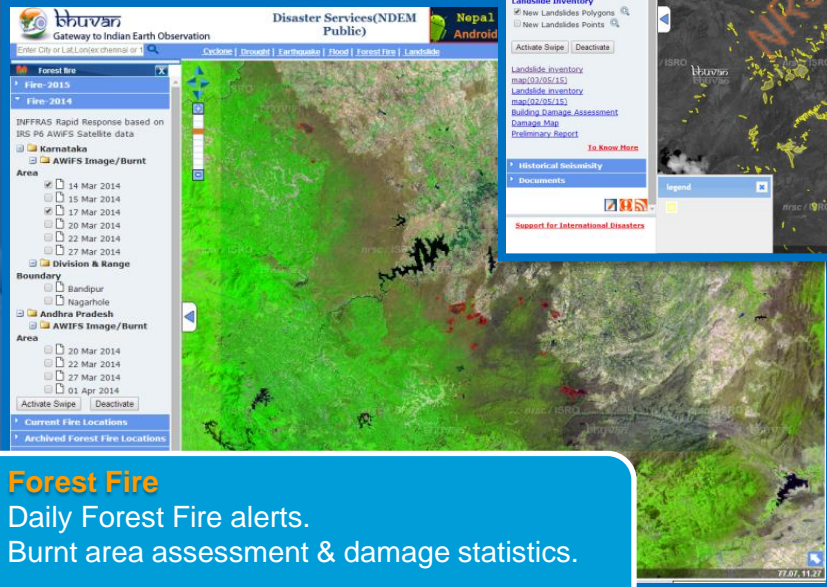
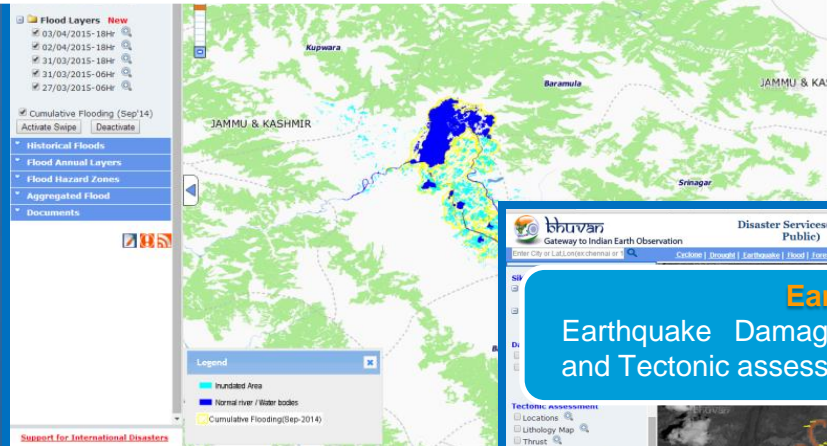


<http://bhuvan-noeda.nrsc.gov.in/disaster/disaster/disaster.php>

NDEM Public Portal – Disaster services

Flood, Cyclone & Tsunami

Event based value added flood/cyclone inundation products. Historical Flood inundation maps from 1998-till date.

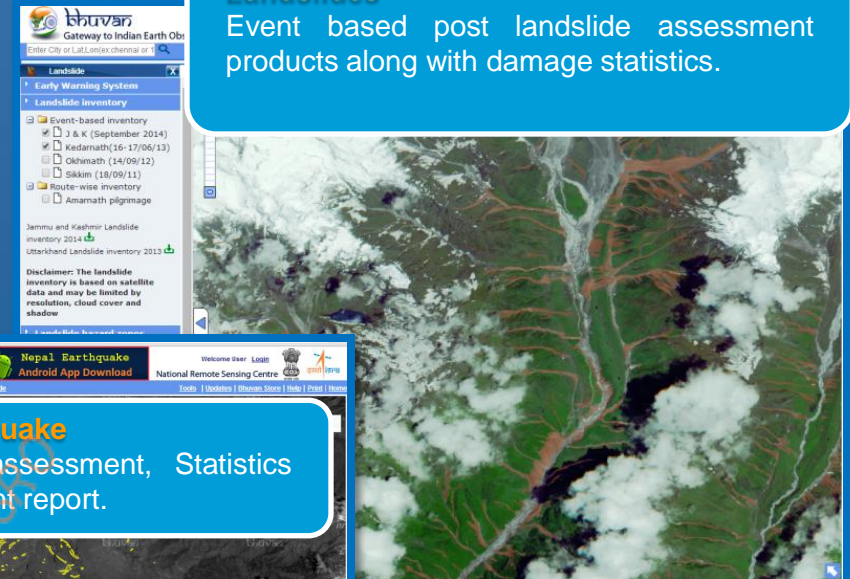


Forest Fire

Daily Forest Fire alerts.
Burnt area assessment & damage statistics.

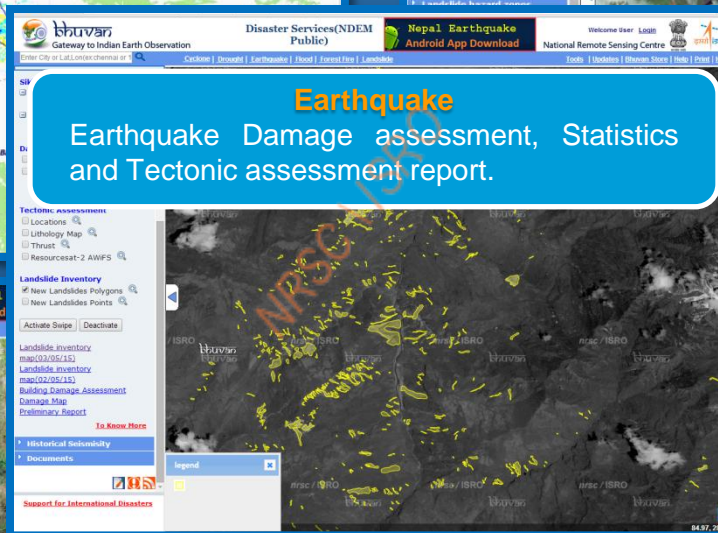
Landslides

Event based post landslide assessment products along with damage statistics.



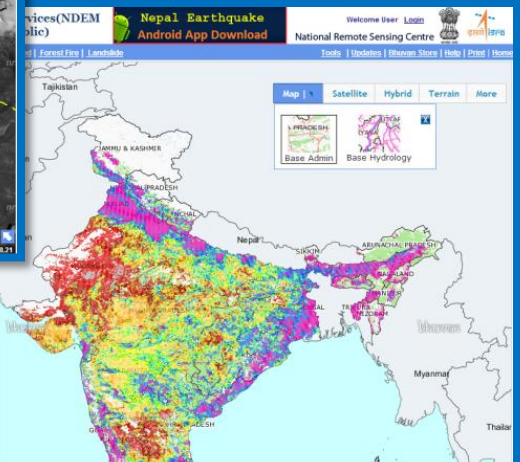
Earthquake

Earthquake Damage assessment, Statistics and Tectonic assessment report.



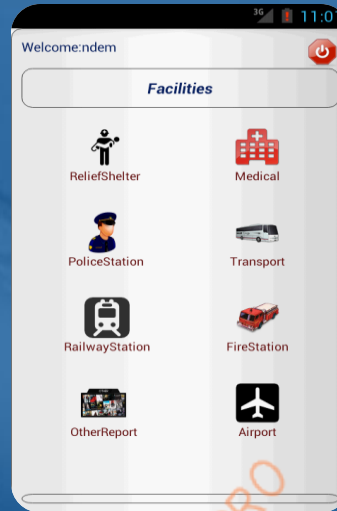
Drought

Agricultural drought assessment using space technology inputs.

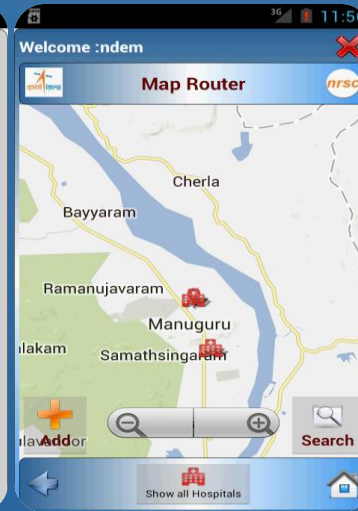


Mobile Applications

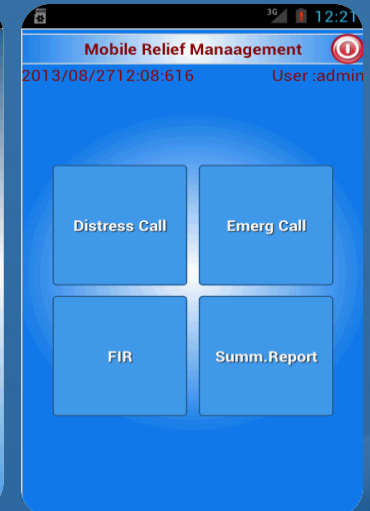
Mobile applications have been customized to collect emergency facilities (hospitals, relief shelters etc.), geo-tagging of information using online maps, performing relief management in near/real time using mobile devices for effective decision making.



Geospatial data collection



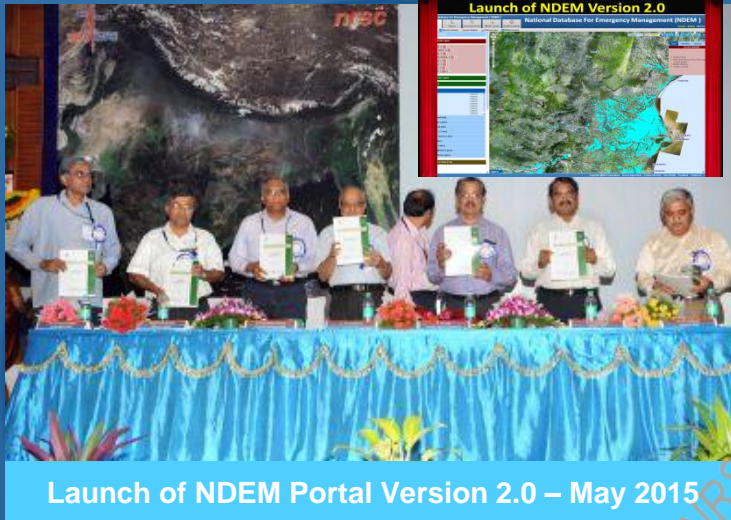
Geo-tagging of emergency facilities



Relief Management using mobile application

- ❑ **Geospatial data collection** – Collection of information about the emergency facilities such as medical facilities, relief shelters, police/fire stations, transportation details etc., are helpful for decision making. This mobile app enables collection of emergency facilities along with photograph in real-time and transmit to central server.
- ❑ **Relief Management** – The real –time field data collected and received through mobile devices is helpful for relief management. This application helps to collect & transmit field information along with photographs from disaster site in real time to visualize the events, performing the relief operations in a better way by communicating back to field functionaries.
- ❑ **Geo-tagging of emergency facilities** – To better utilise the capabilities of online maps on mobile devices, a mobile app is developed where a user can tab 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.

NDEM Events





For further information contact:

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