BHUVAN
Disaster Risk Reduction, Damage Assessment and Response
UNITED Nations/India Workshop
8-10, March 2016

The Geo-Platform Supporting Disasters

www.bhuvan.nrsc.gov.in

National Remote Sensing Centre
Indian Space Research Organization
Department of Space, Hyderabad

Vinod M Bothale
Group Director
Geoportal and WebGIS Services
The Indian Sub-Continent is among the World’s Most Disaster-prone Areas
Disaster Management & Risk Reduction

Early Warning
- Early warning for Landslides
- Forecast: Run-off Depth
- Info. on terrain, hydrologic, climatic
- Socio-economic info.
- Hazard zones
- Historical disaster damages
- Drought scenarios
- Pre and Post event change detection
- Identification of damages
- Assessment
- Crowd Sourcing

Risk Information
- Creation of vulnerability info.
- For developmental planning, reconstruction

Impact Assessment

Preparedness

Emergency Communication
- Mobile Apps for incidence reporting
- NDEM Apps for situational help

How does BHUVAN Support?

BHUVAN SUPPORT

Sub-systems

Pre disaster phase
- Preparedness
- Relief
- Mitigation
- Rehabilitation
- Reconstruction

Post disaster phase
- Involvement of Emergency and Lifeline Services
- BHUVAN SUPPORT
1. Visualization Platform
2. Platform for Building User Applications
3. Platform for Building Mobile Applications
4. Platform for For Free Data Clearing House
5. Platform for Navigation
6. Platform for Mapping
7. Platform for Disaster Support

Bhuvan Geo-Platform
Visualization: National to Local up to Cadastre
1. India
2. Pakistan
3. Afghanistan
4. Nepal
5. Bhutan
6. Bangladesh

Elevation in meters

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“1377 tiles, 10.1 GB”
Ground Knowledge gathering to assess disaster damage
## Govt and Citizen Centric Crowd Sourcing

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**Crowd Sourcing 4 Million**

### Postal Services

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<td>No of Offices Moderated</td>
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### Election GIS

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<td>Updated Polling Stations</td>
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Web Map Services (WMS)

OGC Standards Compliant

Satellite data,
Bhuvan base map
Thematic Maps

Services WMS > 6200

Bhuvan-Thematic Services facilitate the users to select, browse and portal. Users can consume these Thematic Datasets and integrate Services.

Select Theme
Select
- Land Use Land Cover (50K): 2005-06
- Land Use Land Cover (50K): 2011-12
- Land Use Land Cover (250K)
- Land Use Land Cover (10K): SIS-DP
- Urban Land Use (10K): NUIS
- Wasteland (50K): 2008-09
- Glacial Lakes/Waterbodies
- Geomorphology (50K): 2005-06
- Lineament (50K)
- Flood Hazard
- Flood Annual Layers
- Erosion (50K): 2005-06
- Salt Affected and Waterlogging (50K): 2005-06
- Water Bodies
- Urban Sprawl

Search Statistics Analysis Metadata WebServices

View
## Bhuvan for Disasters Support

<table>
<thead>
<tr>
<th><strong>Satellite Data</strong></th>
<th>1m (400+ Cities, 5 Lakh Sq Km), 2.5 m (India). Locational Multi-Date</th>
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</thead>
</table>
| **Base Map**       | Scale based (1:50,000 to **1:10,000**)  
1:10,000 - 80% of India and 152 towns from NUIS Projects  
Administrative and Hydrologic Base  
10 Million Point of Interest Data |
| **Thematic Maps**  | **15 Themes** with **Web Map Services** |
| **Data Download**  | Total downloads: **4.7 Lakhs**  
NICES Products: **31,000 +**  
DEM: India + 5 Countries |
| **Disaster Services** | **6 Disasters**, NRT Support for Cyclone, Flood, Landslides, Forest fire  
• **Live Map Upload from DSC**,  
• **Automated Forest Fire Alert** |
| **Applications**   | **45** |
| **State Portals**  | **30** |
| **Ministry Portals** | **22**  
"Open Source Geospatial Approach & OGC compliance Services" |

**Cert-in Jan-2015**

<table>
<thead>
<tr>
<th><strong>DATA</strong></th>
<th>20 TB as Web Maps</th>
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<tr>
<td><strong>Services WMS 6204</strong></td>
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<tr>
<td><strong>Crowd Sourcing</strong></td>
<td>&gt; 39Lakhs</td>
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<tr>
<td><strong>10 Million POI</strong></td>
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DISASTERS: Near Real Time Support

- Cyclone
- Flood
- Landslides
- Forest Fires
- Earthquake
- Droughts

- Historical Floods
- Flood Annual Layers
- Flood Hazard Layers
- Daily Forest Fires
- Drought with Indices
- Landslide Inventory
- Landslide Early Warning
- Hydrologic Processes
Disaster Management Support

**Floods**
- Flood Inundation Maps
- Damage Assessment
- Hazard Zonation
- Annual Flood Inundation

**Weather & Cyclone**
- Intensity & track prediction
- Warnings & Alerts
- Heat wave alerts
- Damage Assessment

**Drought**
- Monthly Agril. Drought Report
- End-of-the-Season Agril. Drought Report
- Carried out by MNCFC

**Forest Fire**
- Active Fire Detection
- Damage Assessment

**Landslide**
- Damage Assessment
- Hazard zonation
- Rainfall induced landslide forecast

**Earthquake**
- Damage Assessment

**Cyclone Tracks**
- Historical Floods
- Flood Annual Layers
- Flood Hazard Layers
- Daily Forest Fires
- Drought with Indices
- Landslide Inventory
- Landslide Early Warning
- Hydrologic Processes
Landslide occurred during Kedarnath Disaster 2013

Landslide areas in neighborhoods of Kedarnath

2013 Uttarakhand during Kedarnath Disaster Landslides - 6595
Inundation Status

Kedarnath View
High Resolution

Ponding and Breach at
Chorabari Glacier

Ground Photos with SatelliteView

Videos from Bhuvan- 3D

Mobile Viewer for Pre-Post Flood Changes

Uttarakhand Relief and Reconstruction Collaboration Portal
Chaurabari Lake burst – Kedarnath tragedy (2013)
MANU : Restoration and Rehabilitation support
MANU : Collaboration Portal : Field data Collected from Mobile

“Trained : 150 Students of 3 University ; On Field : 30 Teams of 3 each”

Profile of Day wise data collection

Total No Of Locations Collected ~ 19,799
(11 Oct 2013 - 18 Feb 2014)

<table>
<thead>
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<th>Category</th>
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<td>LandCover and NaturalResources</td>
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<td>Roads</td>
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<tr>
<td>OtherInfrastructure</td>
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<td>LandSlides</td>
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<td>RiverBankErosion</td>
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<td>Buildings</td>
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<tr>
<td>BhuvanPOI</td>
<td>9146</td>
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</table>

Moderation : Accept, Reject, Edit, Review & Accept – 15 moderators
Disaster Management Support:

Cyclone HUDHUD

Disaster Services (NDEM Public)

Cyclone NILOFER
Cyclone HUDHUD
Track
Quick Mobile Survey
Crowdsourced Data
Inundation
Forecast
Spatial Overlay
Additional Layers
- Mobile Towers Affected
- BSNL Total Mobile Towers
- Total Substations
- Substations Affected

Share Field Data

Support for International Disasters

Hudhud Damage Assessment & Relief Monitoring System

About Hudhud Cyclone:
Cyclone Hudhud pounded the coastal districts of Andhra Pradesh and Odisha with heavy rain and winds of almost 200 kmph on Sunday leaving a trail of destruction with Vizagport where the very severe storm made landfall bearing the brunt.

Lakhs of people have been evacuated from towns and villages through which the cyclone has passed amid massive rain and wind. The cyclone is similar to last year’s Fani that crossed the Odisha coast leaving behind a trail of destruction.
Disaster Management Support: Cyclone HUDHUD
Floods in Assam – June 15

Disaster Damage Assessment and Response
Live on Bhuvan
Nepal Earthquake (25-04-2015)
Dharahara Tower, Kathmandu


© National Remote Sensing Centre / ISRO
Dharahara Tower, Kathmandu (Plaeides 27.04.2015)
Response to Major Disaster Events - 2014

**Cyclone HUDHUD**
12 Oct 2014

- Proactive planning
- Close Interaction with Govt. of AP
- Exclusive Bhuvan Pages
- Mobile App Launch
- Aerial data acquisition
- Impact assessment

**Achievement:**
Technical intervention in DM
Helped in Relief operations
Assessment of impact & damages

**J&K Floods Sept 2014**

- Satellite data procurement Analysis
- Flood inundation info
- Inundated villages, roads & railway tracks
- Landslides occurred
- Value added products hosted on ISRO-Bhuvan & NDEM Portals
- Interacted with Govt of J&K
- Established VSAT Connectivity
- Activated International Charter
Phuktal River Blockade, J&K

25-Apr-2015 CARTOSAT-2 (1 m)

Discontinuity of Flow

08-May-2015 CARTOSAT-2 (1 m)

Channelized Flow of Water

2028 lakes - 10 ha and above in Himalaya
477 being monitored 44 ha and above with AWIFS. June-Oct.
Framework established to generate daily near-real-time Hydrological fluxes at 9min (~16.5km) grid level for India and SAARC Countries

Daily field and satellite meteorological data products are used

Since 01 Jun 2014, Daily geo-spatial products of Surface Runoff, Soil Moisture and Evapotranspiration for India are posted on NRSC website / Bhuvan

Experimental Hydrological Products extended to SAARC Region, since 01 Jan, 2015

National /Regional Hydrologic daily/weekly/monthly outlook

Stream flows/Flows into reservoir for use in RTDSS in forecast mode

Early Warning/anomalies of Hydrological Extremes
Road Network and Navigation

Get Directions

Start points: Hyderabad, Telangana, India

Via points (optional): Enter address or Location

Destination points: Jaipur, Rajasthan, India

Route type: By Time

Get Route

Route 1
33 hrs 34 min
1563.1 km

Route 2
34 hrs 33 min
1440.2 km

Route 3
37 hrs 57 min
1561.8 km

Route 1:
- Head west on Jawaharlal Nehru Road towards Jawaharlal Nehru Road.
- Go 24 mts
- Make a sharp right turn at NH 7.
- Go 173 mts
- At the fork bear right onto NH 7 using one of the 2 rightmost lanes.
- Go 1.1 km
Points of Interest with Neighbourhood

Proximity Tool: Health and Wellness facilities in Jaipur
100+ unique organizations are using Bhuvan

- 100 + Unique organizations are using
- 800 GB of data flow per month,
- 60 Million hits per month
- 70,000 unique IPs per month
- 50 countries - users
- 6200+ map services,
- 4.7 lakhs Free data downloads
- 10 million point of interest information
Early warning for Landslides, Forecast: Run-off Depth

Info. on terrain, hydrologic, climatic socio-economic info. Hazard zones, Historical disaster damages, Drought scenarios

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BHUVAN SUPPORT

Sub-systems

- Early Warning
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- Impact Assessment
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- Emergency Communication

BHUVAN SUPPORT
NRSC EO Data Achieve (NOEDA)

Satellite Data and Carto DEM... 4,43,174
NICES Products .......................... 30,640

- Terrestrial Sciences -21 Products
- Ocean Sciences – 18 Products
- Atmospheric Sciences – 3 Products

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<th>SATELLITE DATA / DEM</th>
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Oceansat-2 OCM Derived Products
Oceansat-2 OSCAT Derived Product
AWIFS Derived Gridded Products
North Indian Ocean Products
Model Derived Products

Downloads

4,74,631
### NOEDA: National Information System for Climate and Environment Studies (NICES)

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<td>Derived Tropospheric Ozone</td>
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<td>2010 – 2013</td>
<td>Daily</td>
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<td>2002 - 2015</td>
<td>Daily</td>
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<td>Daily Tropical Cyclone Heat Potential</td>
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<td>Surface Soil Moisture - 2 Day</td>
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