Committee on Earth Observation Satellites

ISRO Initiatives in data democracy for capacity building

Session 8: Expanding our work on Data Democracy

Indian Space Research Organization
Dr. Prakash Chauhan, Director, IIRS (ISRO)

CEOS WGCapD-9 Annual Meeting
Sunnyvale, California
10-12 March 2020

Current Operational Remote Sensing Capabilities

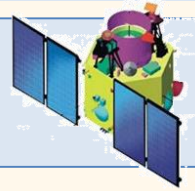
Natural Resources Inventory & Disaster Management

RESOURCESAT- 2 & 2A

- Three tier imaging : 56 m / 23 m / 5.8 m
- Revisit Capability : 03 / 11 / 03 days

Large Scale Mapping, Infrastru. Planning & Cartography

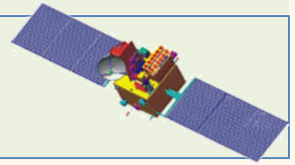
CARTOSAT-1, CARTOSAT-2 (3) & 2S (4)
CARTOSAT-3



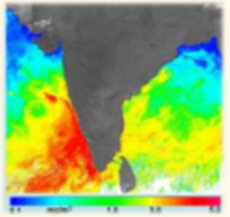
- 2.5 m Stereo imaging
- Sub-meter PAN (0.25 cm)
- 1.5 m Multi-spectral

Oceanography

OCEANSAT-2 ; SARAL ; SCATSAT-1



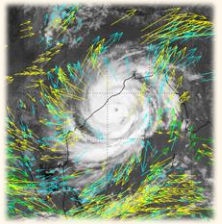
- Ocean color 360 m with 2 days revisit
- PFZ, Ocean State Forecast
- Ocean Altimetry, Surface Wind Vector



Weather & Climate

INSAT 3D & 3DR ; MEGHA-TROPIQUES

- 6 channel Imager – 48 images per day
- 19 Channel Sounder – Atm. Profiles
- Radio Occultation – humidity profiles



Bhuvan : The Platform with Diverse Application Potential

Visualization (>22 TB) and Free Download (>110 GB)

Maps & OGC Services (~7000+)

Applications (200+)

State Portals (30)

Crowd Sourcing (20 M)

1 Visualization Platform

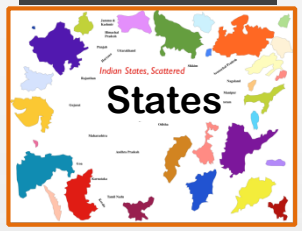
2 Platform for Building User Applications

3 Platform for Building Mobile Applications

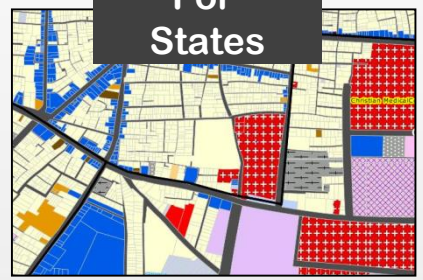
4 Platform for For Free Data Clearing House

Satellite Data & Products

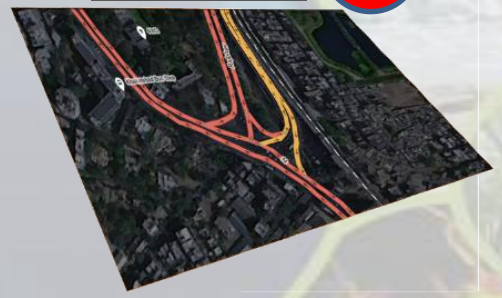
5 Platform for States To Share data



6 Applications For States



7 Platform for Mapping



8 Platform for Disaster Support

https://bhuvan.nrsc.gov.in

Registered users : > 1.5 lakhs

Download: > 1 TB per month

Meteorological and Oceanographic Satellite Data Archival Centre

https://mosdac.gov.in

Indian Store-house for Meteorological and Oceanographic Data

- **8** Indian Satellite**, 194** Products and **23** applications (INSAT-3D/3DR, SCATSAT-1, Megha-Tropiques, SARAL, Kalpana-1, INSAT-3A, Oceansat-2)
- GISAT, Oceansat-3 and INSAT-3S planned
- Total of **13 million** products disseminated to **139 countries**
- Weather and Ocean State Forecast

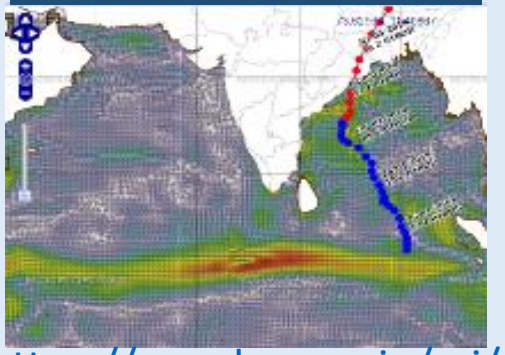
Major Applications

- Automated Ocean Forecast to ships **(Ocean-Eye)**
- Cyclone Track and Intensity forecasting **(SCORPIO)**
- Nowcasting of Heavy rain and Cloud burst **(Netra)**
- Rip current forecast for 175 beaches
- Heat/Cold wave alerts

Data Analytics and Visualization

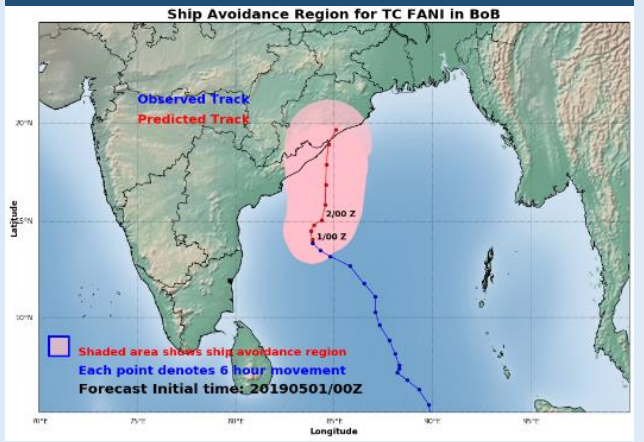
- An Integrated data visualization system for Earth Observation, In-situ data & Forecast Information (https://mosdac.gov.in/live)

Ocean Eye



https://mosdac.gov.in/sci/

Cyclone

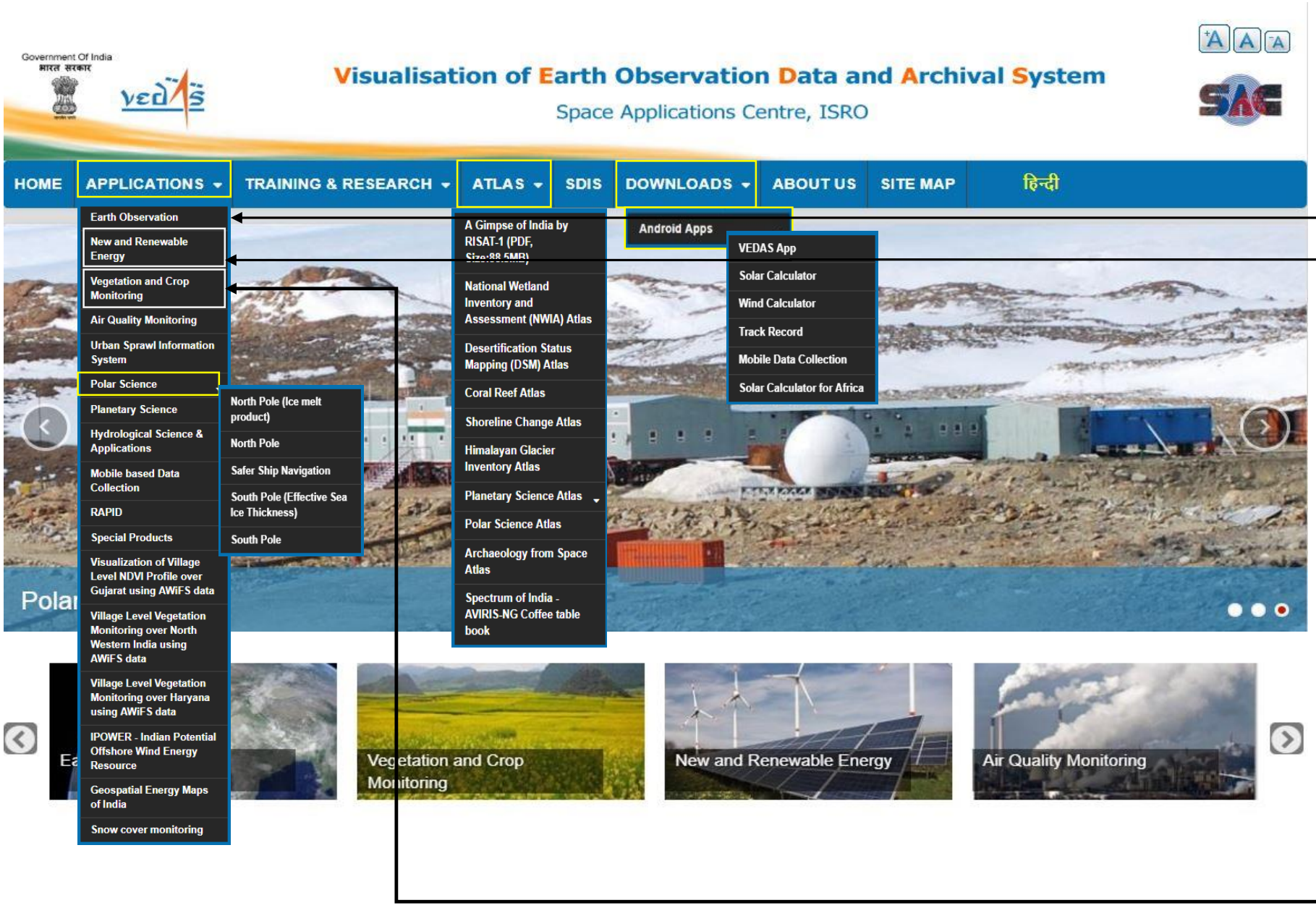


https://mosdac.gov.in/scorpio

Advanced Satellite data Visualization

Rip Current Forecast

https://mosdac.gov.in/rip_current_forecast



Earth Observation
Desertification (2 cycles)
Wetland
Coastal Environment
Coral Reef
Shoreline Change (2 cycles)
Snow & Glacier
Wasteland; Alpine Treeline (2 cycles)

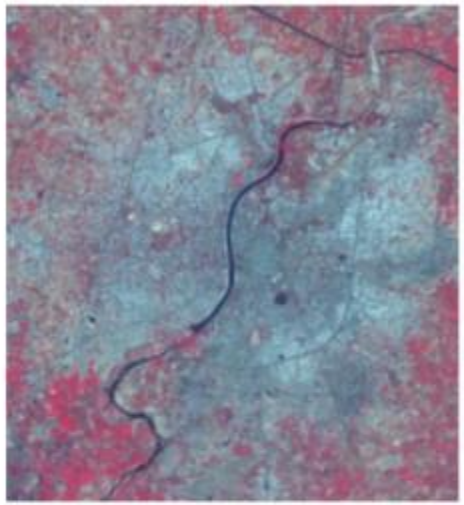
New and Renewable Energy	
Solar Insolation	January 2009 to October 2019
Wind Power	March 2000-2014
Forecast	Insolation; Temperature;
	Dust; RH (in Air Quality Monit)

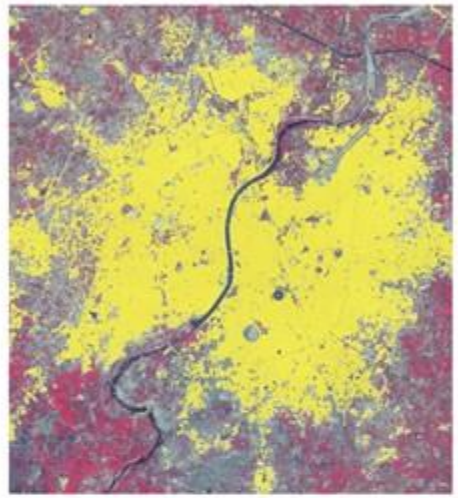
Vegetation and Crop Monitoring		
	Theme:	
		Vegetation Indices (NDVI)
		Vegetation Indices (NDWI)
		Soli Moisture
		Rainfall
		Temperature
		Surface Dryness Index
		SAR Backscatter
		Crop cutting experiment
	Data Analysis:	
		NDVI Difference
		NDWI Difference
		Temporal RGB
		Temporal NDVI max
		Range Analysis
		Cumulative Analysis
		Temporal Analysis
		NDVI PCA
		NDVI VCI
		Long-term Statistics

https://vedas.sac.gov.in

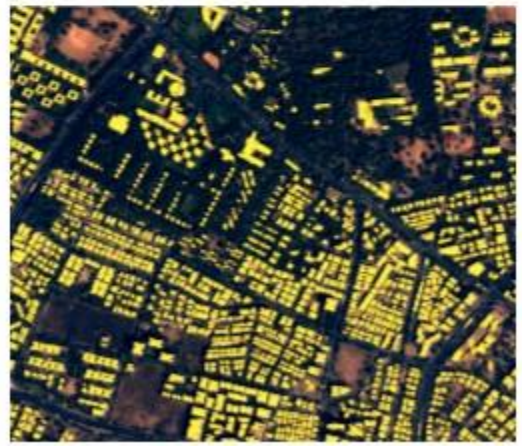
Artificial Intelligence (**AI**) and Big Data Analysis (**BDA**) on VEDAS platform

Urban area extraction using IRS LISS-IV data



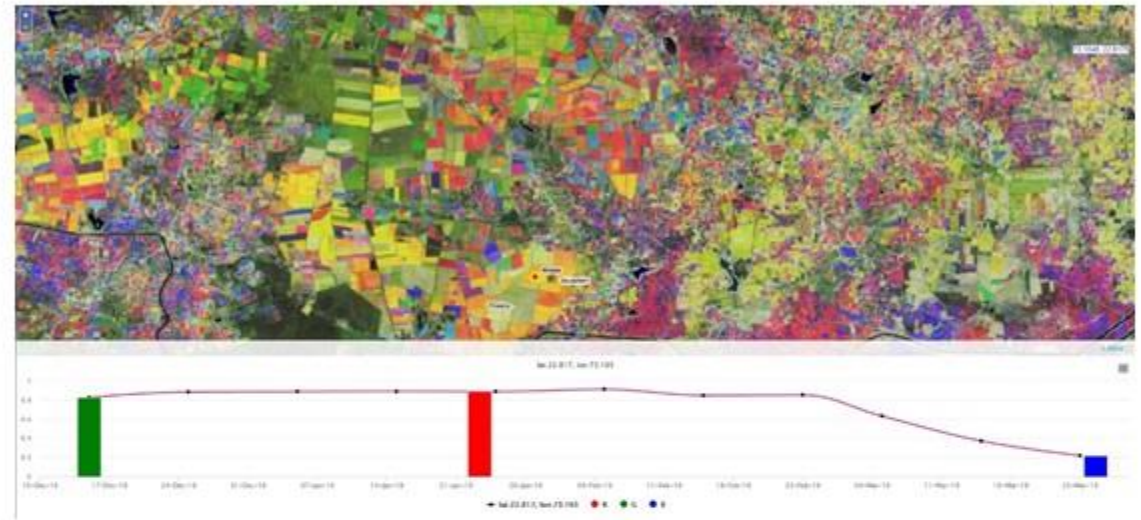


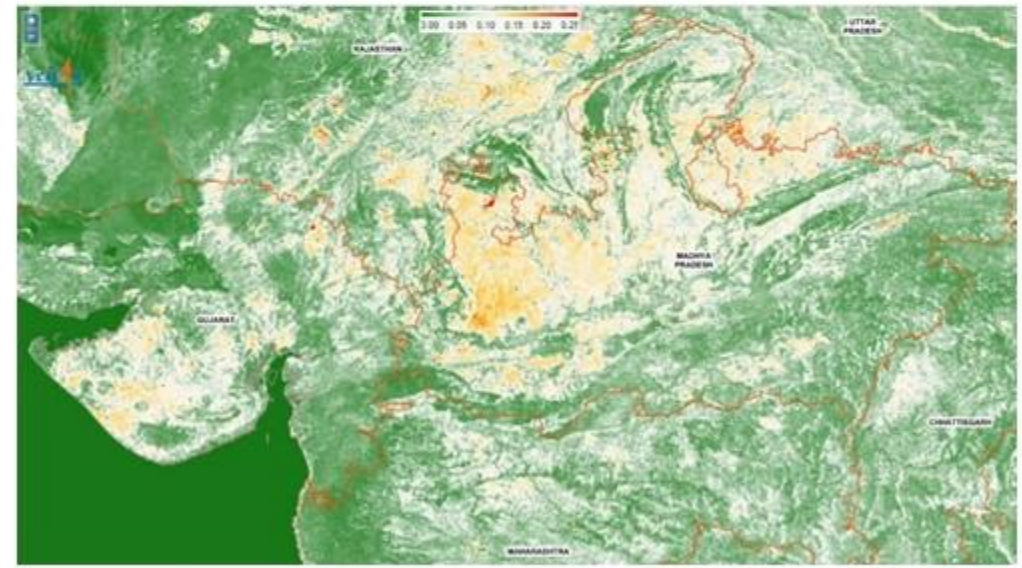
Input → Output



Building Footprint Extraction using Cartosat data

Multi-temporal data visualisation and Classification on Web





Multi-temporal data analysis on Web
(Std. Dev of February NDVI for 2001-2019)

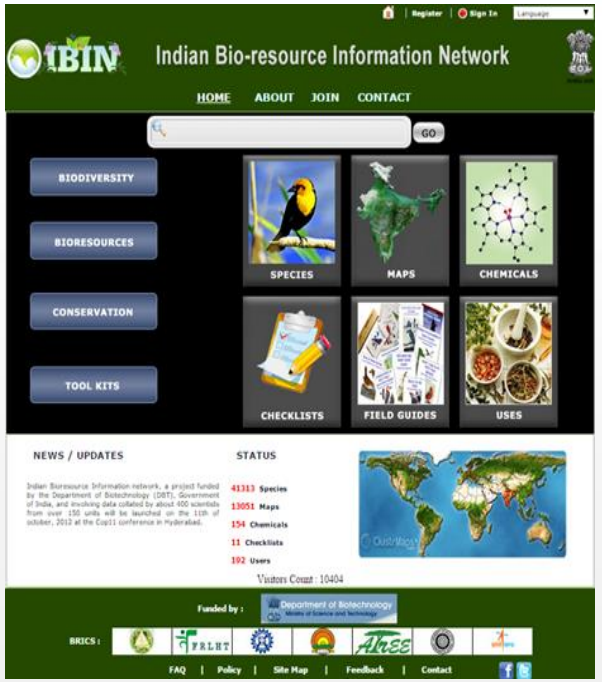
INDIAN BIORESOURCE INFORMATION NETWORK

(http://www.ibin.gov.in/)

(Joint Project of ISRO and DBT)

❖ Objectives :

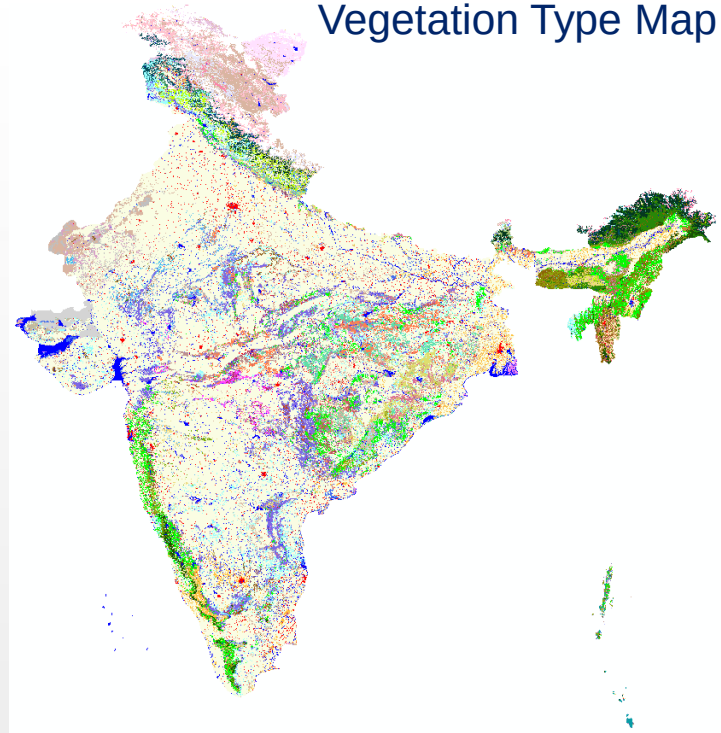
- ❑ Enriching and promoting the utilization of IBIN species & spatial datasets, & demonstration/outreach of IBIN datasets for education purpose
- ❑ IBIN Data Contributors (BRICs) – IIRS, UAS, WII, CIMAP, FSI, IHBT & NRSC
- ❑ High level distributed computing framework developed for the following:
  - Web application for conservation, prioritization & consolidation of Protected Area Network,
  - Assessment of habitat condition of RET and Invasive species using **Geospatial analytical tools**
  - Advanced **spatial decision support tools** and **geospatial modelling applications**
  - Near real time monitoring of “rain bird” for predicting Indian Monsoon through web interface.

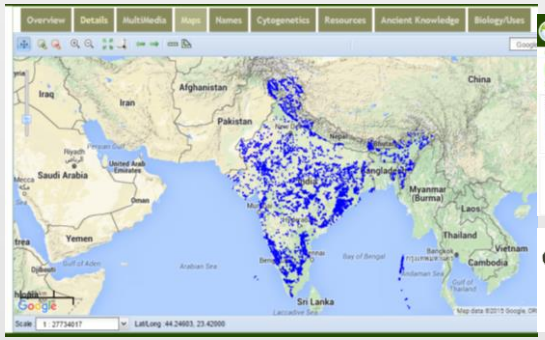


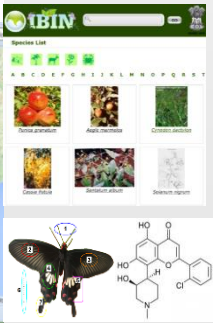
Category	Data Available
Plants	21,570
Amphibians	222
Lizards	175
Mammals	127
Snakes	203
Turtles	39
Birds	1,303
Fish	672
Mollusc	1,075
Prawn	72

Category	Data Available
Parasite	232
Predator	295
Butterfly	2043
Lichens	471
Marine Animal	4,350
Microbes	19,926
Pest	4,634
Laboratory Animals	23
Domestic Animals	7
Silkworms	5

Vegetation Type Map







AIR QUALITY MONITORING & FORECAST SYSTEM (https://airquality.iirs.gov.in/)

List of Layers

OVERLAY LAYERS

- DUST (Current forecast for 48 hrs)
  - PM10, PM2.5 and Dust load
- Pollutant Gases (Current forecast for 48 hrs)
  - O3, CO, NO2, and SO2
- Satellite Based Estimation (Last five observations)
  - AOD, PM2.5, and PM10
- Active fire data from FIRMS
- Wind forecast NCEP-GFS and using Windy API
- Air quality index (48 hrs forecast)
- Vector Layers (India State, District &Taluk and Continents)

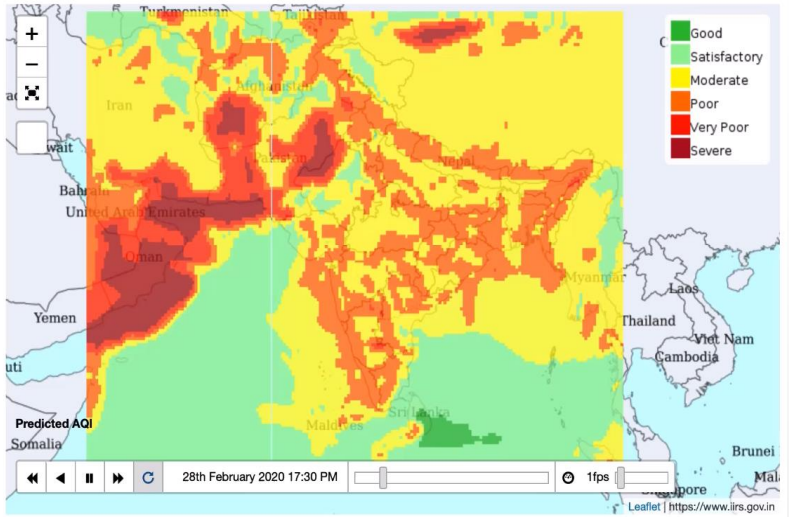
BASE MAPS

- OCM True Colour (Source: IIRS)
- Bhuvan Map (Source: Bhuvan)
- NASA Blue Marble (Source: NASA EOSDIS GIBS)
- Aerosol Optical Depth (Source: RAPID-IMD)
- MODIS Aqua Corrected Reflectance TrueColor (Source: NASA EOSDIS GIBS)
- Aerosol Optical Depth - Terra/ Aqua MODIS (Source: NASA EOSDIS GIBS)

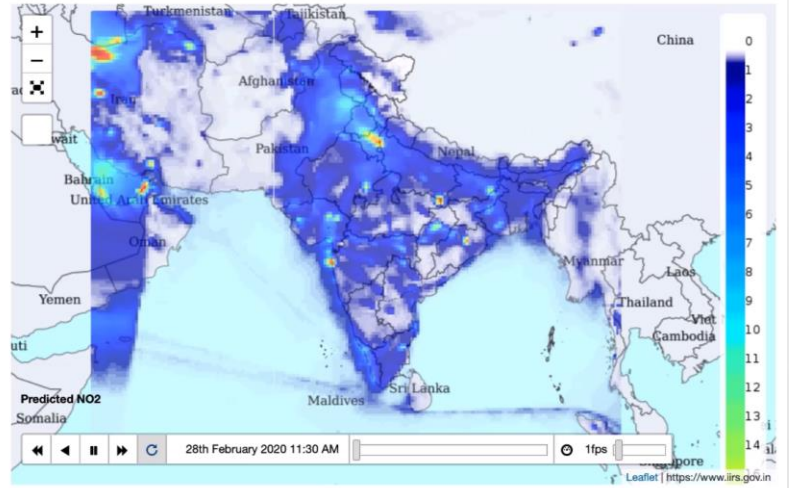
Data Used

Dust Forecast	•2 days forecast for dust burden and dust based particulate matter (PM 10 and PM 2.5) generated using numerical prediction model WRF fully coupled with Chemistry (WRF-Chem). •Generated for every 6 hour interval at 25 km resolution.
Pollutant Gases	•WRF-Chem model is being used to simulate 2 days forecast of 4 gaseous air pollutants O3,CO, NO_2 and SO2. •Generated for every 6 hour interval at 25 km resolution.
Satellite Based Estimation	•Satellite based estimation of surface level Aerosol Particulate Matter (PM2.5 and PM10) at 12.5 km resolution . •Geographically Weighted Regression (GWR) is used to estimate regional PM2.5 & PM10 by combination of INSAT-3D derived AOD, dispersion, source apportionment, meteorology and ground based measurements.

≡ Predicted AQI

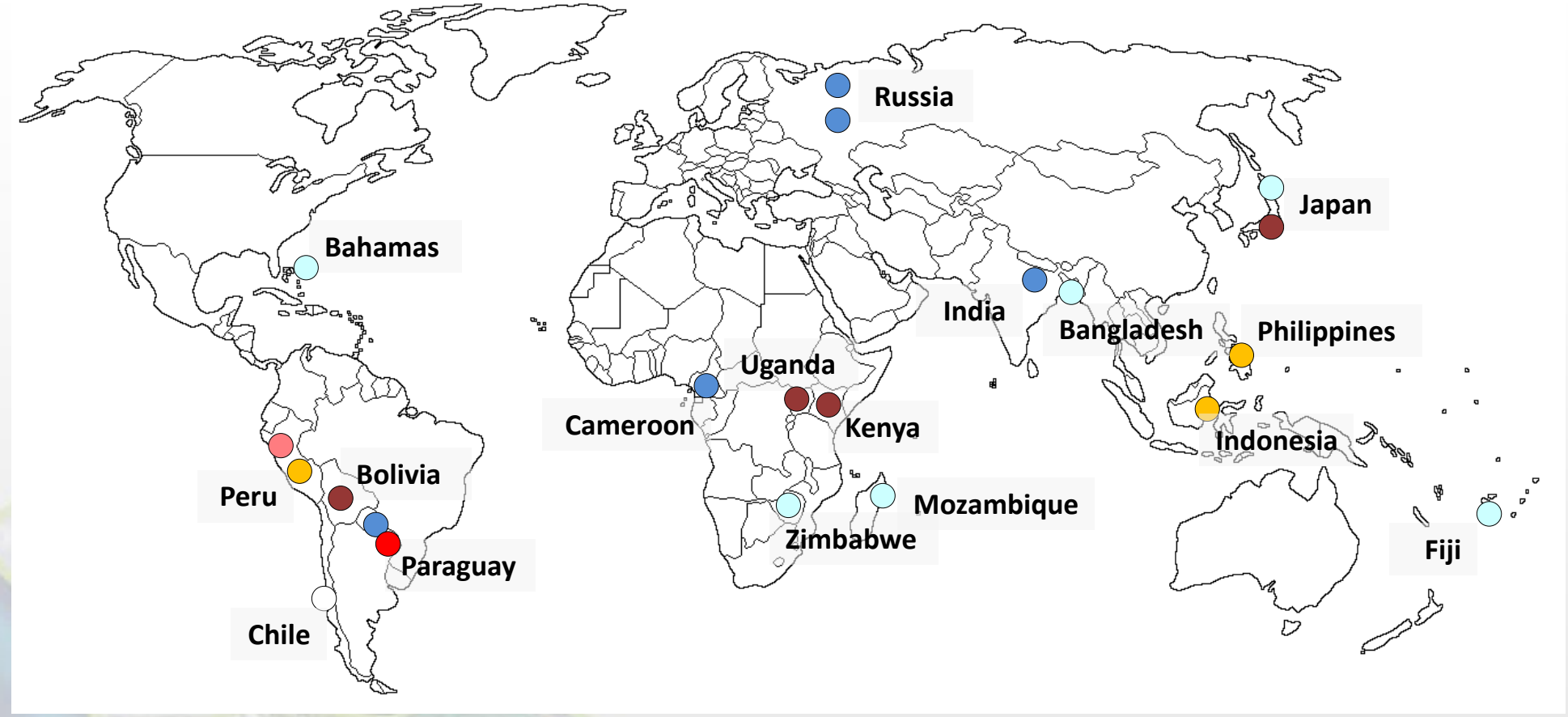


≡ Predicted NO2



Support to other countries during 2019

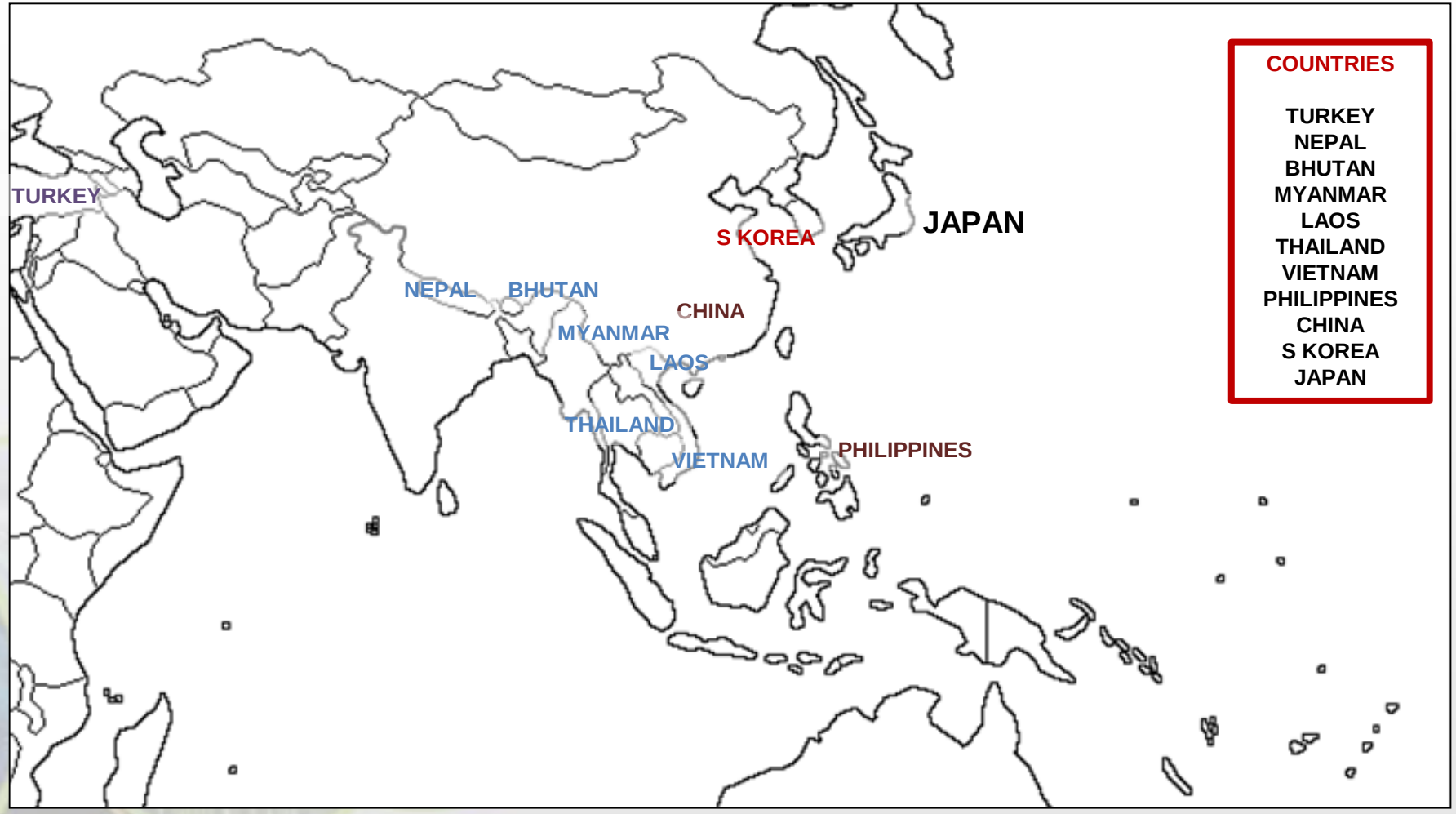
International Charter



- Data support extended to 17 countries / 21 Disaster Events

Sentinel Asia – 2019

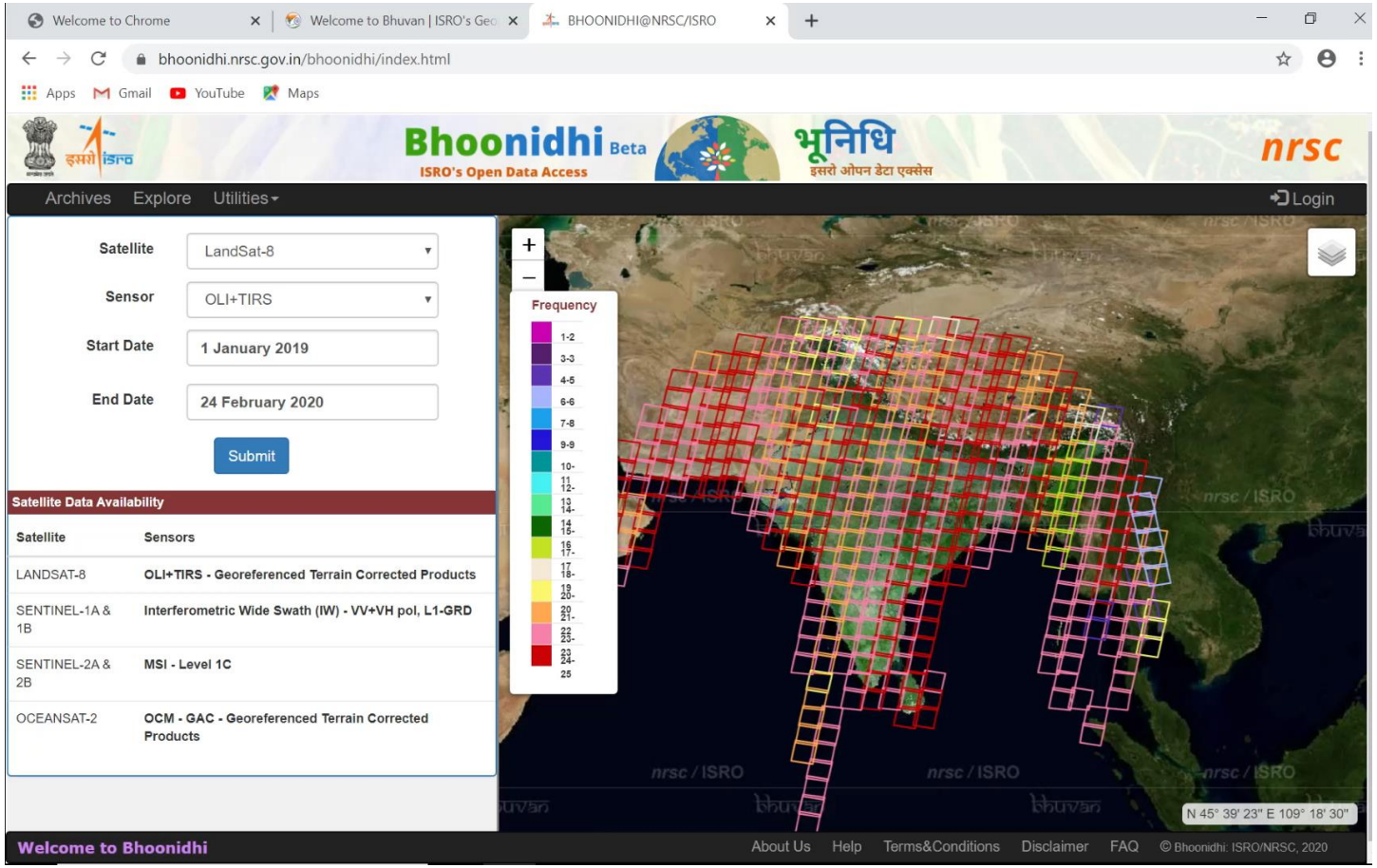
- Data support extended to **11** countries / **19** Disaster Events



FLOODS | LANDSLIDES | EARTHQUAKES | FOREST FIRES | MULTIPLE DISASTERS

Bhoonidhi

ISRO Open Data Access web application facilitates the dissemination of free satellite data products to online users on web.



Data in Bhoonidhi :

- Oceansat-2
- Landsat-8
- Novasar-1
- GISAT-1
- Sentinel 2A, 2B
- Sentinel 1A, 1B

Data search based on

- Satellite
- Resolution
- Event
- Time series

Thank You

CART option to Add/Delete/Confirm the items in a CART which is day wise.