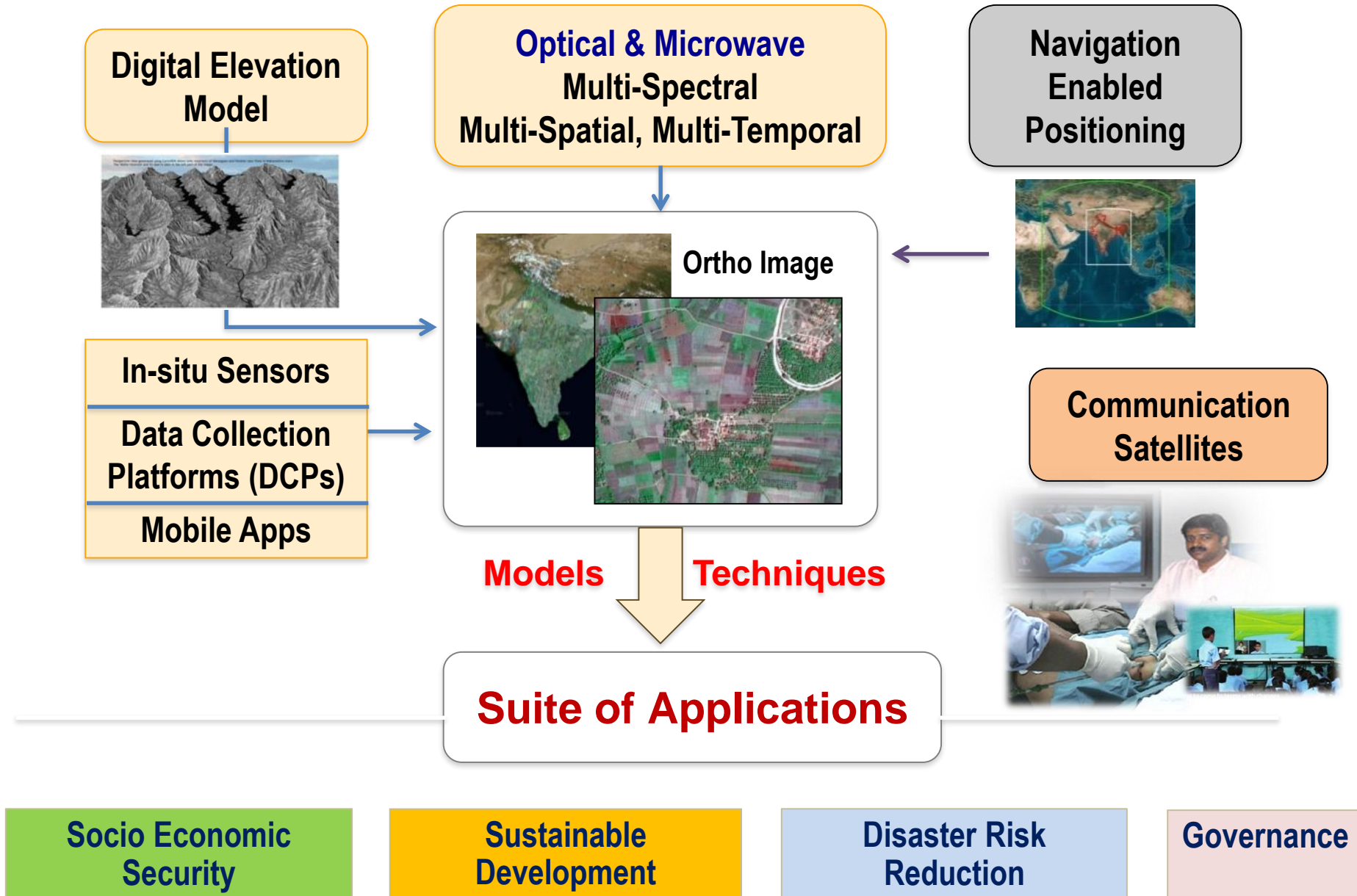


Status on Space Applications for Sustainable Development

Shantanu Bhatawdekar
Director
EOA & DMS Programme Office (EDPO)
Indian Space Research Organization
INDIA
August 2020



Framework for Space Technology based Applications



SPACE APPLICATIONS VERTICALS

SOCIO ECONOMIC SECURITY

- Food
- Water
- Energy
- Health
- Shelter
- Infrastructure
- Information



SUSTAINABLE DEVELOPMENT

- Impact Assessment
- Bio- Resources Conservation
- Fragile & Coastal Ecosystem
- Climate Change Induced Impacts
- Urbanization
- Geo-sphere Bio-sphere

In Tune with Sustainable Development Goals (SDGs) envisaged by the Government

DISASTER RISK REDUCTION

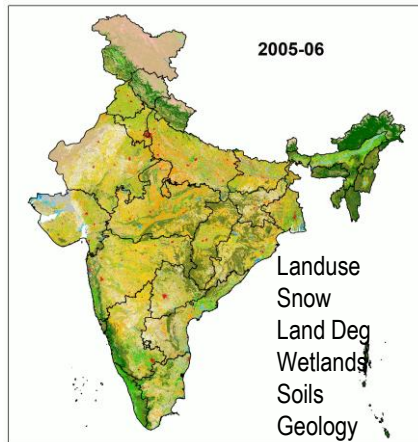
- Preparedness
- Early Warning
- Response
- Recovery



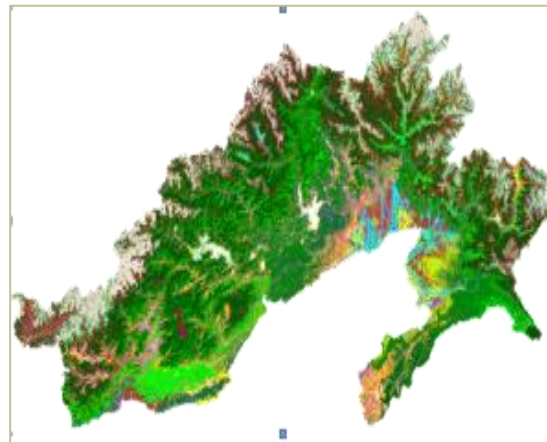
GOVERNANCE

- Planning
- Monitoring
- Evaluation
- Decision Support

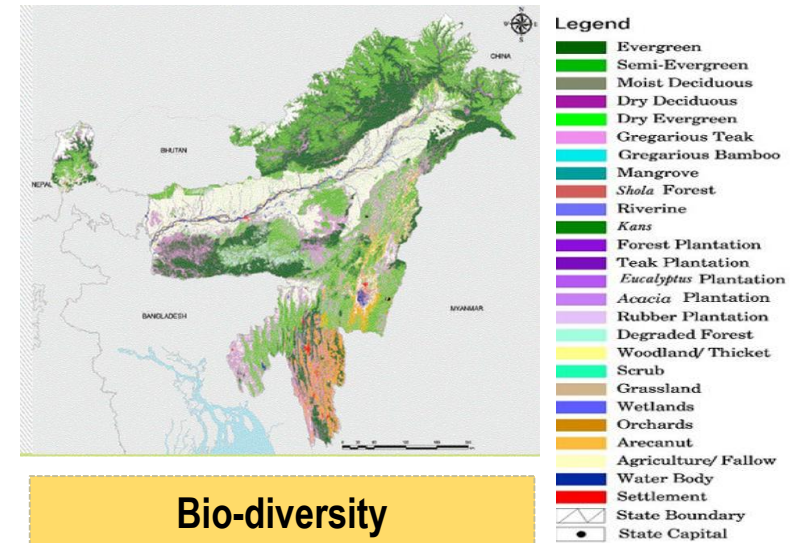
MANAGEMENT OF NATURAL RESOURCES



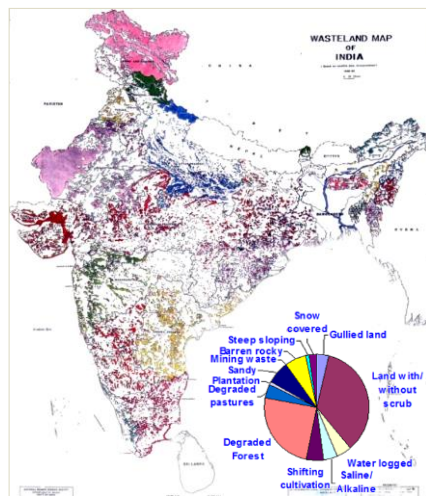
NR Census



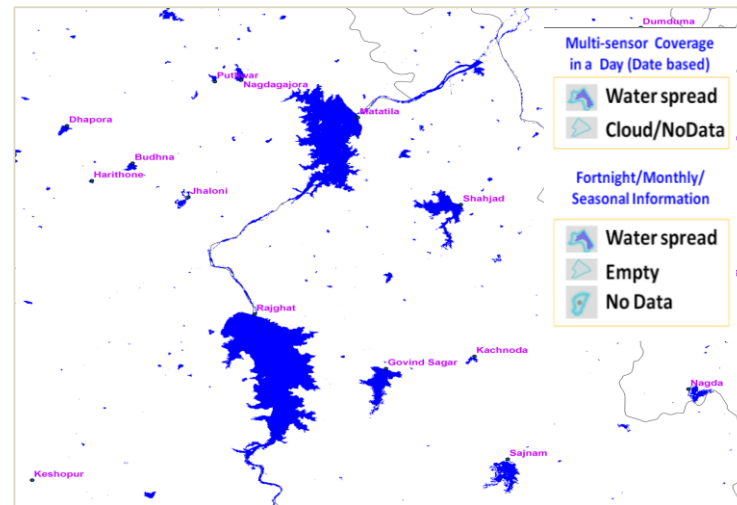
Biennial Assessment of forest



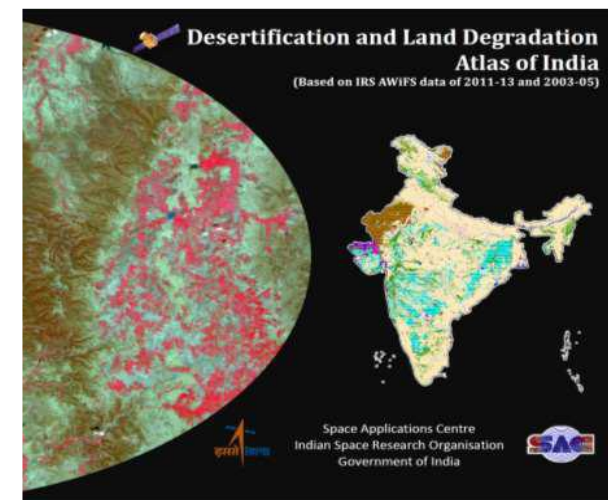
Bio-diversity



Wasteland Change

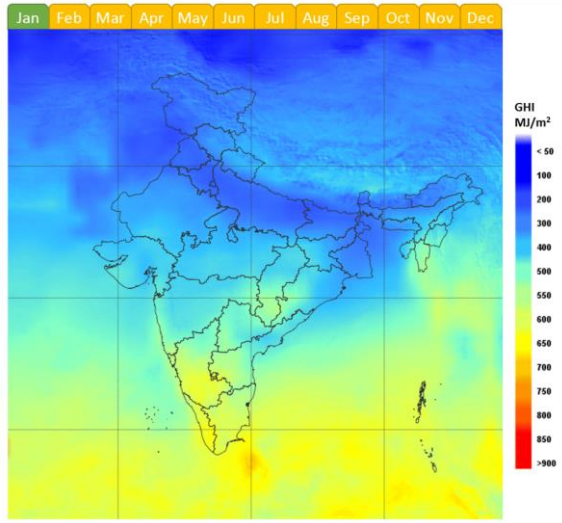


Surface Water Spread Maps

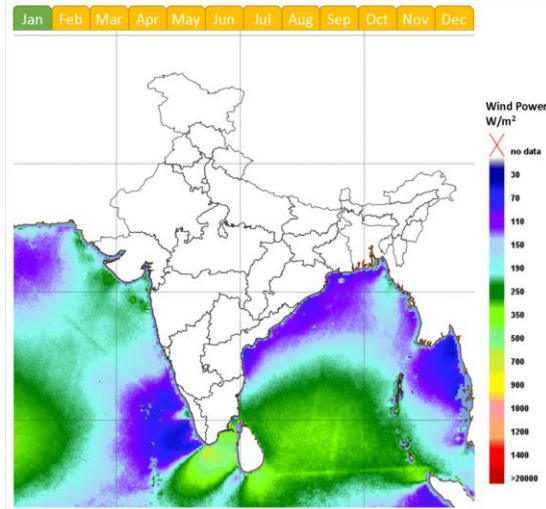


Desertification

RENEWABLE ENERGY



**Solar Energy Potential
(INSAT-3D/3DR)**



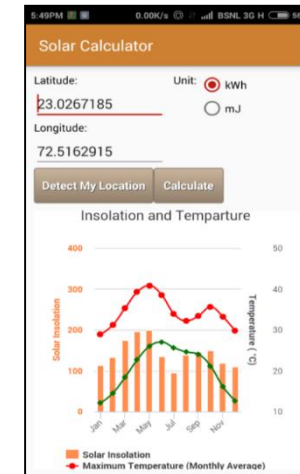
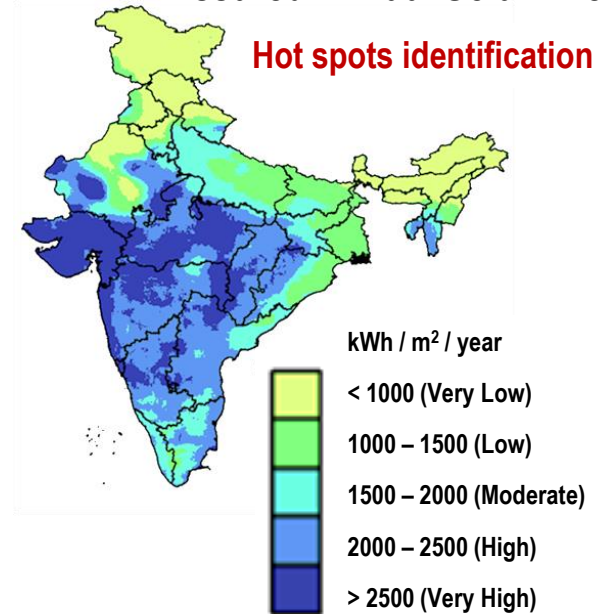
**Wind Energy Potential
(using Scatsat Data)**

Potential areas to achieve target of 175 GW by 2022

- Digital Energy Atlas
- 48 Hour forecast for solar insolation & wind speed - for plant operators supplying power to the grid
- Development of Geo-spatial Energy portal & Apps

Assured Annual Solar Energy

Hot spots identification



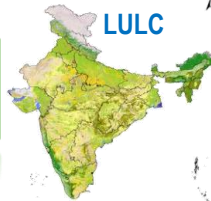
Location-specific Solar potential



SDGS & INDIAN SPACE PROGRAMME

Natural Resources Conservation (6)

Natural Resources Census,
PFZ Forecast, Areas for Crops'
Expansion, Desertification and
Land Degradation



Health/Climate Change Induced Impact (2)

Tele-medicine,
Air Quality Forecast /
Monitoring, NICES (53 Products
including 13 ECVs)



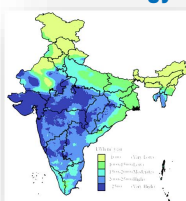
TM Network



Renewable Energy

Solar, Wind, Wave & HEP
Potential Estimation

Solar Energy



Disaster Resilient Community

Infrastructure Planning, Disaster
Management Support



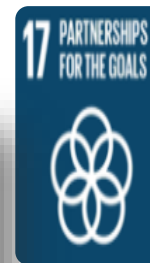
Capacity Building (2)

Tele-education, e-learning,
Academic collaboration,
Technology transfer to
industries



International Cooperation

Joint Missions with Int. Space
Agencies, South Asia Satellite,
Data Support for International
Charter, Bilateral/Multi-lateral
Cooperation, COSPAS-SARSAT,
CSSTE-AP



Collaboration Internalization Institutionalization



IMD
Weather
Services



MNCFC
Crop
Services



INCOIS
Ocean
Services



FSI
Mapping,
Fire Alerts



NDEM
DM
Services

Information Dissemination



Bhuvan



SPACE TECHNOLOGIES FOR SOCIAL DEVELOPMENT

Decentralized Planning

Fish Cultivation in Village Water Bodies

Crop Insurance

MGNREGA

Irrigation Infrastructure Monitoring and Assessment

Water Resources Information System

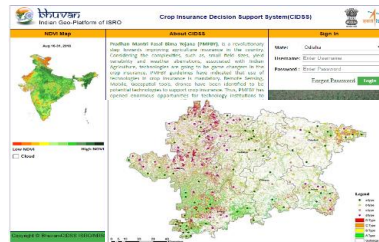
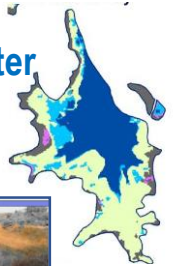
Satellite Navigation

Tele-medicine, Tele-education

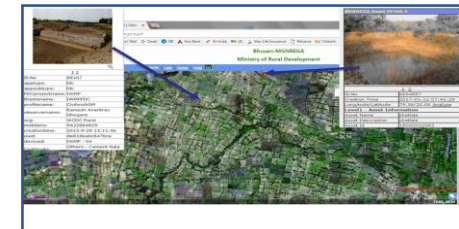


Enable Developmental planning percolate to Gram Panchayats

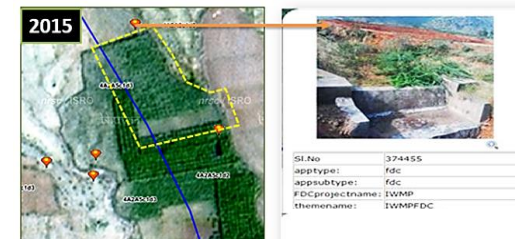
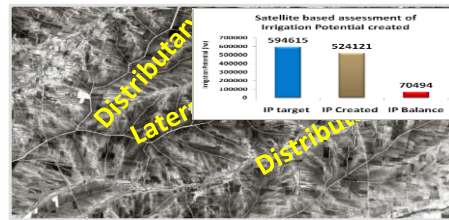
Inventory & Monitoring of Village Water bodies for Fish Culture



Crop insurance decision support system



Geo-tagging of MGNREGA assets for monitoring progress of activities

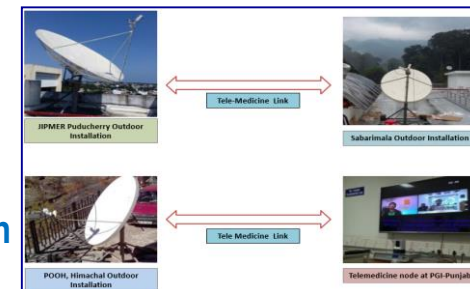


Improvement in Watershed condition

Online monitoring of irrigation Projects

Geospatial and ICT based solutions for water management in Telangana

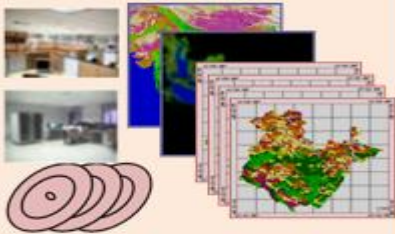
Specific Mobile-based application for Fishermen



Observational Systems Satellites, Aerial, Ground



Multi-tier databases With decision tools



Emergency Communication

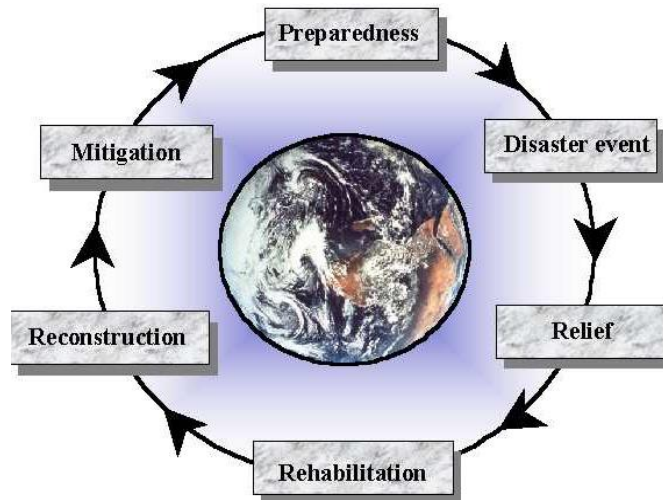
- Virtual Private Network
- Satellite Phones
- Distress Alert Terminal
- DTH based Warning



Decision Support Centre (DSC) at NRSC, Hyderabad

in association

MHA, NDMA, MOA, Cabinet
Secretariat, State Agencies,



Technology

Functionaries

- Centre
- State
- District
- NGOs

People

Floods



Drought



Cyclone



Forest Fire



Earthquake



DISASTER RISK REDUCTION & RESILIENCE

2020

Cyclone AMPHAN

West Bengal, Odisha

FLOOD EARLY WARNING Godavari, Brahmaputra

LOCUST EARLY WARNING

Rajasthan, Gujarat...

FLOODS MONITORING

Assam, Bihar, Mumbai,
Karnataka...

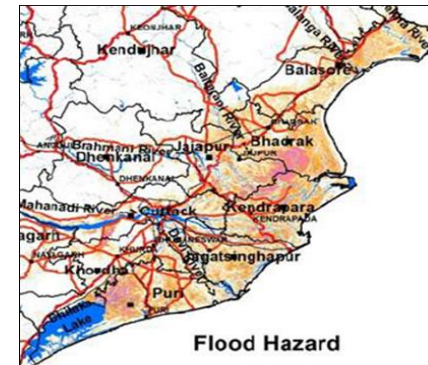
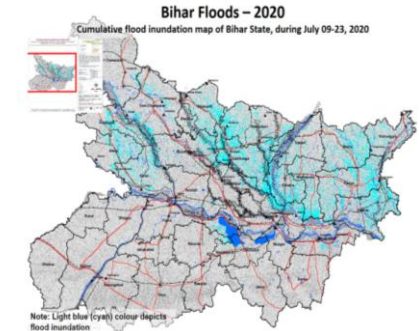
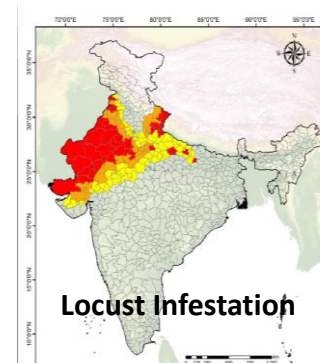
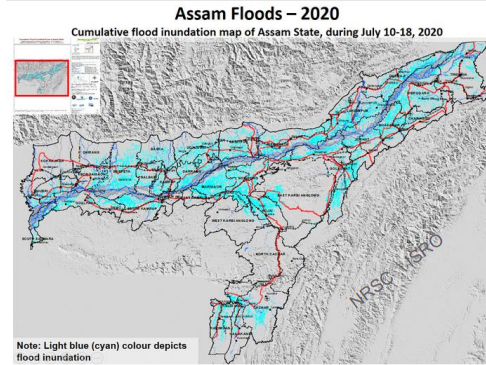
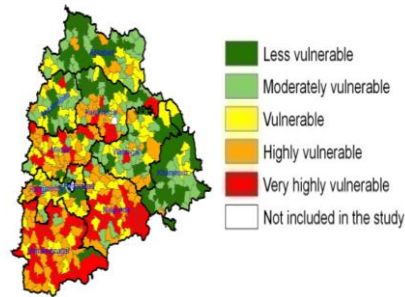
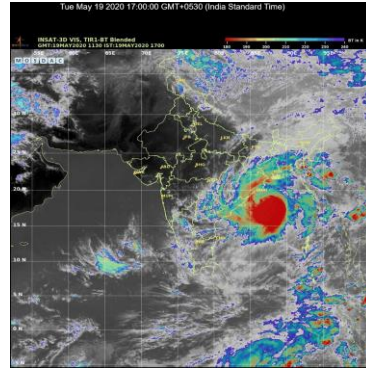
LANDSLIDES

Kerala

FLOOD HAZARD

LANDSLIDE HAZARD

DROUGHT VULNERABILITY



- **Super Cyclone AMPHAN** – Accurate Forewarning, Support for Rapid Response; Inundated Jute Crop Assessment....
- **Floods in Assam & Bihar** - ~120 value added products disseminated; Village-wise Inundation; Submerged crop area...
- **Landslides in Kerala** – Damage Assessment
- **Flood Hazard Atlas** – Bihar & Odisha
- **Support to Charter and Sentinel Asia**

Monitoring Systems for Climate Variables

National Information System for Climate and Environment Studies (NICES)

67
Geophysical
Products

A multi-institutional effort
involving various departments and national institutions

13
Essential
Climate
Variables

Terrestrial

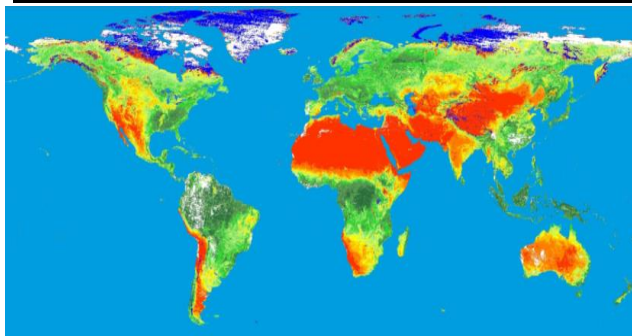
Ocean

Atmospheric

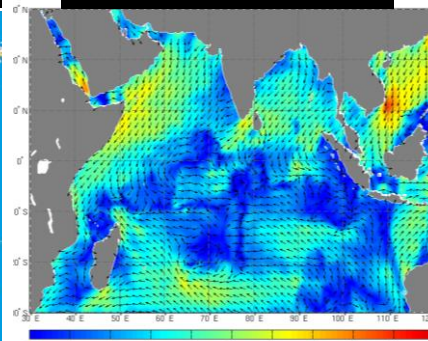
Cryosphere

Model Derived

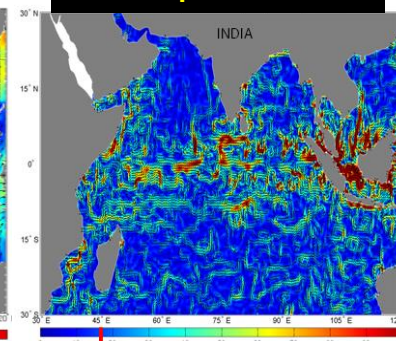
Global Normalized Difference Veg. Index



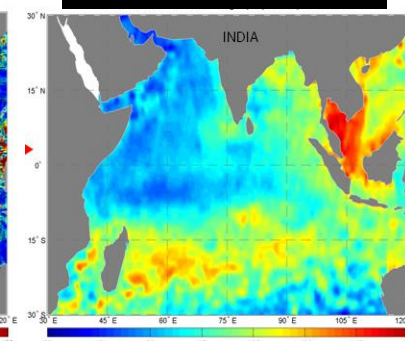
Ocean Surface Winds



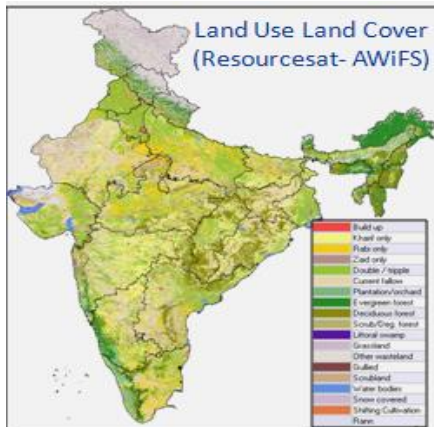
Geostrophic Currents



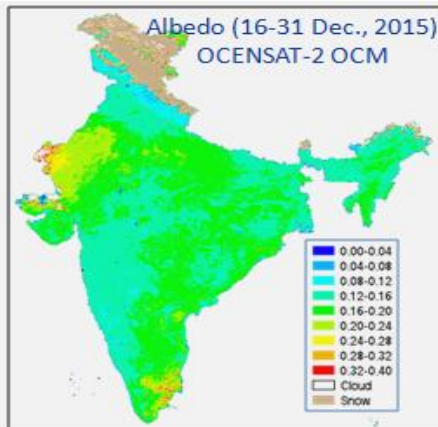
Sea Surface Heights



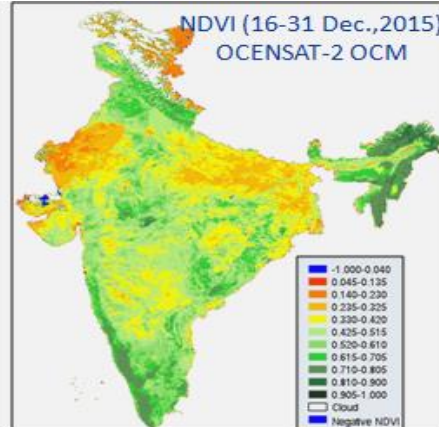
Land Use Land Cover
(Resourcesat- AWIFS)



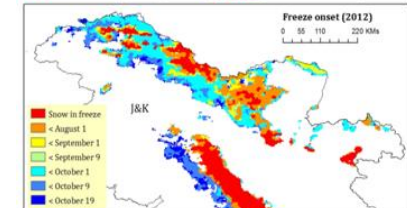
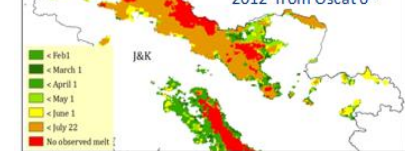
Albedo (16-31 Dec., 2015)
OCENSAT-2 OCM



NDVI (16-31 Dec., 2015)
OCENSAT-2 OCM



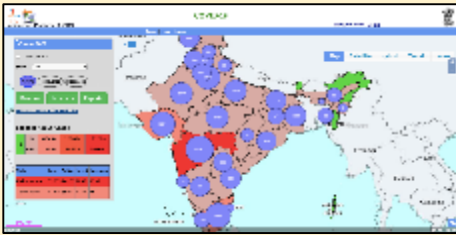
Melt onset (2012)
Snow melt and freeze onset,
2012 from Ocat σ^0



COVID-19 – ISRO Contributions

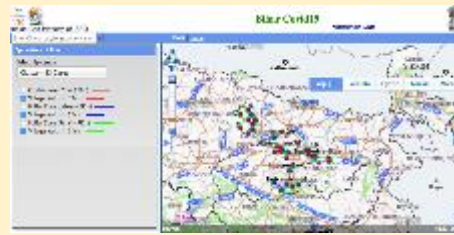
- Indian Government and State Govts have taken several steps to contain the spread of COVID-19 in the country. To support these efforts, ISRO has helped these State Govts and Others, by providing geo-spatial tools:

Tracking



- Growth Status - Spread
- State Wise Spread Count

Hotspots



- With Buffers & Villages
- Containment Zones

Vegetable Markets



- Services of mobile vegetable market at different places

Food for Needy



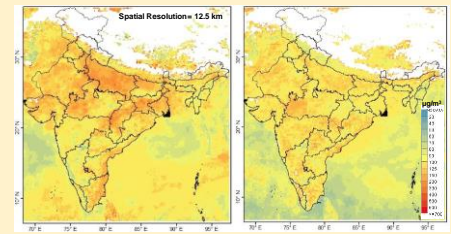
- Easy navigation to reach food to needy at various locations in Chennai.

Home Isolation



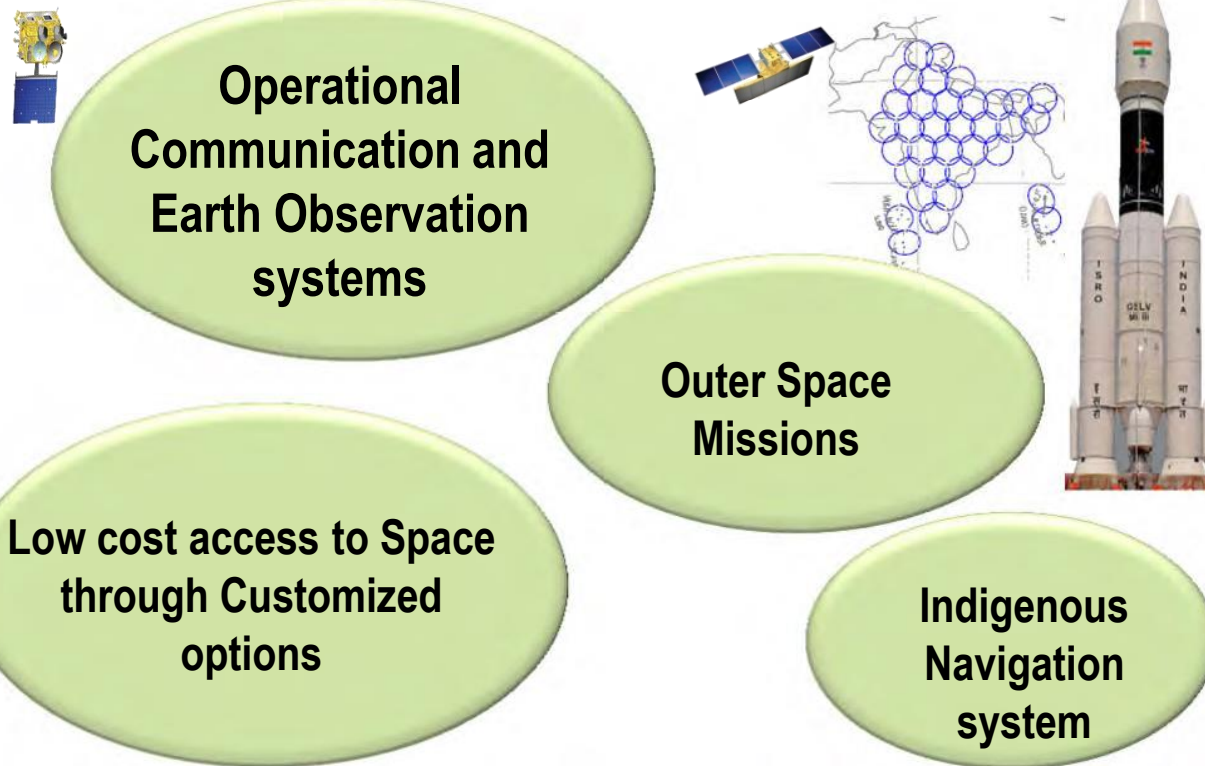
- Round-the-clock monitoring of home isolation of patients

Pollution Studies



- AOD and Particulate Matter PM2.5 & PM10,

Current status of India's Space Policy



Future focus is to facilitate the overall growth of space activities in India

Encourage Private sector in space activities, in compliance with the obligations under international treaties on space activities

Regulatory mechanism for Authorization and Licensing of Private Industry

- **Satellite Communications – SATCOM Policy**
- **Remote Sensing Data Policy (RSDP 2001, 2011,...)**
- **Remote Sensing Data Pricing Policy 2015**
- **Policy for Tech. Transfer and Spin-off promotion**
- **Space Industry promotion – active participation/policy**
- **Map policy**

THANKS...