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Session 2

SPACE TECHNOLOGY FOR EARLY WARNING PREPAREDNESS & RESPONSE

Speaker

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Expert in Cyber & Counter Terrorism Issues, National Security Strategies &Cyber Policies.

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- *Worked as an **Advisor- (Cyber Security)** for TCIL, India.*
- *Was associated with Diplomatic Mission as a **Principal Advisor ,**Republic of Sudan.*
- *Current **Eminent Faculty** with Para Military Forces in India in the field of Cyber Security & Counter Terrorism.*
- ***Honorary Advisor**- (West Asia & Middle East) International Solar Alliance Secretariat, formed under Paris Convention Treaty.*
- ***Member** IT-Support Group, International Solar Alliance Secretariat.*
- ***Member** Global Advisory Committee, International Solar Alliance.*

Early Warning

- The term 'early warning' is used in many fields to describe the provision of information on an emerging dangerous circumstances where that information can enable action in advance to reduce the risks involved.
- An Early Warning System (EWS) can be defined as a set of capacities needed to generate and disseminate timely and meaningful warning information of the possible extreme events or disasters (e.g. floods, drought, fire, earthquake and tsunamis) that threatens people‘s lives.
- The purpose of this information is to enable individuals, communities and organizations threatened to prepare and act appropriately and in sufficient time to reduce the possibility of harm, loss or risk.

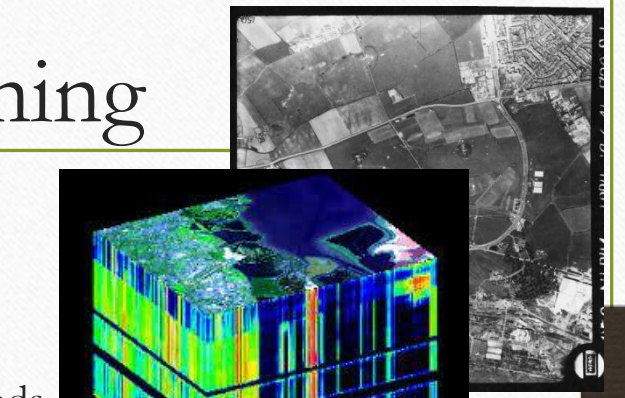
Elements of Early warning

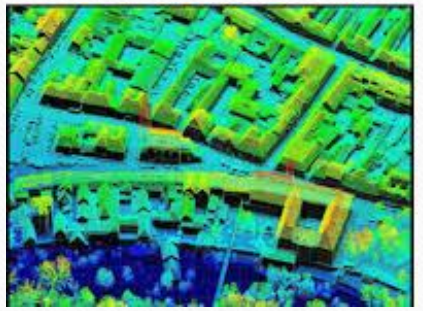
- **Risk Knowledge:** Risk assessment provides essential information to set priorities for mitigation and prevention strategies and designing early warning systems.
- **Monitoring and Predicting:** Systems with monitoring and predicting capabilities provide timely estimates of the potential risk faced by communities, economies and the environment.
- **Disseminating Information:** Communication systems are needed for delivering warning messages to the potentially affected locations to alert local and regional governmental agencies. The messages need to be reliable, synthetic and simple to be understood by authorities and public.

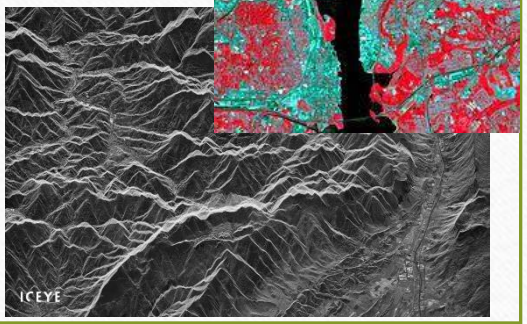
- **Response:** Coordination, good governance and appropriate action plans are a key point in effective early warning. Likewise, public awareness and education are critical aspects of disaster mitigation.

Space Technologies for Early Warning

- **UAV Aerial Photographs**
  - Extent and impact of environmental disasters like landslides and erosion hazards
- **Earth-Observing Satellite Images**
  - Assessment and monitoring processes of deforestation, desertification, droughts, floods
- **Meteorological Satellites**
  - Weather forecasting
  - Assessment, prediction and monitoring of drought, flood and large-scale fires hazards
- **Satellite Radar**
  - Accurate sea surface temperature measurements
  - Rapid changes in ice configuration
- **Satellite Laser Ranging**
  - Monitoring and recording earthquakes and volcanic activity







Economic and Social Commission for Asia and the Pacific (ESCAP)
efforts related to space applications

- Asia Pacific Gateway for disaster risk reduction
- Regional cooperation
  - Sharing of information, communications and space technology infrastructure and resources through Regional Space Applications Programme (RESAP) in cooperation with similar regional organizations to strengthening/developing regional cooperative mechanisms and to ensure that DRR and CCA are integrated with development
  - Enhance disaster preparedness and early warning at community level, improving connectivity including through communication satellites

Regional/International Initiatives

- Regional Cooperation Initiatives
  - Sentinel-Asia -- Asia-Pacific Regional Space Agency Forum
  - Satellite constellation for disaster monitoring -- Asia-Pacific Multilateral Cooperation on Space Technology and Applications

- International Initiatives
  - UN Platform for Space-based Information for Disaster Management and Emergency Response (UN SPIDER)
  - ESCAP partners with UNOOSA to promote regional component of UN SPIDER
  - International Charter on Space and Major Disasters

India's Supportive Role

- Under the framework of Asia-Pacific Regional Space Agency Forum (APRSAF) initiative Sentinel Asia, ISRO supports the disaster management activities in Asia-Pacific region.
- ISRO as the signatory of International Charter "Space and Major Disasters" supports various Authorized Users (AUs) of the Charter during major disasters.
- ISRO also supports the Disaster Management activities of UNESCAP under regional co-operation.

India's Platform Initiatives

- ISRO disseminates relevant information from various sources (space technology, ground sensor technology, crowd source etc,.) in to an interactive geo-spatial domain through various geoportals under Disaster Management Support (DMS) Programme:
  - Bhuvan, National Database for Emergency Management
  - Meteorological & Oceanographic Satellite Data Archival Centre (MOSDAC) for the administrators to better understand the impact and for improved decision support.

bhuvan
Indian Geo-Platform of ISRO

भारत सरकार
Government of India
मॉस्डैक
MOSDAC

India's Early Warning Preparedness & Response for Flood from Cyclones

Preparedness

With large coast line, India is susceptible for cyclones. So, understanding the impacts of cyclone, with respect to its earlier footprints, low lying areas, etc, can be achieved through satellite imagery. Using historical satellite data and Digital surface models, these inputs can be derived

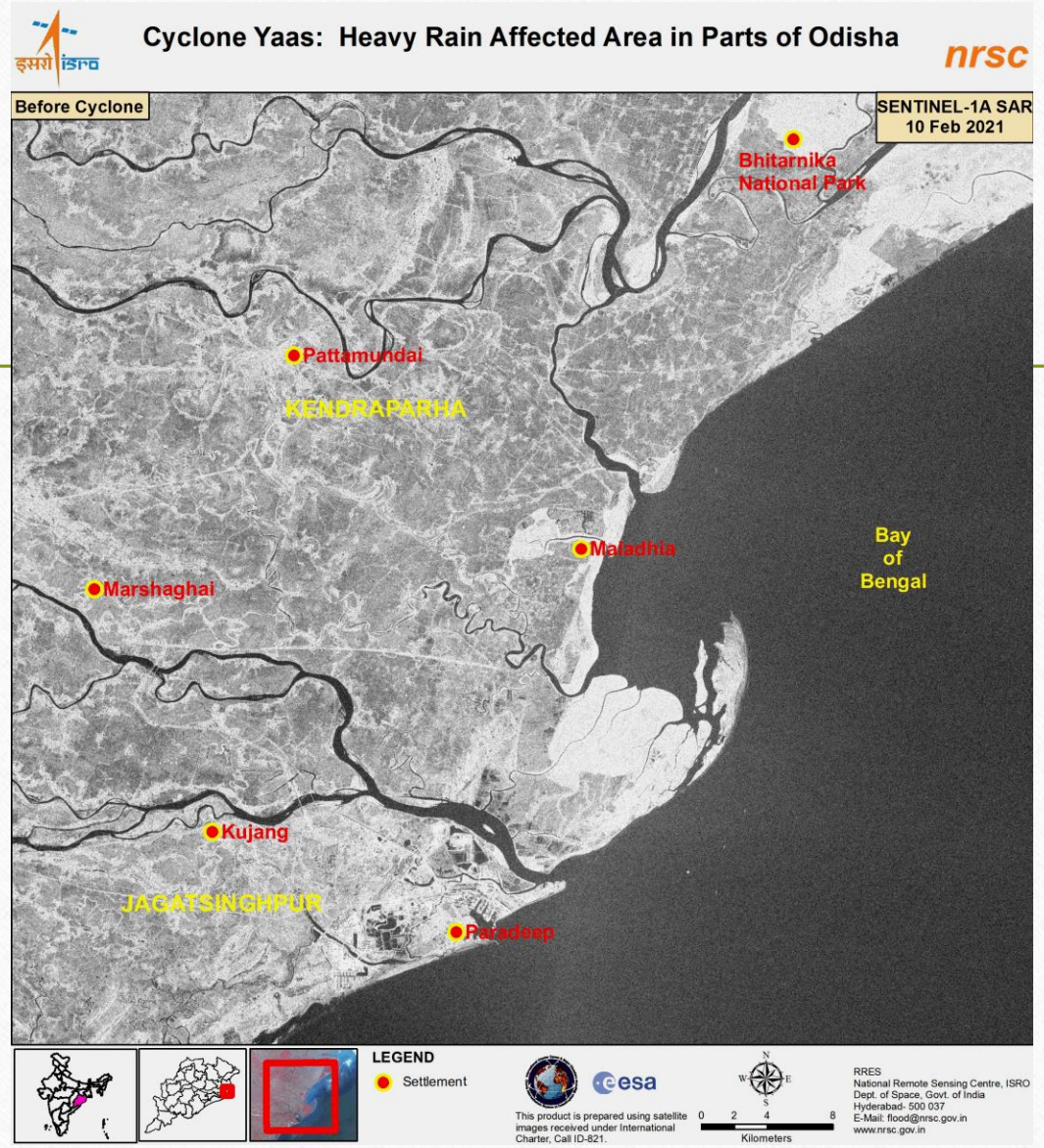
Early Warning System's

ISRO uses geo-stationary and low earth orbit satellites for providing experimental inputs on cyclogenesis, cyclone track, cyclone intensity. INSAT series of satellites with frequent imaging provide the cyclone parameters for near real time analysis using early warning system's

Response

Near real time information on inundation due to cyclones derived using optical and microwave SAR data is provided to the concerned departments for public announcement

www.isro.gov.in/cyclones



UNITED NATIONS
Office for Outer Space Affairs

Ministry of I.C.T
IRANIAN SPACE AGENCY

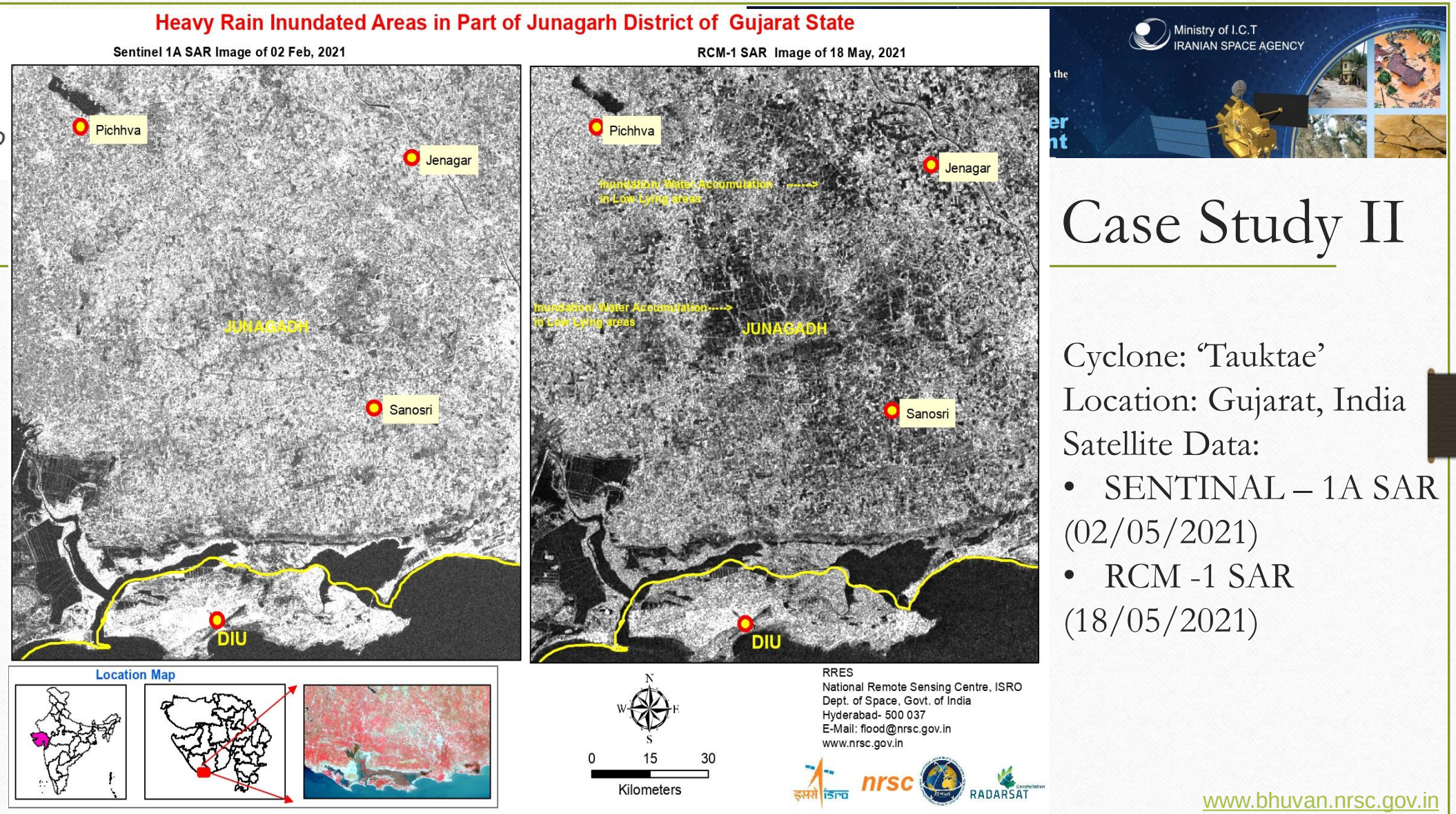
United Nations/Islamic Republic of Iran Workshop on the
Space Technology Applications
for Drought, Flood and Water
Resource Management

Case Study I

Cyclone: 'Yaas'
Location: Odisha, India
Satellite Data:

- SENTINAL – 1A SAR (10/02/2021 & 29/05/2021)
- RADARSAT -2 SAR (27/05/2021 & 29/05/2021)

www.bhuvan.nrsc.gov.in



Case Study II

Cyclone: 'Tauktae'
Location: Gujarat, India
Satellite Data:

- SENTINAL – 1A SAR (02/05/2021)
- RCM -1 SAR (18/05/2021)

www.bhuvan.nrsc.gov.in

India's Early Warning Preparedness & Response for Floods

Preparedness

Based on integration of historic satellite datasets acquired during major floods in different States, flood hazard map layers were prepared for entire country

Early Warning System's

Using hydrological modelling of satellite and ground based hydro-meteorological inputs and digital elevation models, experimental spatial flood early warning systems are established for selected flood prone rivers like Brahmaputra (Assam)

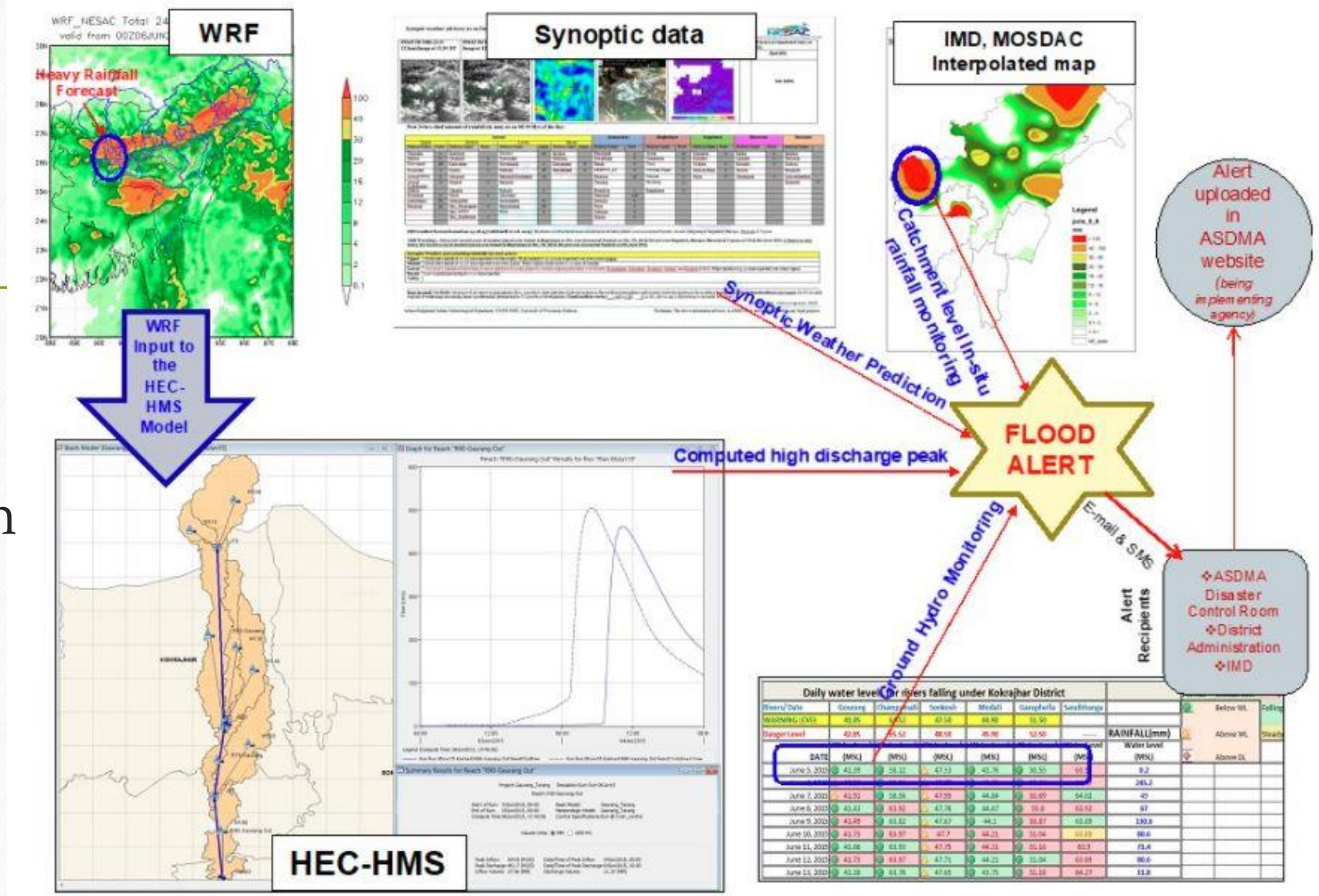
Response

Near real time information on flood inundation derived using optical and microwave SAR data is provided to the concerned departments for public announcement

www.isro.gov.in/floods

Case Study III

Flood Early Warning System (FLEWS) in Assam, India

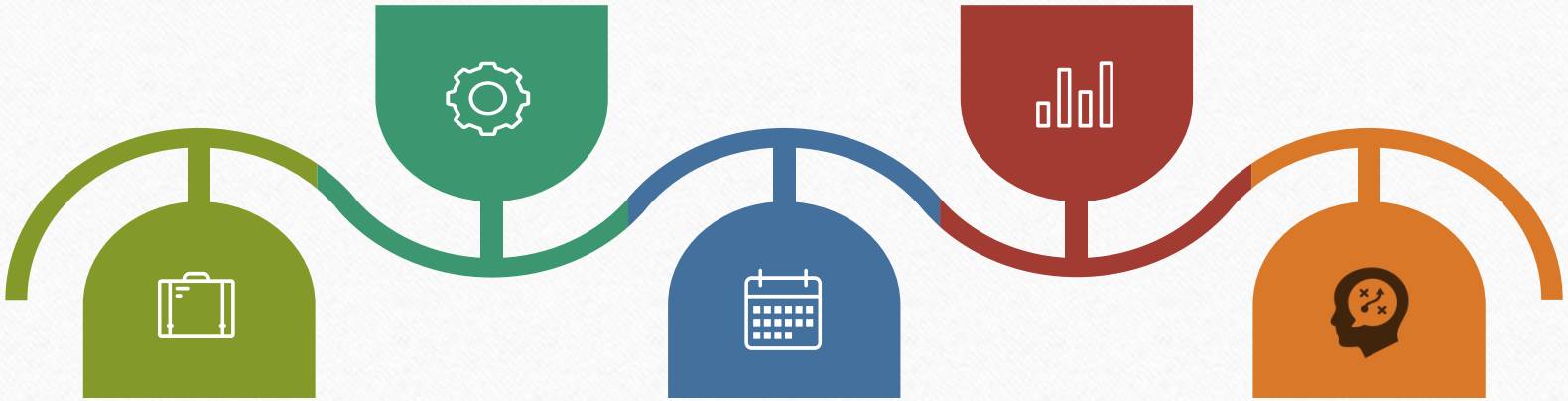


www.asdma.gov.in

Roadmap

Preparedness & Response - Collaboration Network Expansion

Improve Awareness on Preparedness & Response of Early Warning



Existing Policies & Systems

Real-Time Data Sources Network Expansion

Incorporating Deep Learning AI Early Warning Systems

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