Geospatial Technologies for Flood Management in Pakistan

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Pak-RSO, SUPARCO
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AGENDA

- Introduction to Pak-RSO
- Geospatial Technologies for Flood Monitoring
  - Mitigation Stage
  - Preparedness Stage
  - Response Stage
  - Recovery Stage
- Geospatial Technologies for Landslide Monitoring
- Conclusion

Space Application Centre for Response in Emergency and Disasters (SACRED) - PAK-RSO

- **THE CENTRE PROVIDES SPACE BASED INFORMATION TO NATIONAL / PROVINCIAL DISASTER MANAGEMENT AGENCIES TO RAPIDLY ASSESS THE EXTENT OF NATURAL DISASTERS AND DAMAGES TO HUMAN LIVES, PROPERTY AND INFRASTRUCTURE.**
- **THE CENTRE ALSO PROVIDES ASSISTANCE TO REGIONAL COUNTRIES IN CASE OF NATURAL DISASTERS.**

Email: sacred@suparco.gov.pk **Web:** Disasterwatch.sgs-suparco.gov.pk

International Cooperation In Disaster Management

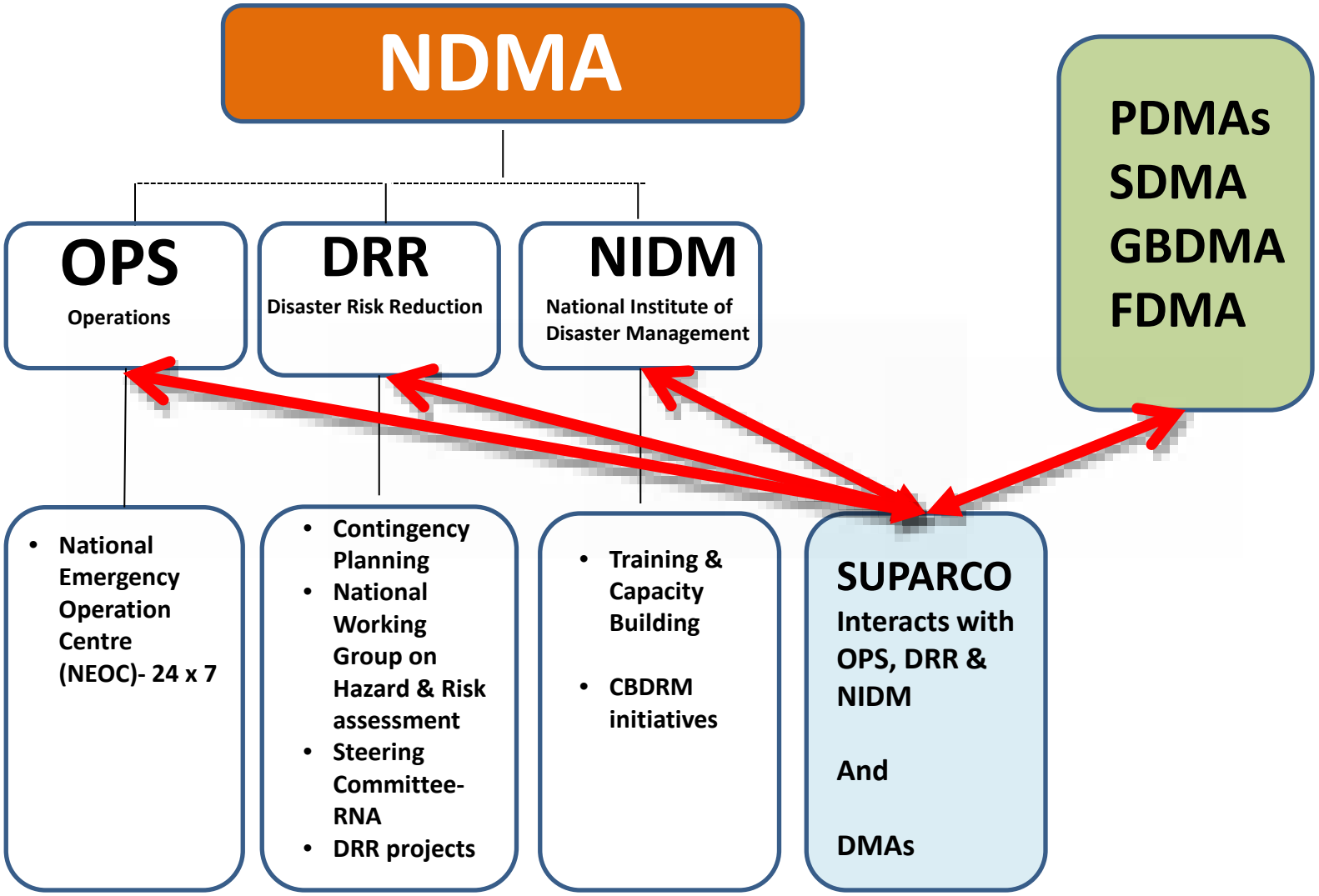
International Charter Space and Major Disasters

- ✓ The International Charter aims at providing a unified system of space data acquisition and delivery to those affected by natural or man-made disasters through Authorized Users
- ✓ On Behalf of NDMA, SUPARCO has been registered with Charter as Authorized User (AU)
- ✓ SUPARCO is host to UN-SPIDER Regional Support office in Pakistan
- ✓ SUPARCO is also Member of JPT-3 project of Sentinel Asia and is registered as Data Analysis Node (DAN)
- ✓ SUPARCO is also Member of APSCO Disaster Management Framework

DISASTER MONITORING – PAST EXPERIENCE

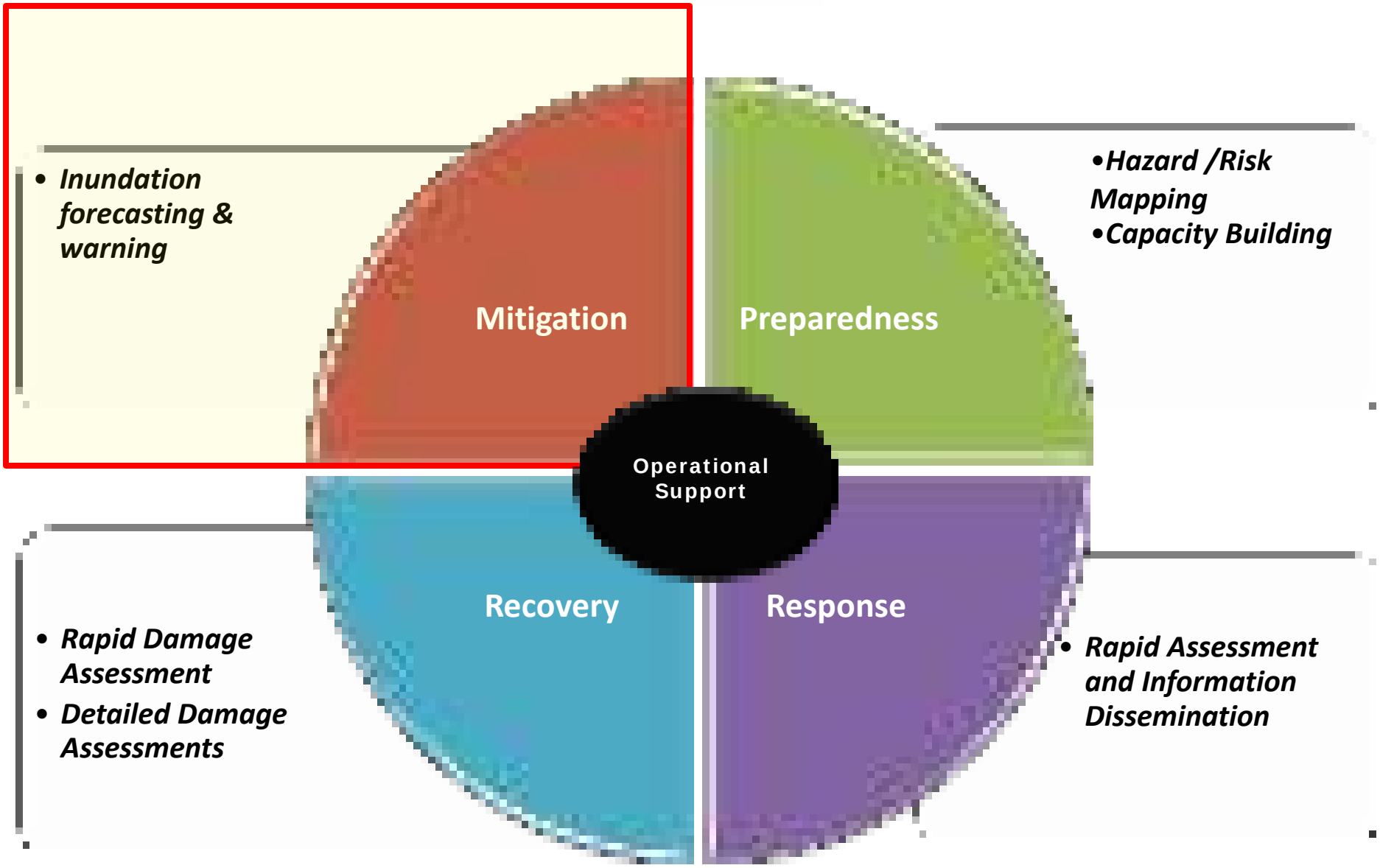
During Natural Disasters, SUPARCO provided technical support to various national Organizations NDMA, PDMAs and International Agencies ICIMOD, UN-FAO etc

National Coordination & Support Mechanism

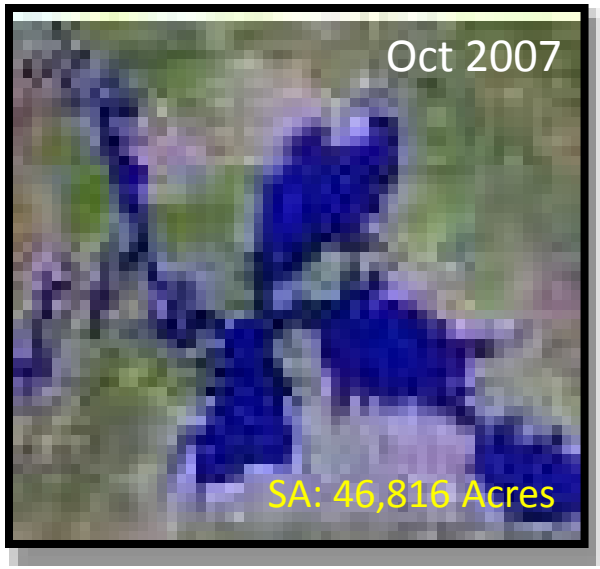


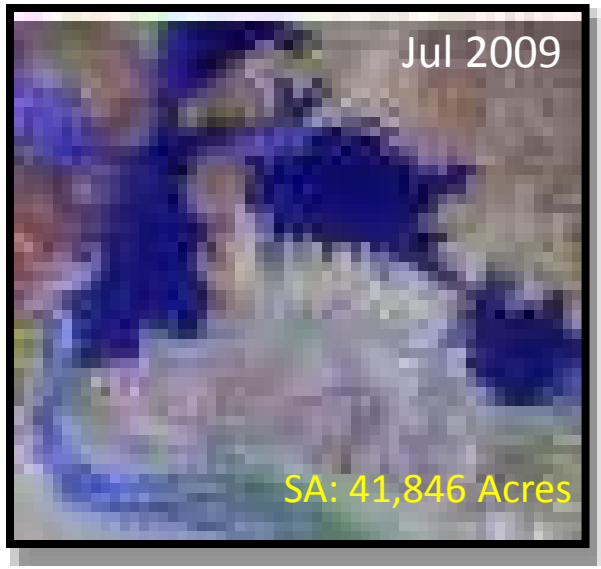
Geospatial Technologies for Flood Management

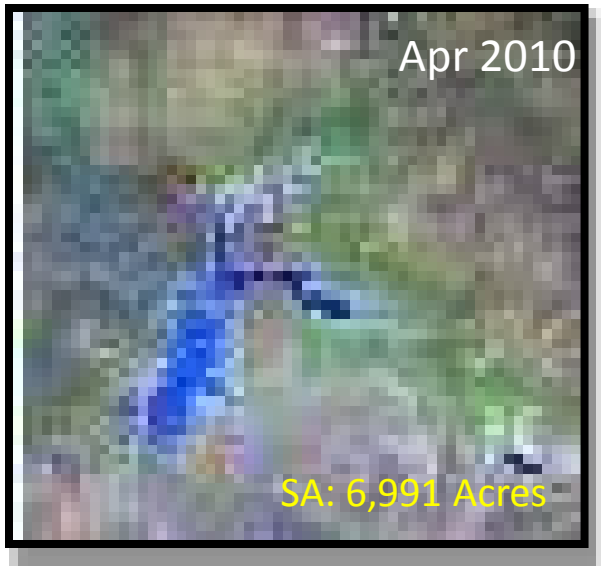
Geospatial Technologies for Flood Management

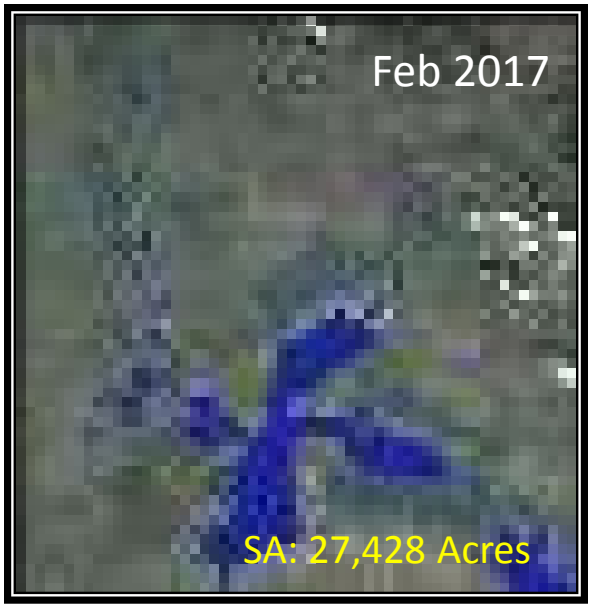


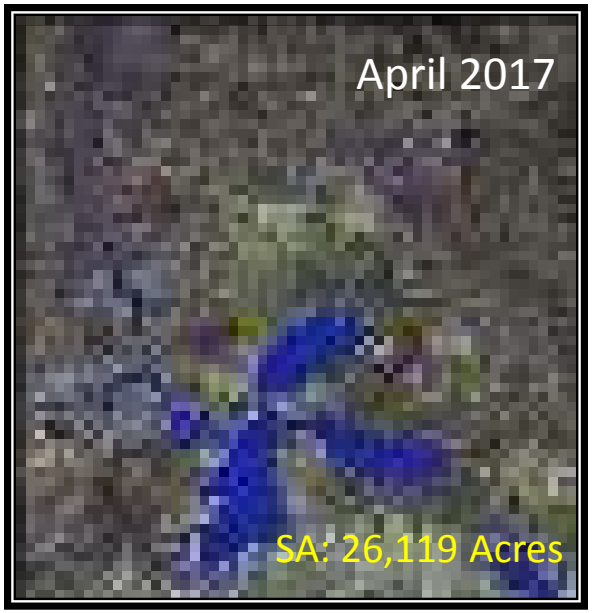
Dams Monitoring – Surface Water Dynamics

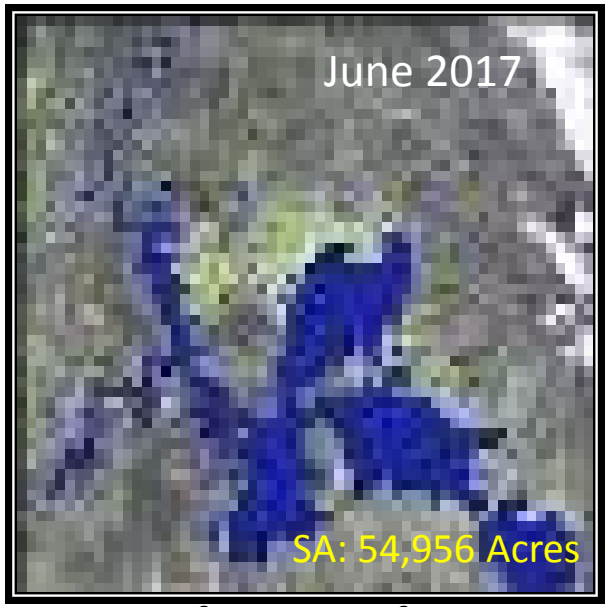








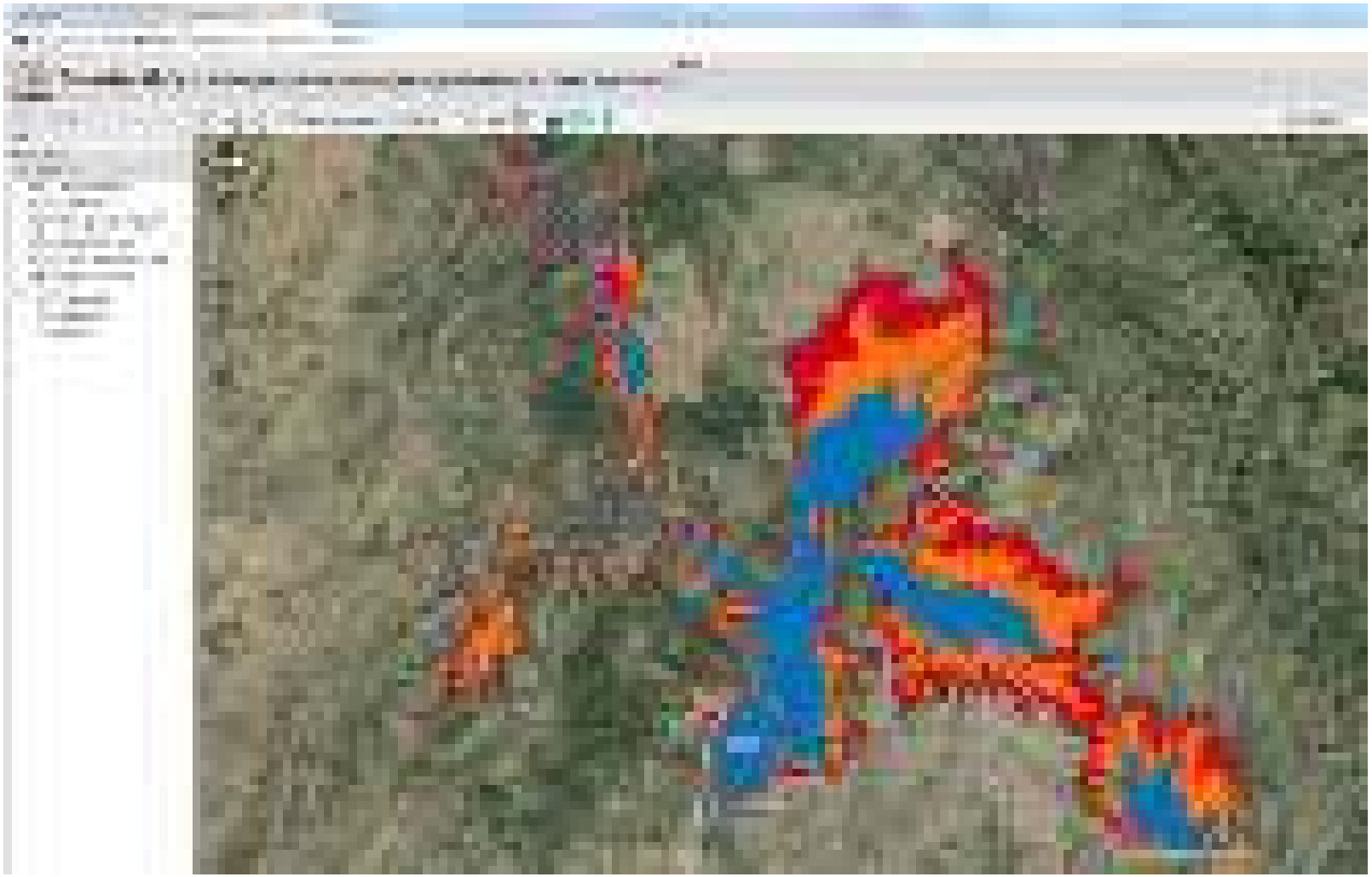




SA = Surface Area of reservoir

DAMS MONITORING – SURFACE WATER DYNAMICS

Water Occurrence Density 2013-15

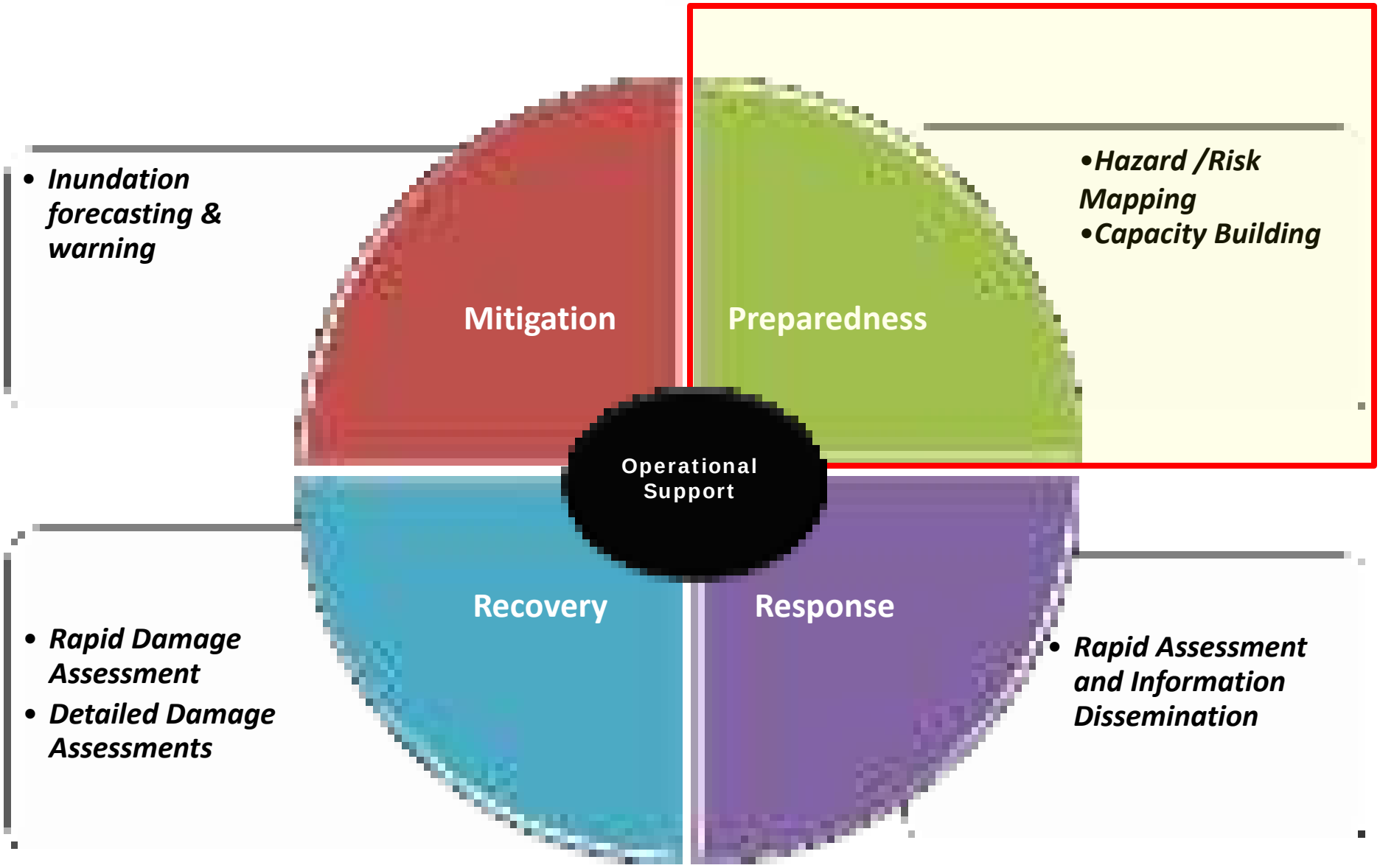


Monitoring of Encroachment Removal in Punjab and Sindh

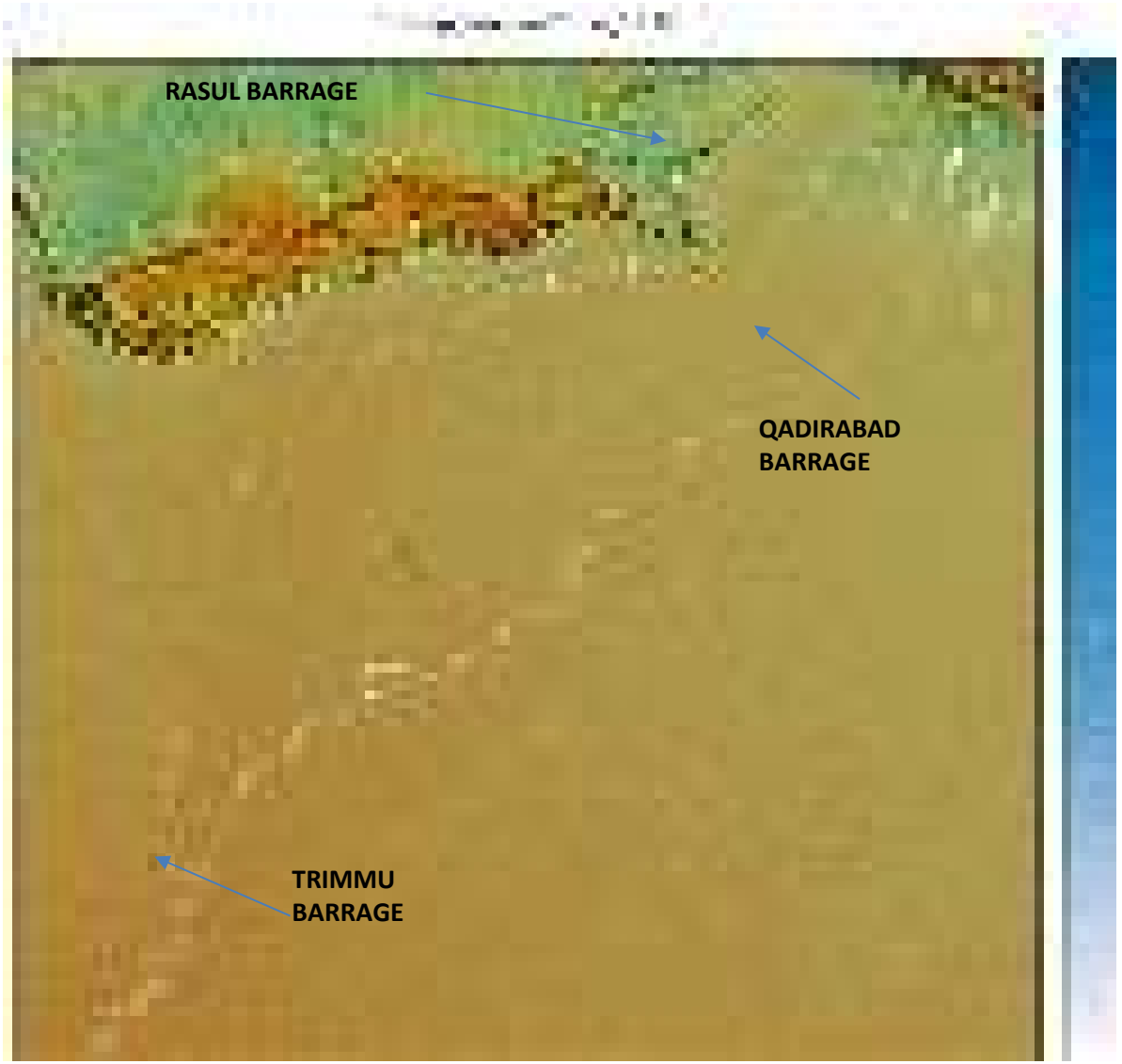
Following the floods of 2010, PID Punjab and Sindh carried out encroachment removal activities along River Indus.

SUPARCO carried out monitoring of encroachment removal based on 1.5m Spot-6/7 satellite imagery

Operational Workflow

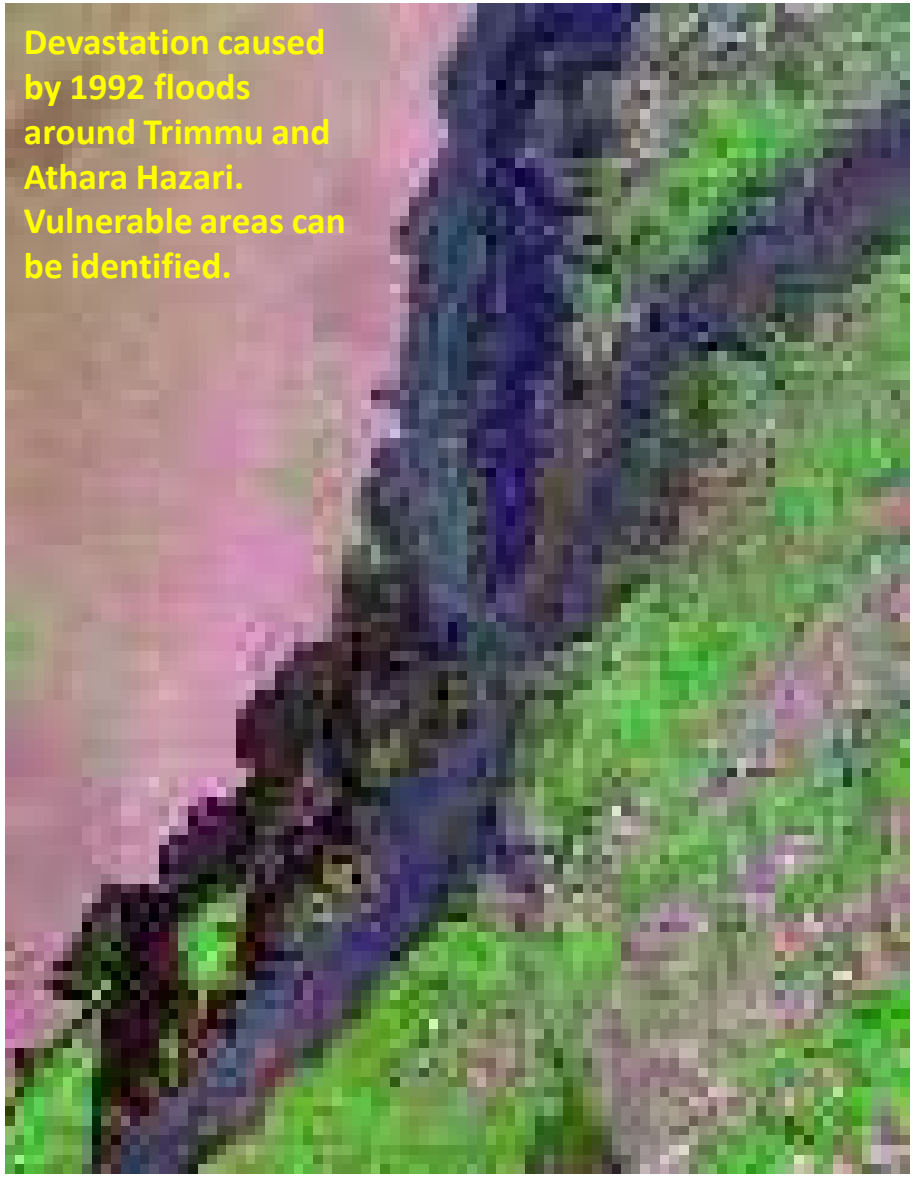


Flood Modeling and Inundation Forcasting

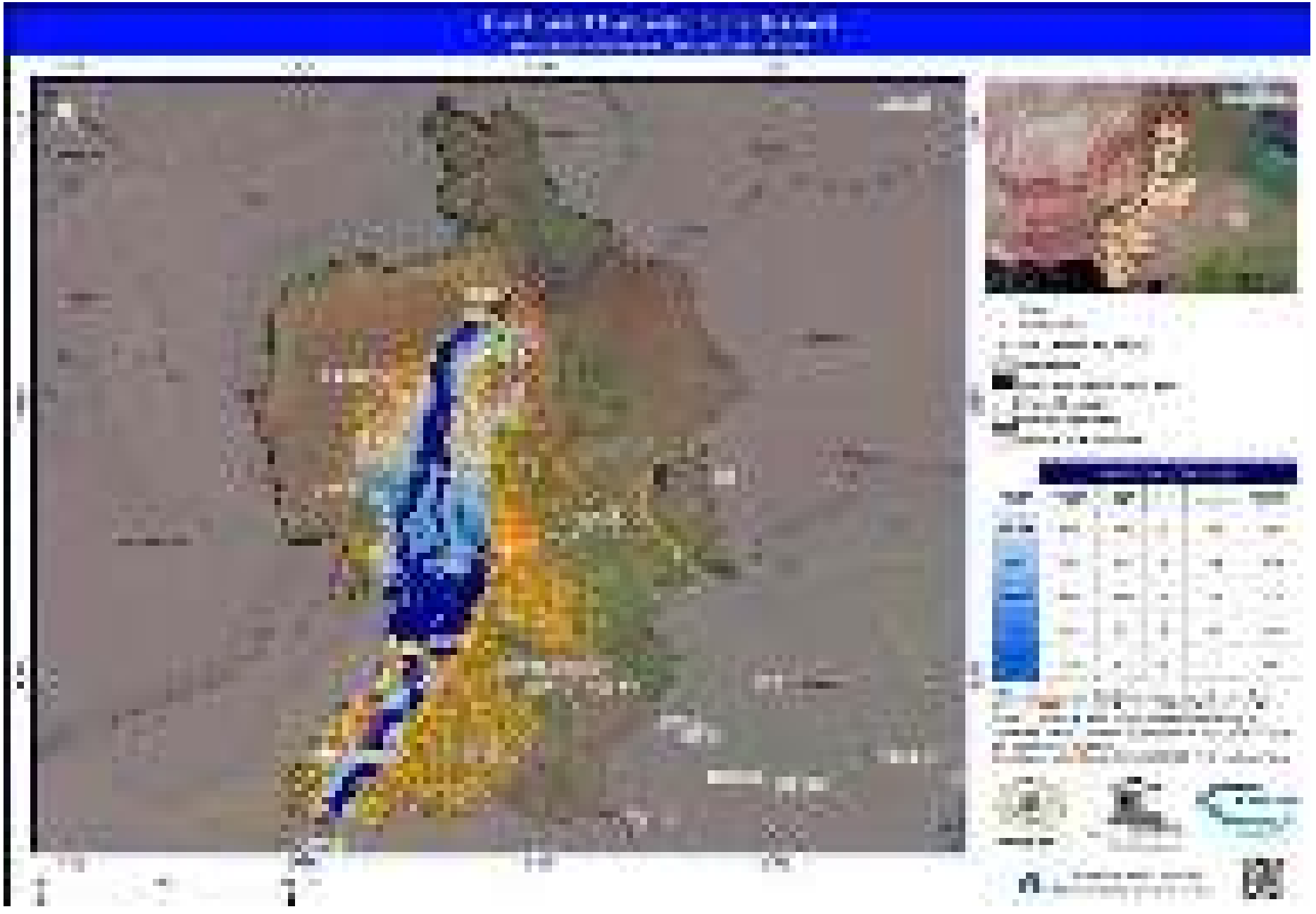


Simulation results show how flood waters progress along Jhelum and Chenab rivers causing heavy inundations.

Flood Modeling applications – Flood 2014



Flood Hazard Maps



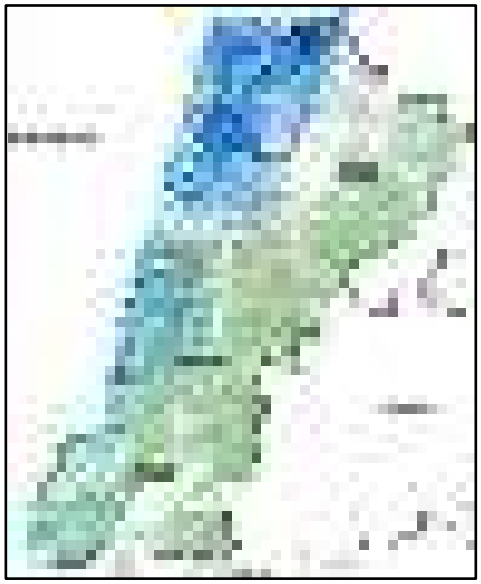
Multi-Hazard Vulnerability Risk Assessment (MHVRA)

Objective

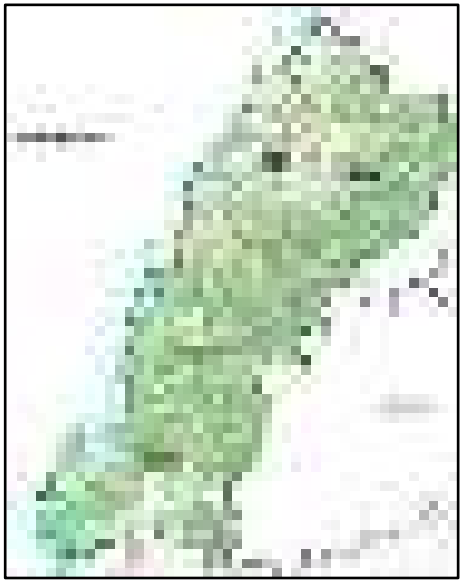
National Disaster Management Authority (NDMA) intends to carryout Multi Hazard Vulnerability and Risk Assessment (MHVRA) in 49 x vulnerable districts spread across Pakistan as part of the National Disaster Management Plan (NDMP).

Flood and Drought Hazards

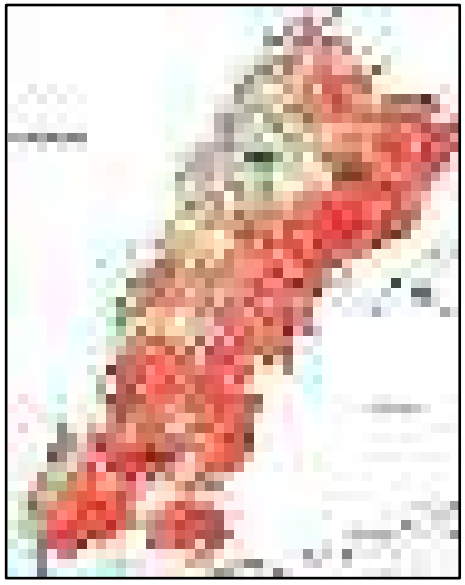
Landuse and Landcover → Spatial Analysis ← Rabi and Kharif Crops



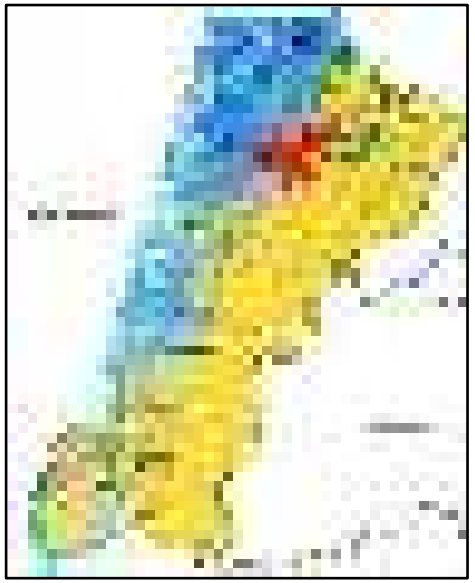
Kharif Crop Exposure to Drought



Rabi Crop Exposure to Flood

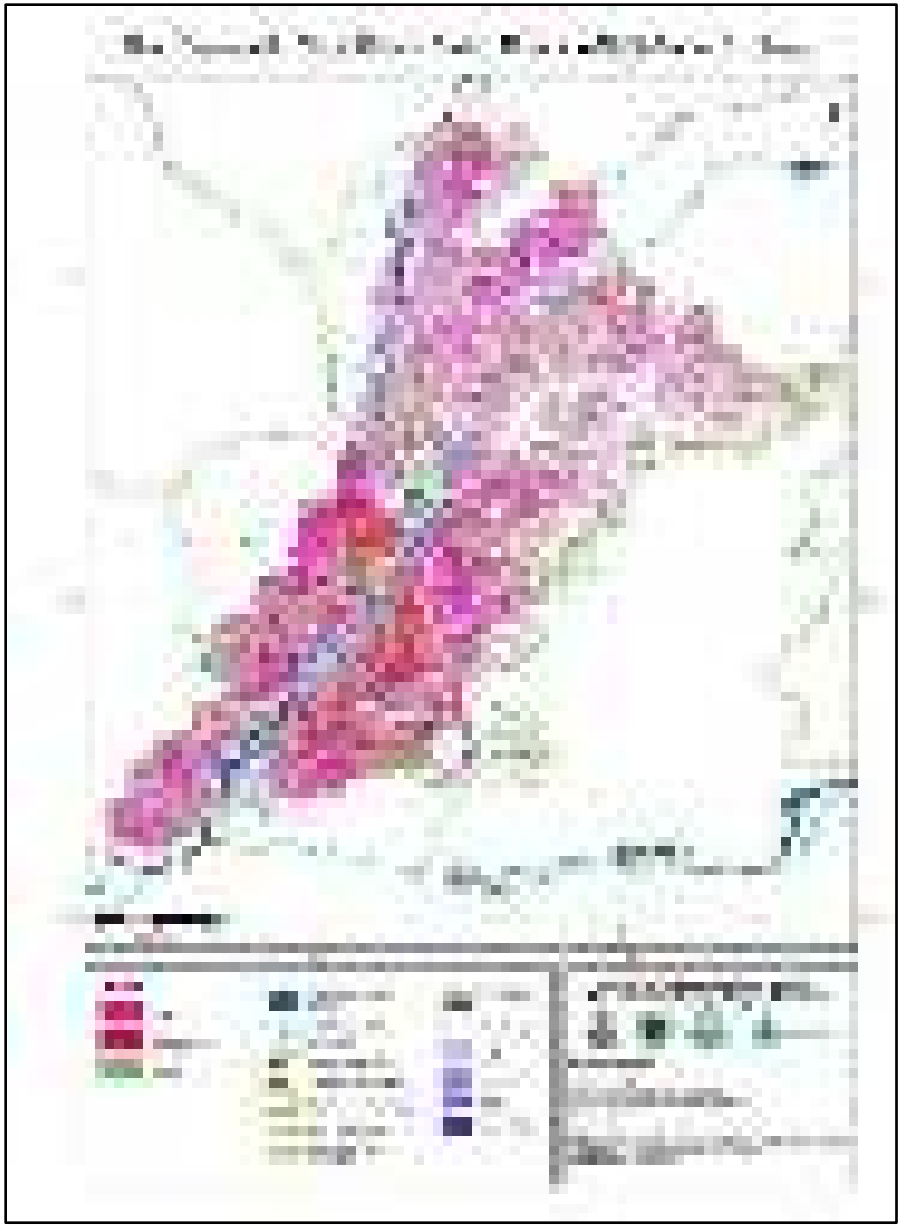


Rabi Crop Exposure to Drought



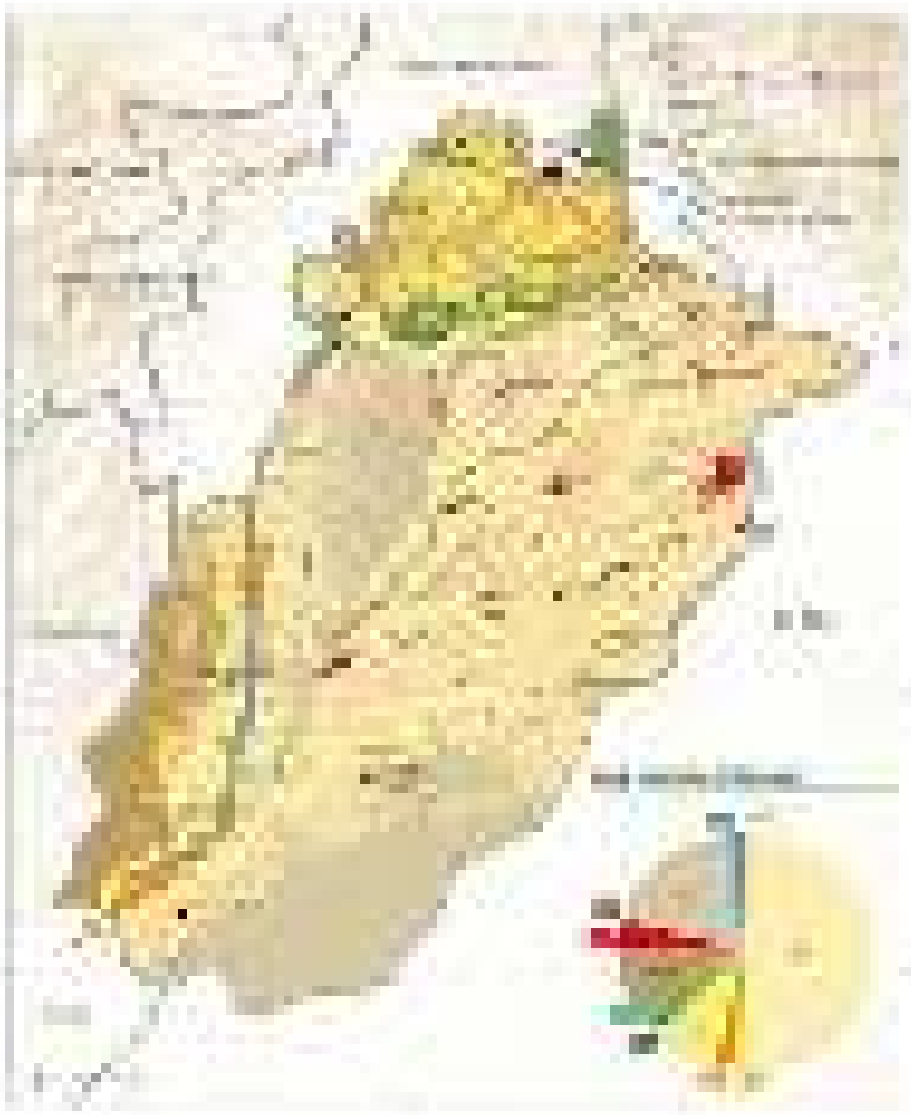
LULC Exposure to Flood

Multi-Hazard Vulnerability Risk Assessment (MHVRA)



LANDCOVER AND LANDUSE

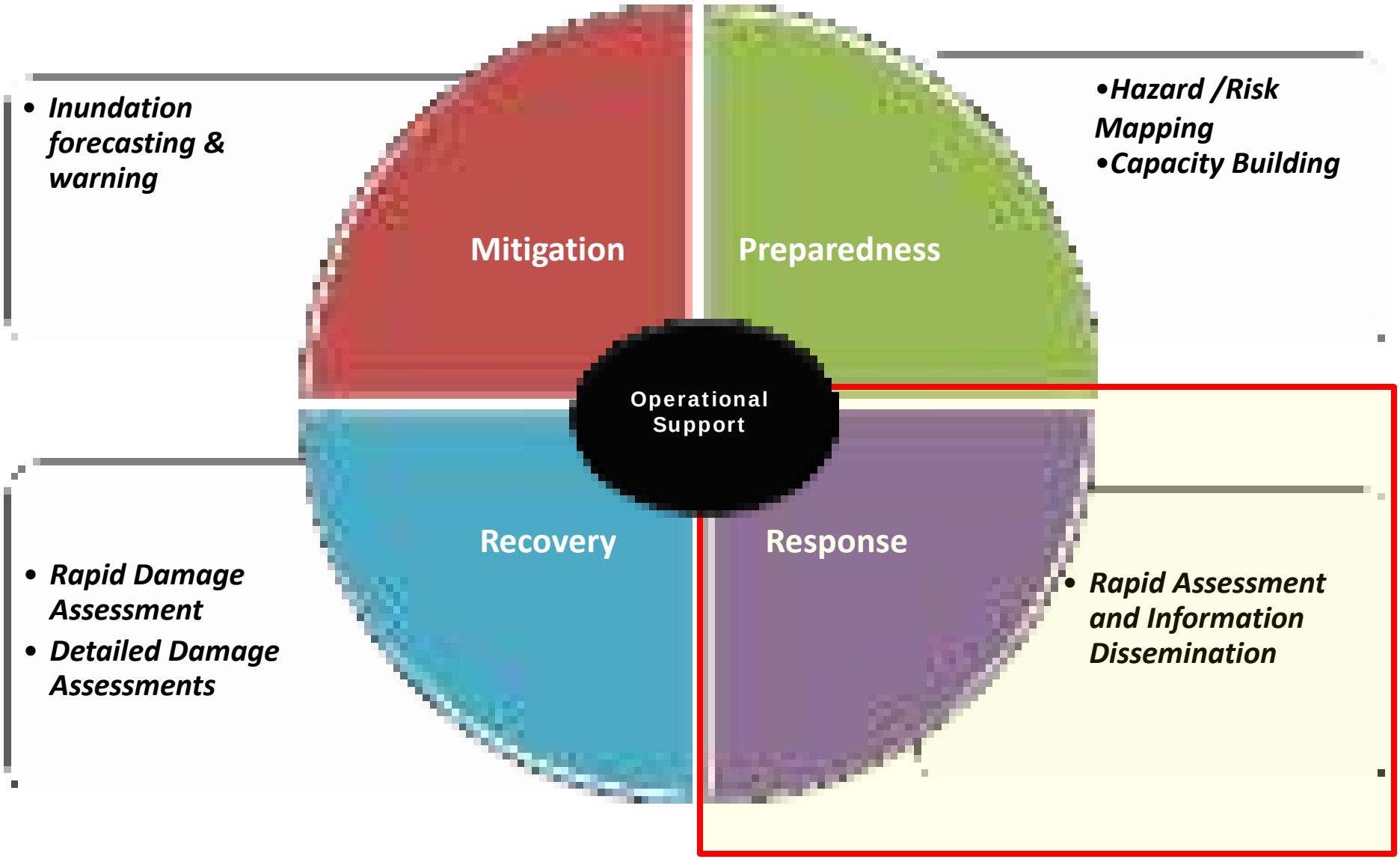
PUNJAB

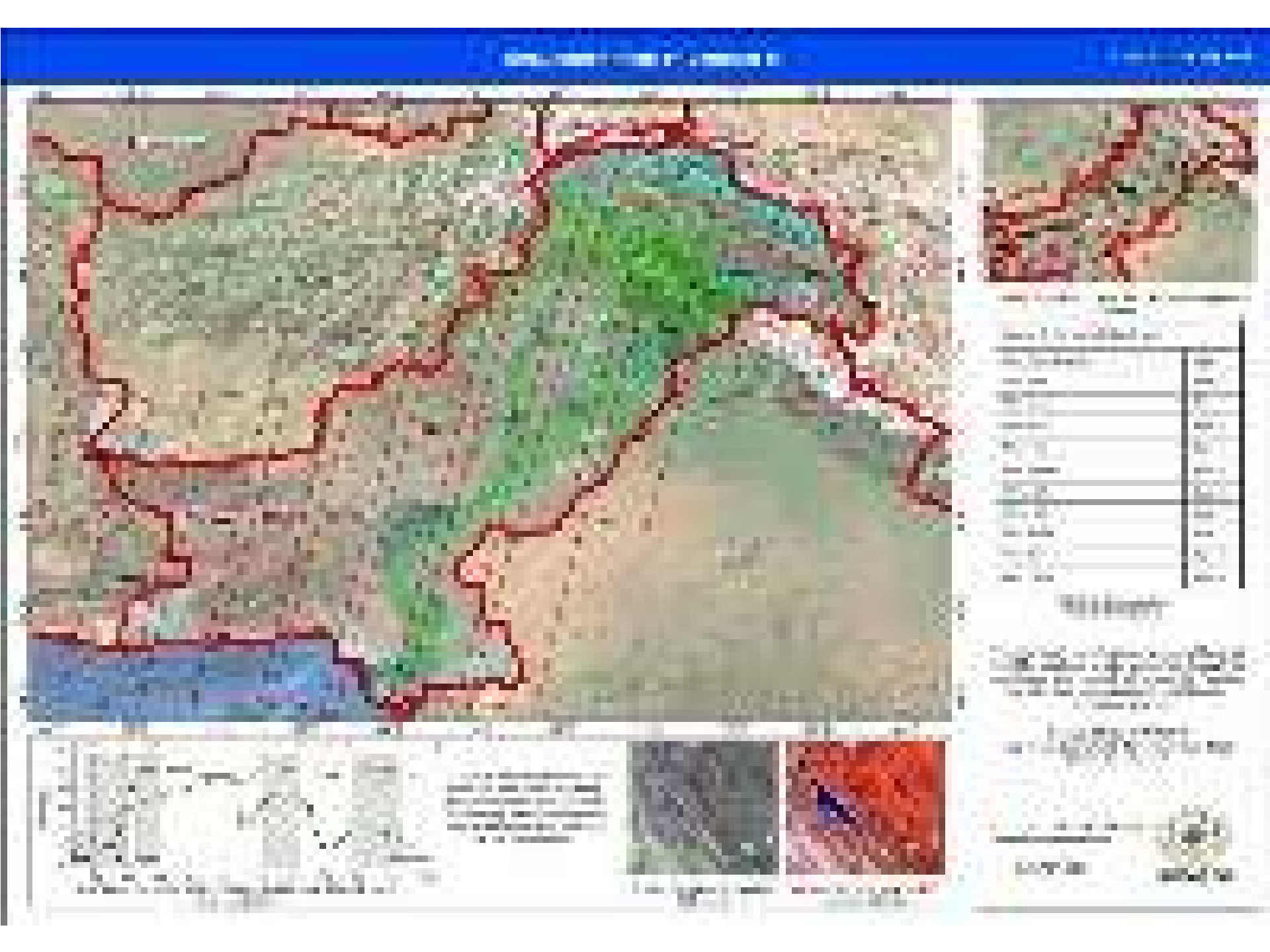


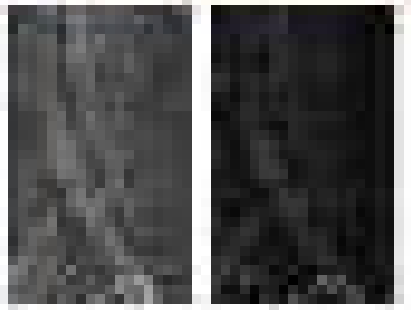
SINDH

- STANDARDIZED LANDCOVER CLASSIFICATION ATLASES HAVE BEEN PREPARED BY SUPARCO COVERING SINDH, PUNJAB AND KP, WHEREAS LCCS ATLAS FOR BALOCHISTAN IS IN PROCESS.

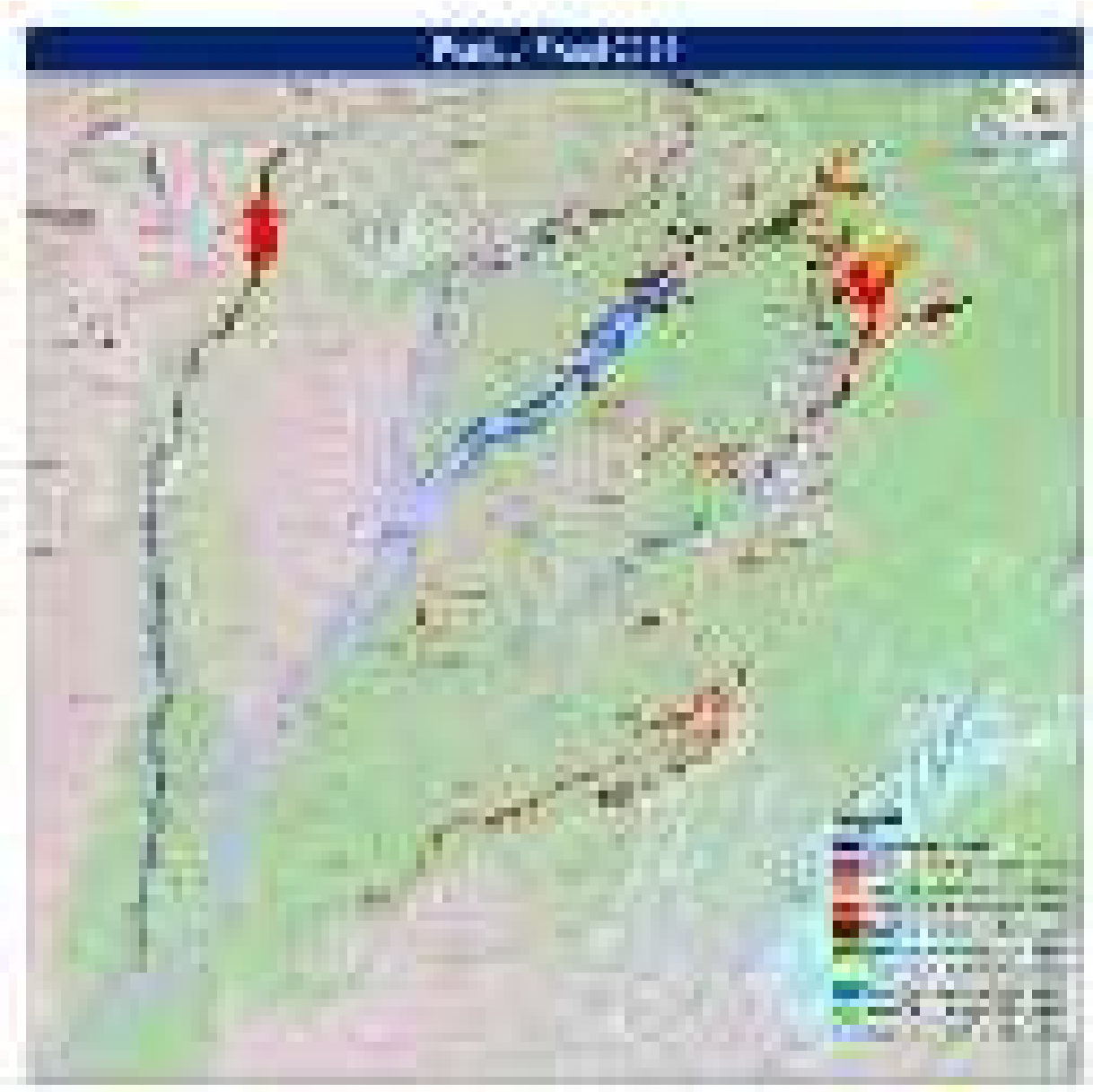
Geospatial Technologies for Flood Management







Daily Monitoring of Rivers - MODIS



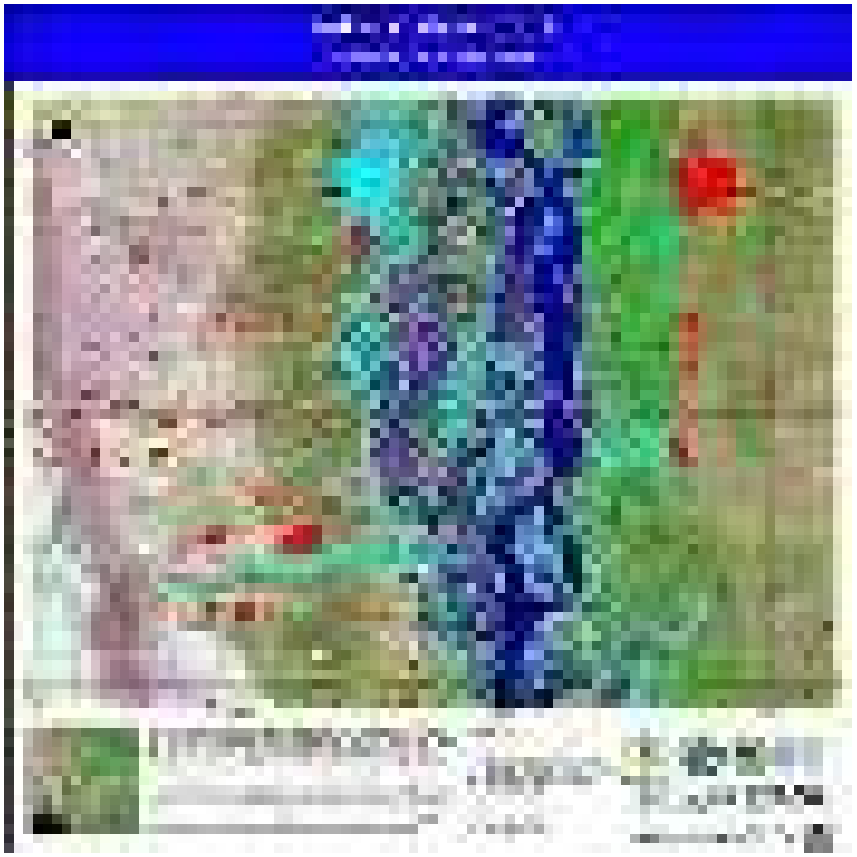
Daily Monitoring of Rivers - MODIS

Monitoring of Rivers

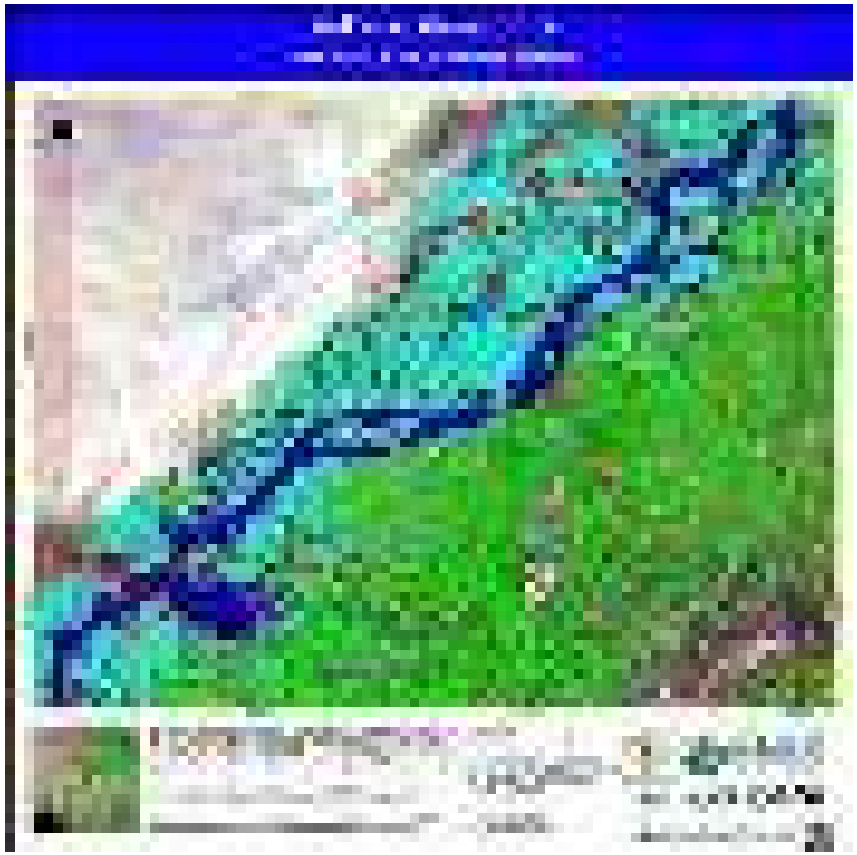
Monitoring of Rivers

MONITORING WITH SAR

ALOS PALSAR-2 and Sentinel-1 data

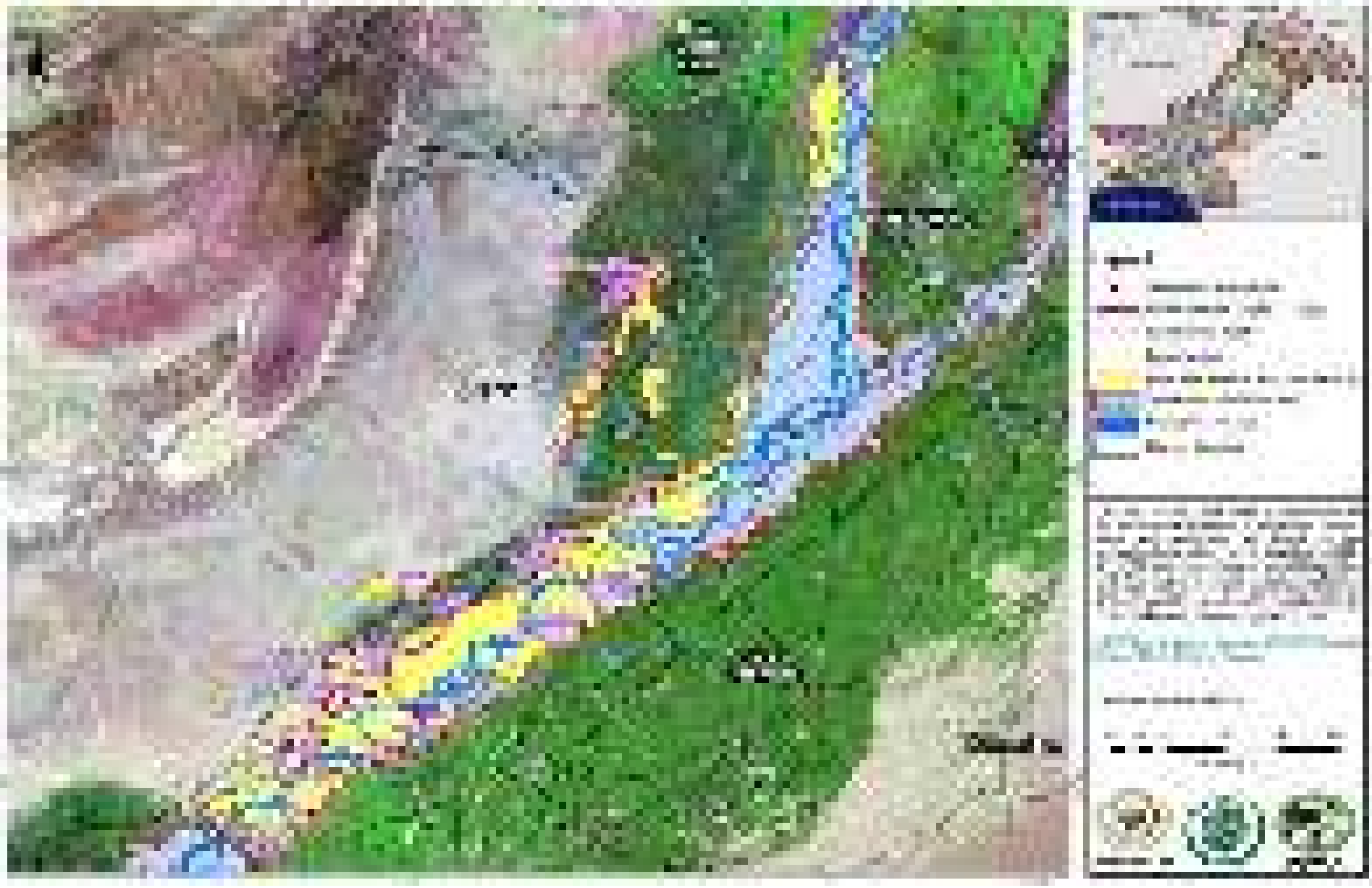


Inundations along Lala creek and Indus in Layyah District

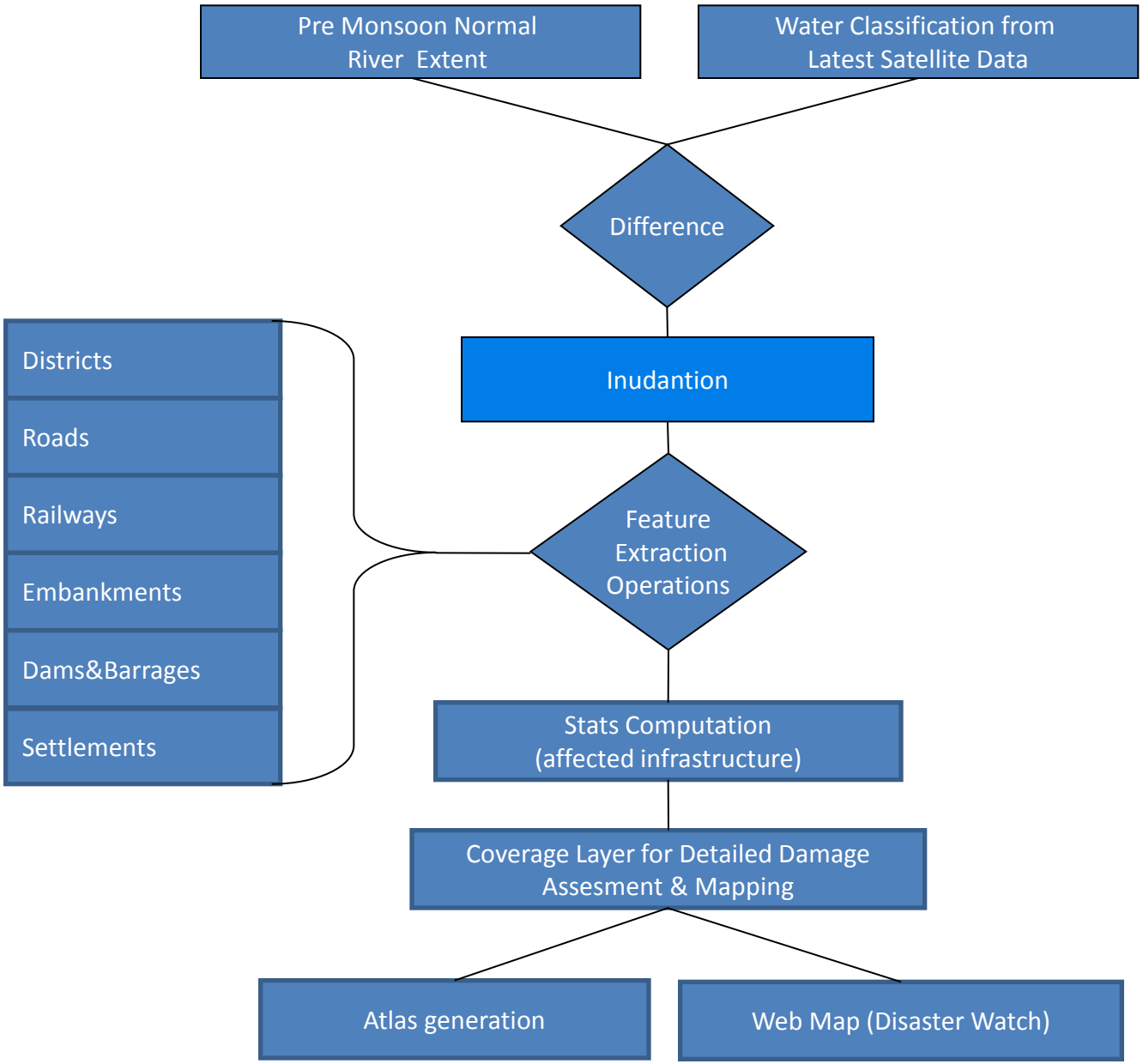


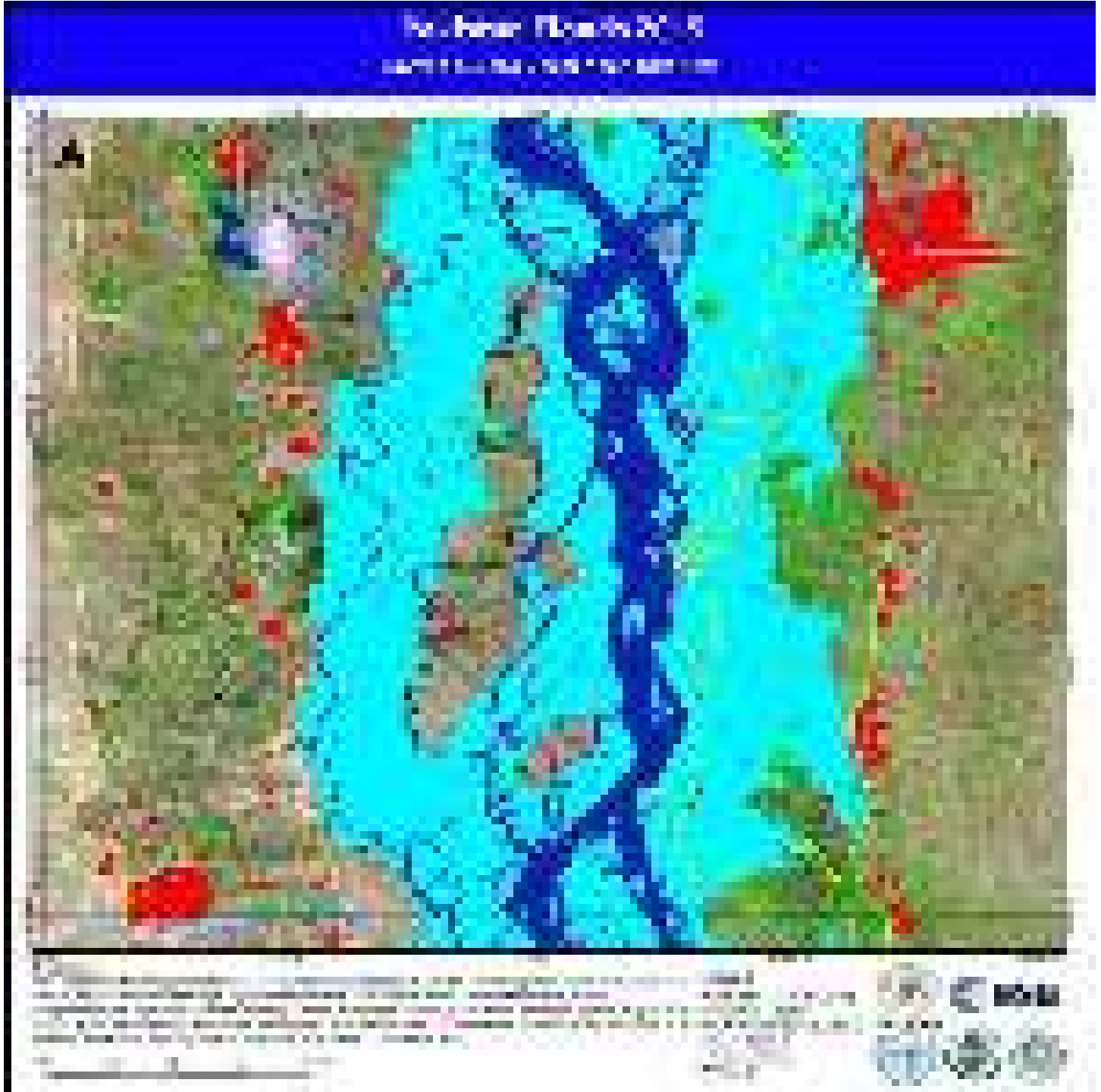
Inundations in Rajanpur District due to flash floods and riverine flooding in Indus

THE DISASTER HOTSPOTS ARE MONITORED USING VARIOUS SATELLITE PLATFORMS AND INFORMATION SOURCES TO PROVIDE A COMPLETE PICTURE TO THE DISASTER MANAGEMENT STAKEHOLDERS AND RELIEF AGENCIES.



Detail Damage Assessment and Mapping





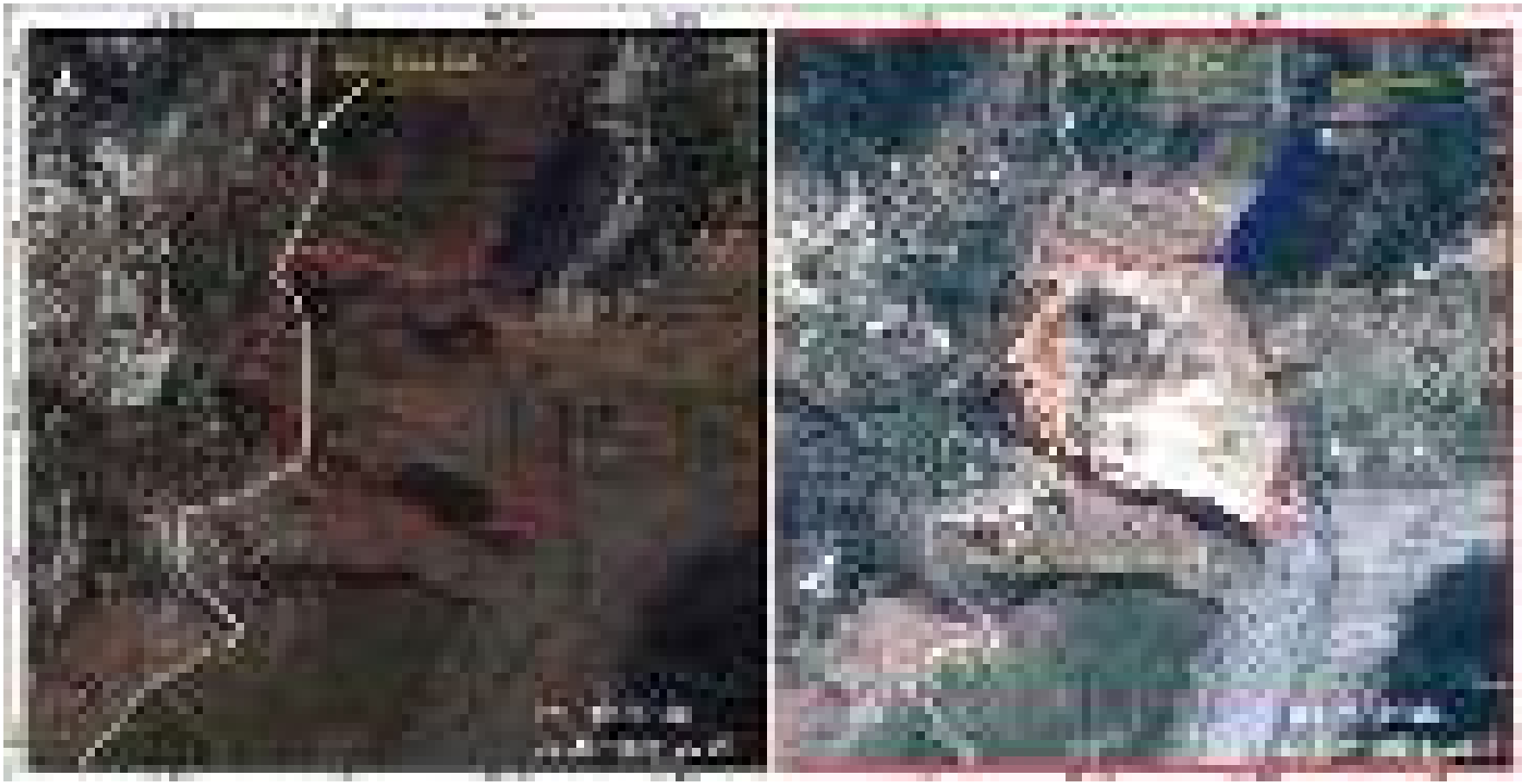
MONITORING OF LANDSLIDE – KARORA 2016

A landslide triggered by monsoon rains hit over 30 houses at Karora Area, District Shangla, KP on 02 July 2016. Heavy rains and landslides also blocked Swat-Bisham road.

Imagery: GF-2 **Date:** 07-07-16

Spatial analysis was performed on 0.8 m GaoFen-2 Satellite data provided by UN-SPIDER Beijing office in collaboration with Chinese National Space Administration (CNSA).

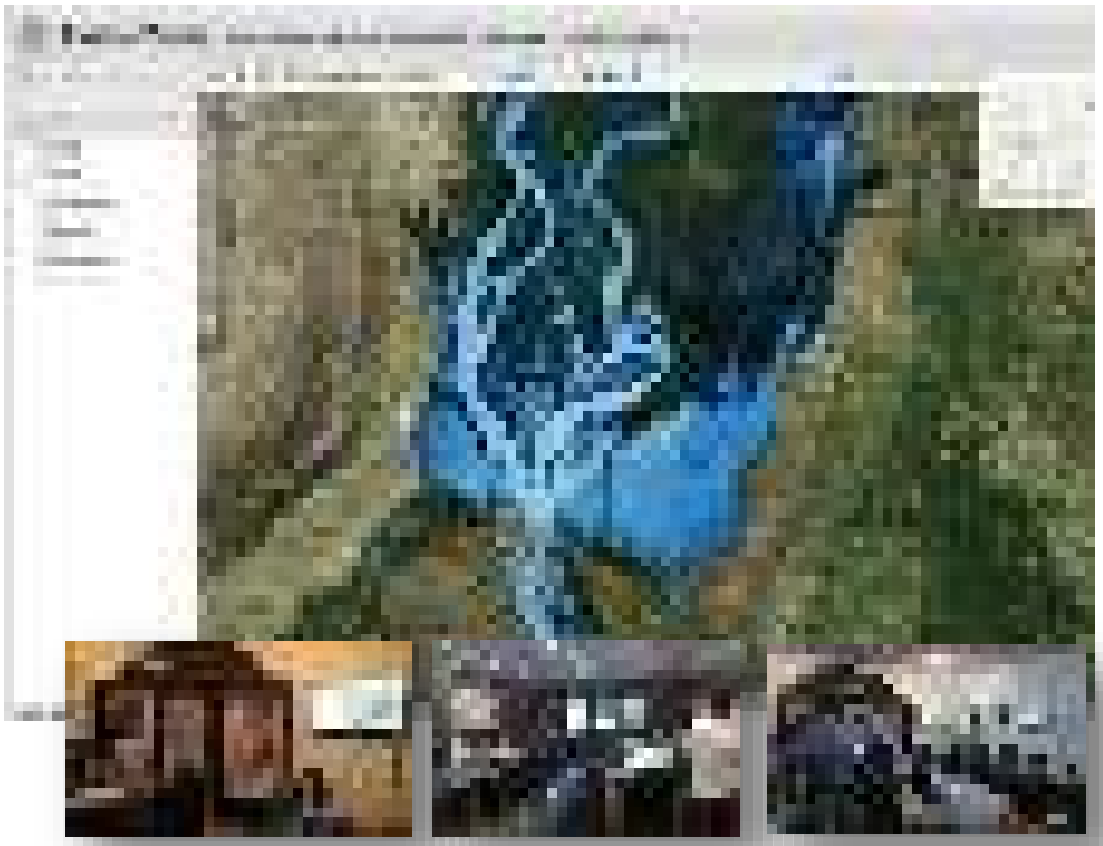
Monitoring of Landslide – Havelian 2015



Spatial analysis was performed on 0.5 m Pleiades Satellite data.

NEAR REAL-TIME SUPPORT THROUGH DISASTERWATCH

DISASTERWATCH DEPLOYMENT AND INTEGRATION WITH NDMA AND PITB



SUPARCO's DisasterWatch web portal being utilized and referenced at a press-conference in Flood control room, S&GAD (Civil Secretariat) Punjab and PDMA Punjab control room.

- THE INFORMATION IS DISSEMINATED TO FLOOD MANAGEMENT STAKEHOLDERS AT EVERY LEVEL THROUGH INDIGENOUSLY DEVELOPED WEB-BASED VISUALIZATION PLATFORM 'DISASTERWATCH', PRINTED MAPS AND STATISTICS.
- DISASTERWATCH PORTAL HAS ADDITIONALLY BEEN INTEGRATED AT WITH THE NDMA AND PUNJAB GOVERNMENT'S OFFICIAL WEBSITES, THROUGH WHICH, RESCUE / RELIEF AND FLOOD MANAGEMENT ORGANIZATIONS SUCH AS RESCUE 1122, PID, BOR, P&D ACCESS LATEST SATELLITE BASED DATASET AND SPATIAL INFORMATION FOR PLANNING AND RELIEF ACTIVITIES.

DisasterWatch platform

Using DisasterWatch for dissemination of spatial data and analysis

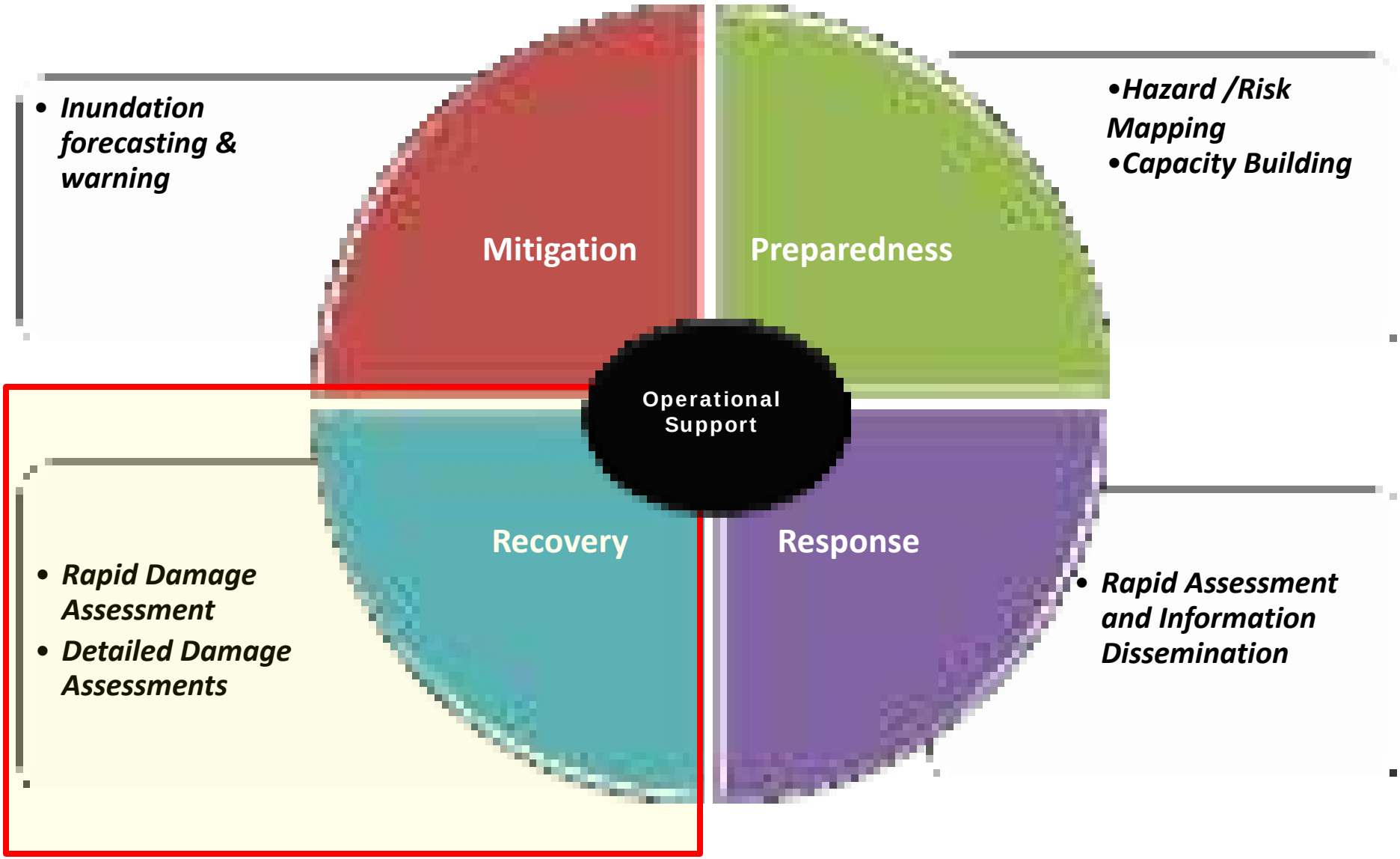
CROP DAMAGE ASSESSMENT

RAPID DAMAGE ASSESSMENT

WATER-OCCURENCE BASELINE

- The DisasterWatch platform has become the central web portal for dissemination of various satellite based analysis and value added products and solutions. The DisasterWatch portal currently provides analysis and satellite based information for earthquake, floods, landslides and drought

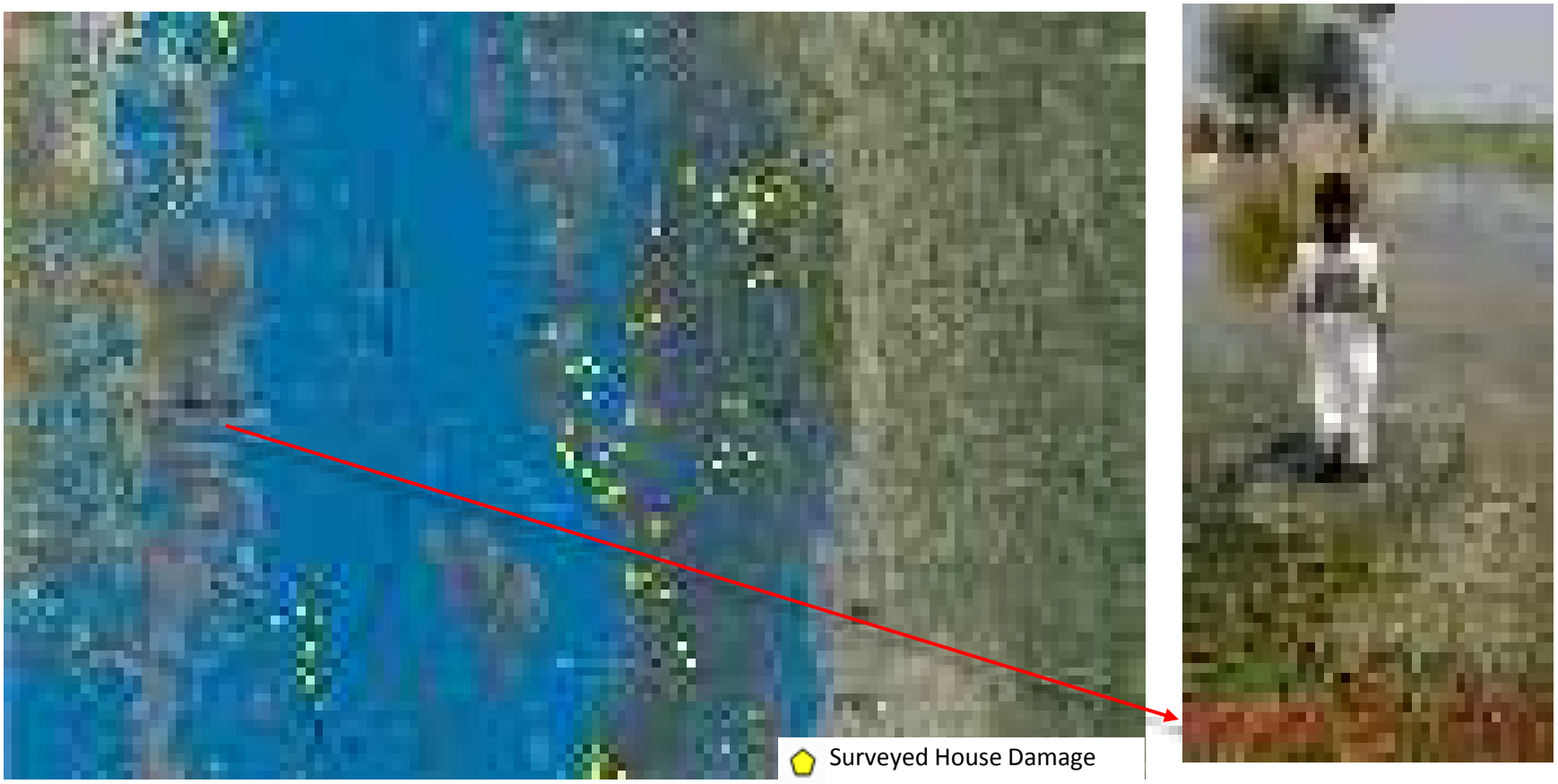
Geospatial Technologies for Flood Management



Monitoring of key infrastructure

Monitoring of Bank Erosion

House Damage Assessment – Floods 2015



Suparco was requested by the Government of Pakistan to assist in validation of house damage assessment surveys. The validated data is then used for the disbursement of compensations by the government.

CONCLUSION

- The role of the Geospatial technologies in flood monitoring is proven
- Flood Modeling play a great role in Flood Hazard Assessment and mapping
- Multiple datasets should be used for the flood monitoring including Optical as well as SAR
- In-situ data must be used with earth observation for damage assessment