PAK-RSO ACTIVITIES

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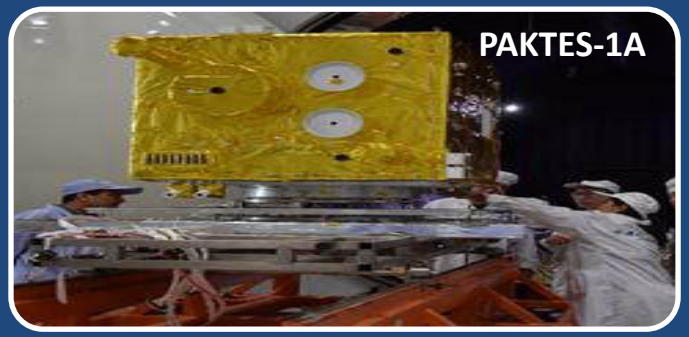
Sequence of Presentation

- About SUPARCO
- Space Technology for Disaster Management
- Flood 2022
- NatCat Model Project
- Way Forward

Assets in Space

COMMUNICATION

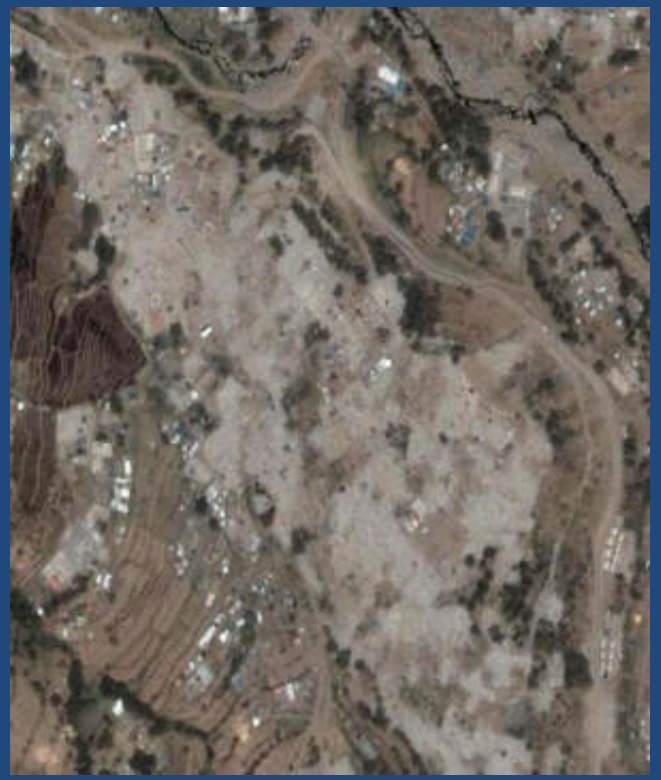
REMOTE SENSING



SATELLITE GROUND STATIONS

- DIRECT RECEIVING STATION - PRSS-I , PAK-TES-1A, SPOT CONSTELLATION
- SPATIAL RESOLUTION VARIES FROM 0.3 TO 20 METER
- LEGACY ARCHIVE SINCE 1989

Background – Major Disasters in Recent History



Kashmir Earthquake - 2005

Pakistan Flood - 2010

Awaran Earthquake – 2013

Space Applications Center for Response in Emergency and Disasters

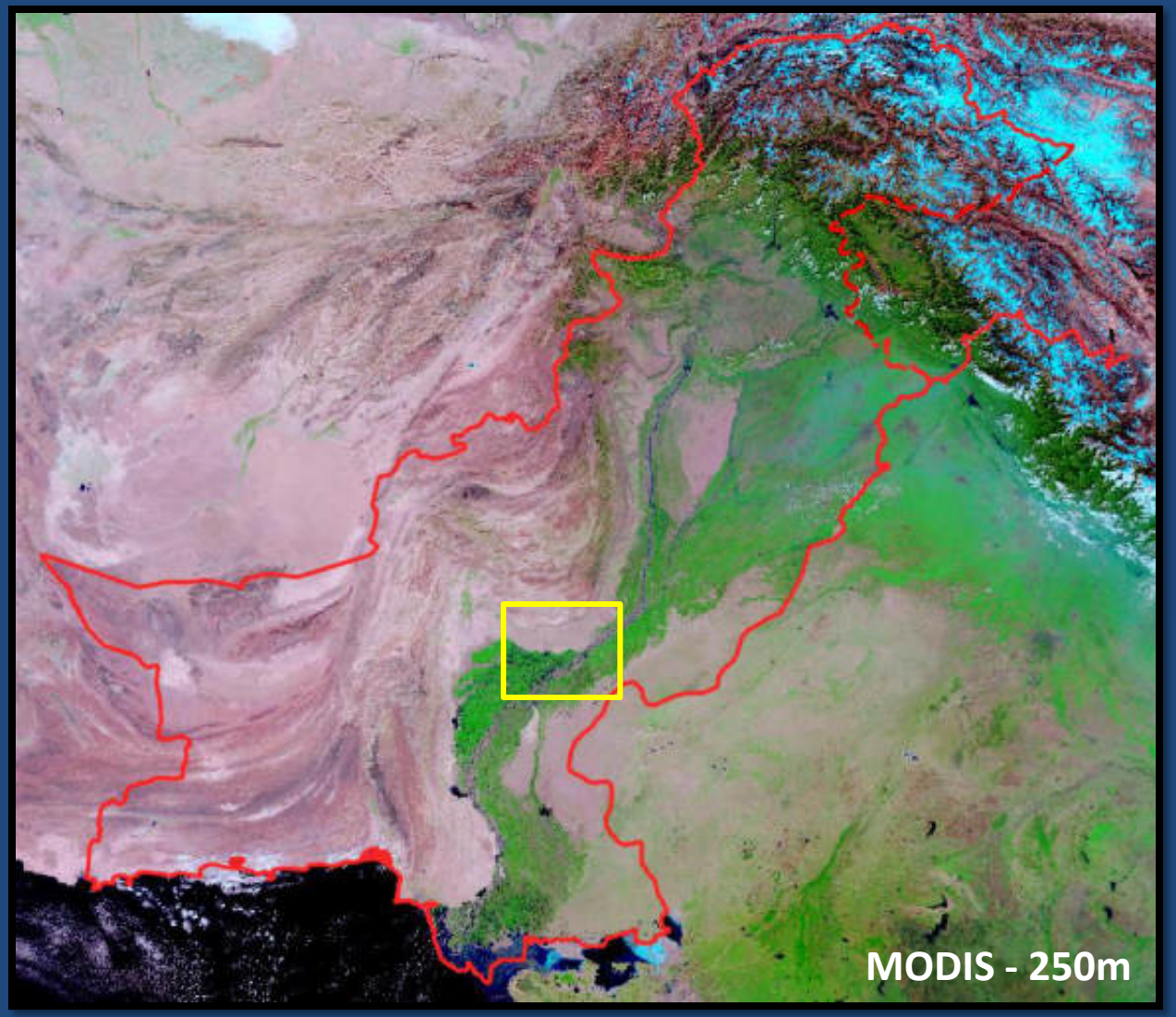
- The centre provides space based information to Federal & Provincial disaster management agencies to rapidly assess the extent of natural disasters and damages
- Center is also host to ***UN-SPIDER*** Regional Support office in Pakistan and provides assistance to ***regional countries*** in case of natural disasters

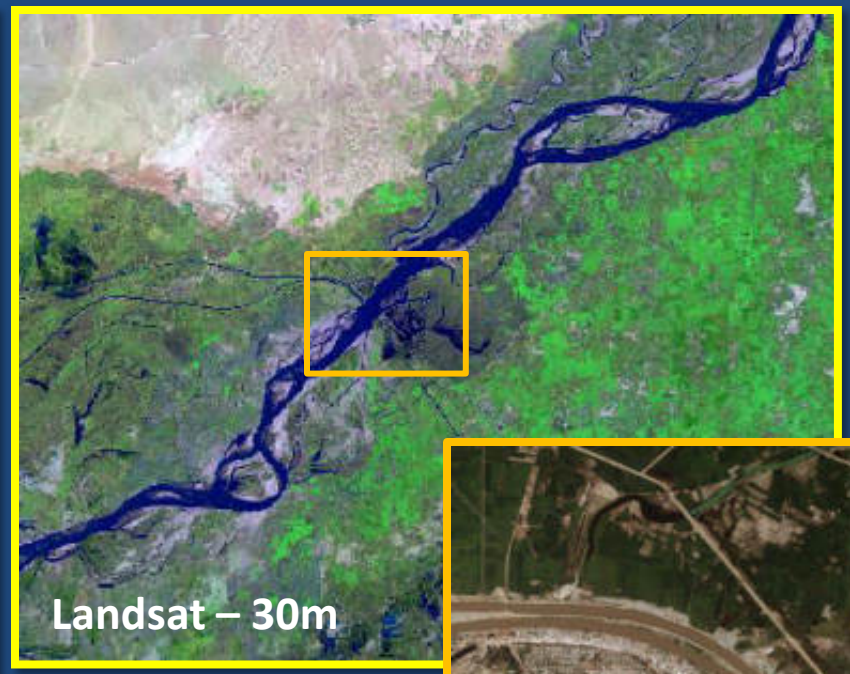
Space Technology for Disaster Management

Satellite due to the synoptic view and repeated coverage can play pivotal role in the monitoring of following:

- ✓ River basins including trans-boundary which are otherwise inaccessible
- ✓ Dams on Eastern Rivers during monsoon
- ✓ Long-term changes in Glaciers
- ✓ Drought assessment
- ✓ Active Landslide and faults
- ✓ Environmental profile at national and regional level

Space in Aid





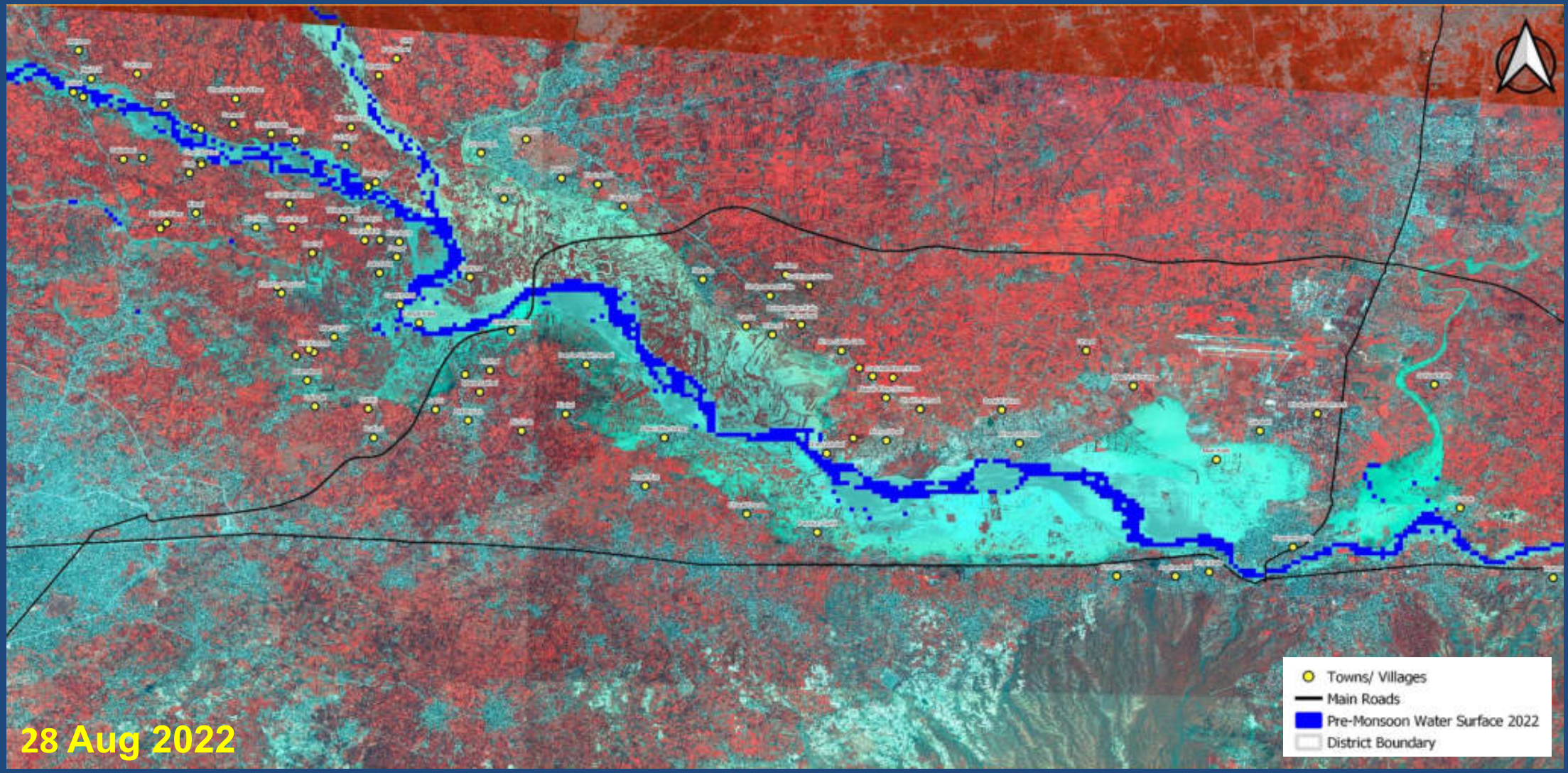
Satellites can provide information at Regional, National and Local level

Space based support to NDMA/PDMAs during Monsoon

- Regular monitoring of Rivers, Trans-boundary dams, Glaciers
- Torrents / Flash floods
- House / settlements damage assessment
- Road / bridges damage assessment on major highways
- Crops damage assessment
- Dams breach assessment / identification

Flood 2022

Flooding in Kabul and Swat Rivers at Nowshera

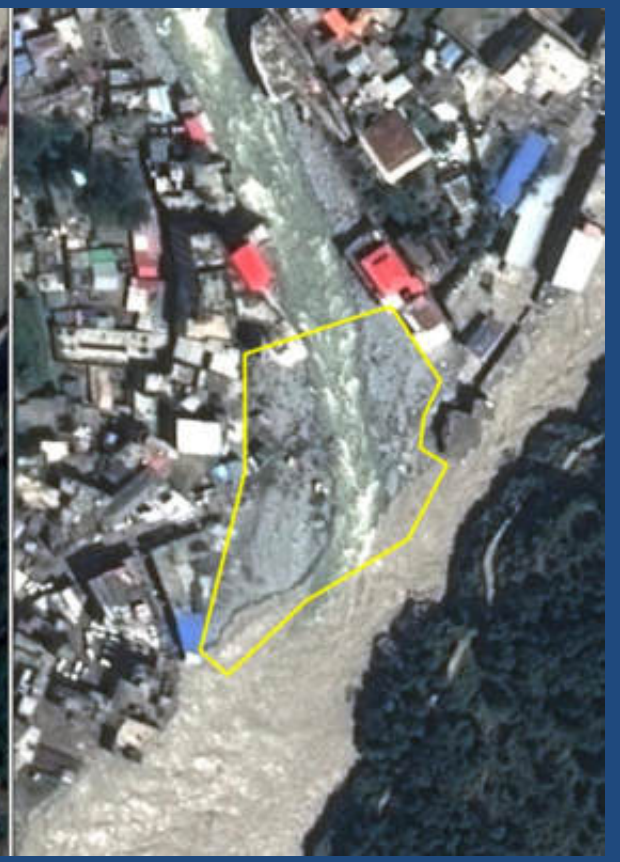


Damages caused by Floods/Rains 2022 - Buildings

Pre - 01 Jun 2022

Post - 28 Aug 2022

Pre - 01 Jun 2022



Post - 28 Aug 2022

Damages caused by Floods/Rains 2022 – Road/Bridges

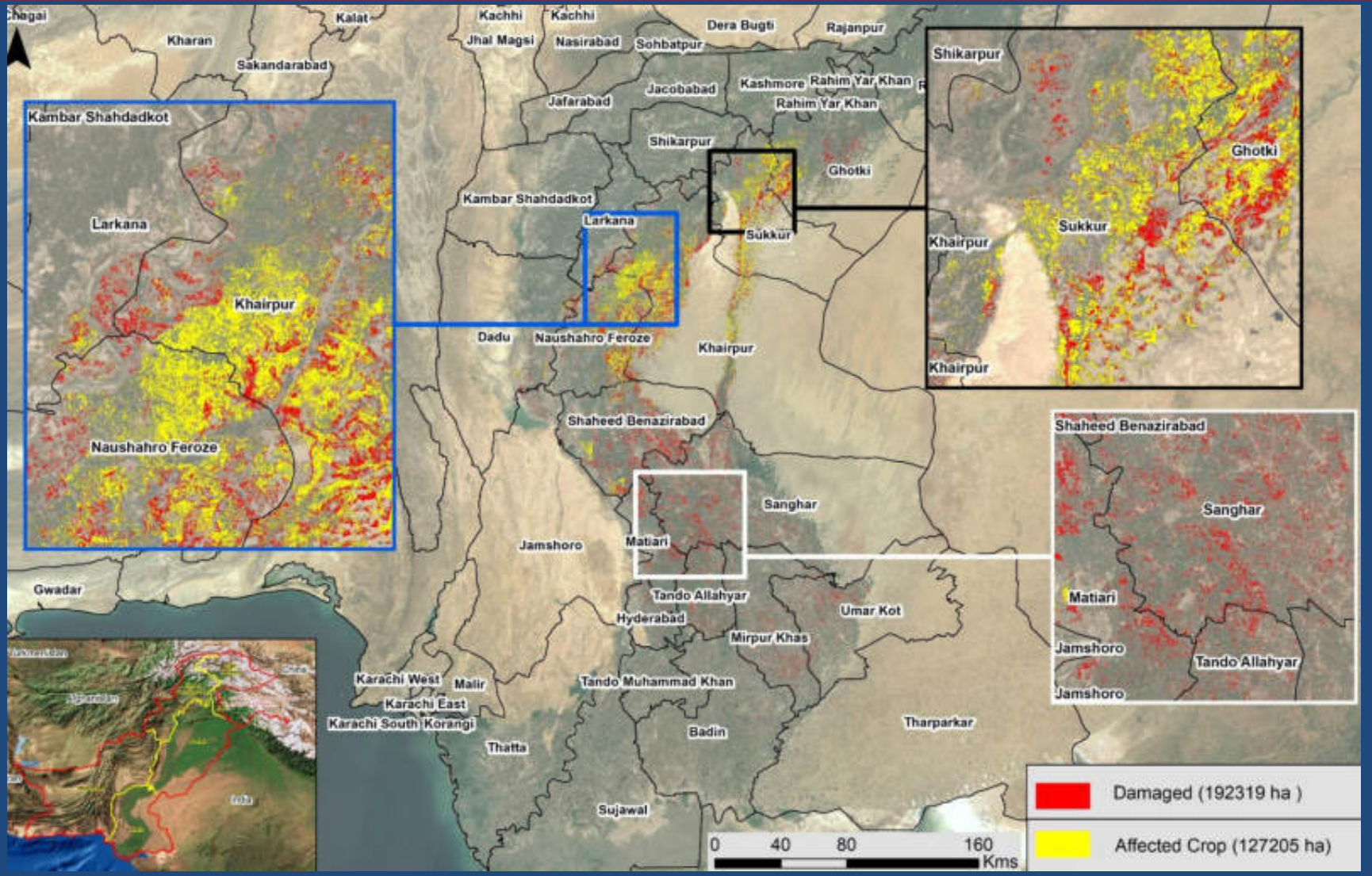
Pre - 01 Jun 2022

Post - 28 Aug 2022

Pre - 01 Jun 2022

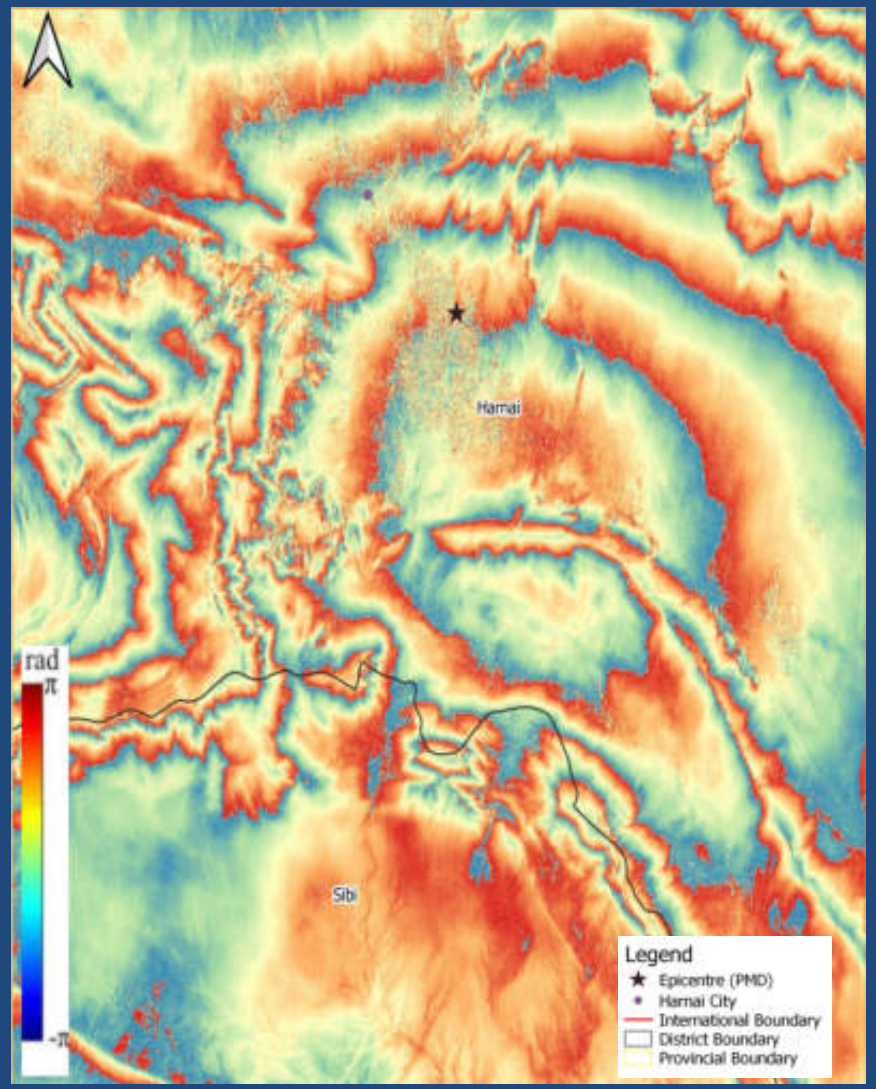
Post - 28 Aug 2022

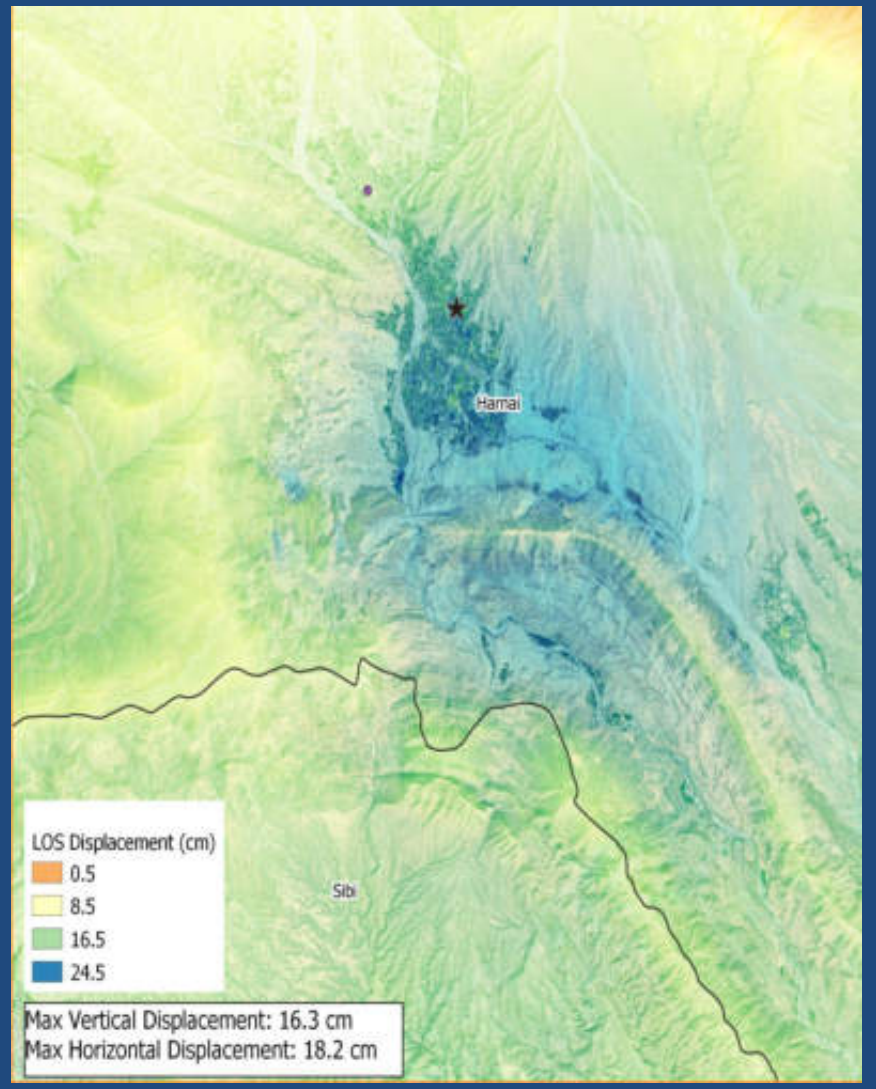
Damages caused by Floods/Rains 2022 – Crops



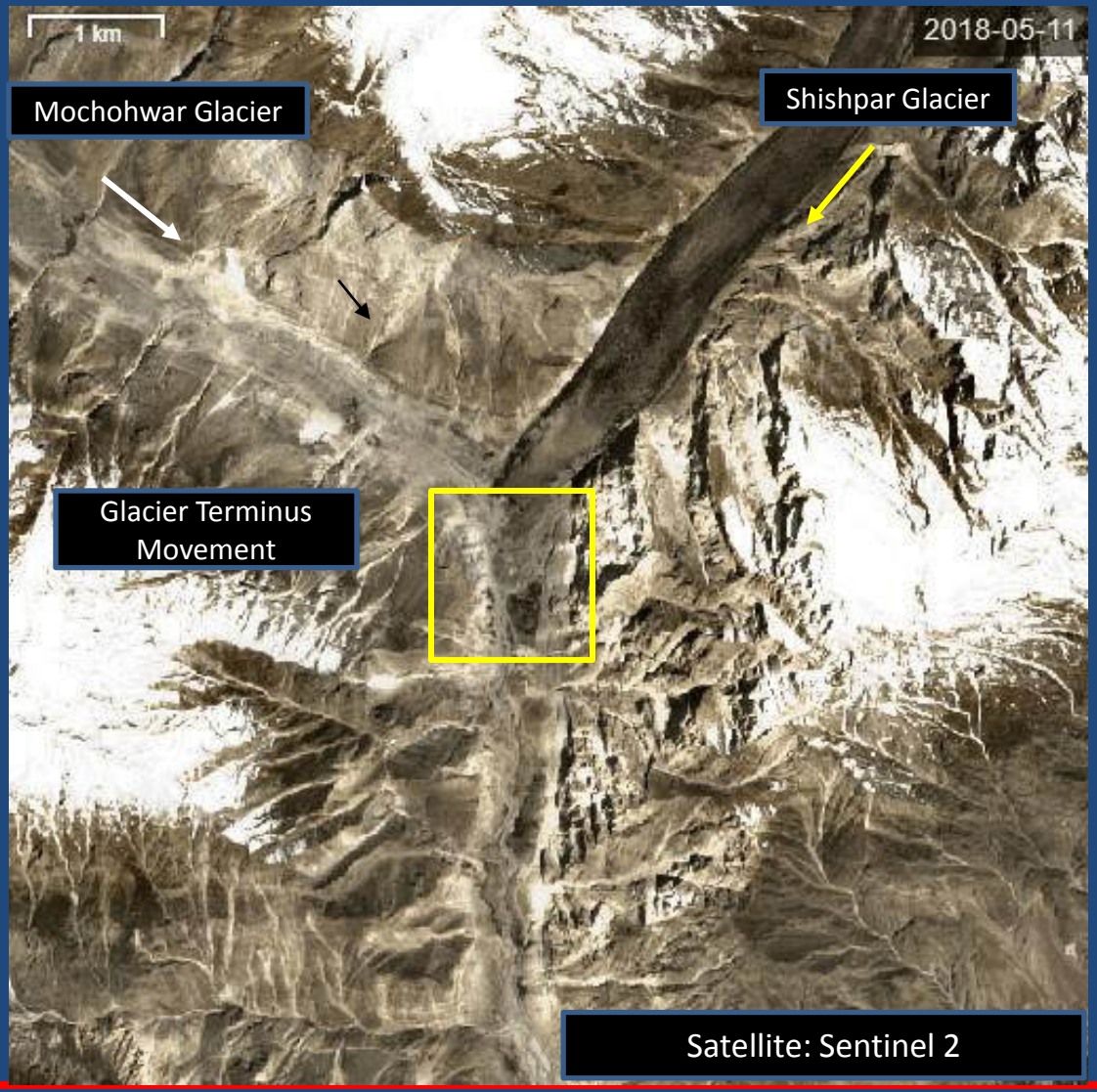
Harnai Earthquake, Co-Seismic Displacement Map

- **Background:** Line of Sight (LoS) Displacement extracted from SAR Interferogram
- **Image Date:** 28 Sep & 10 Oct 2021
- **Location:** Harnai, Balochistan
- **Data Sources:** Sentinel-1



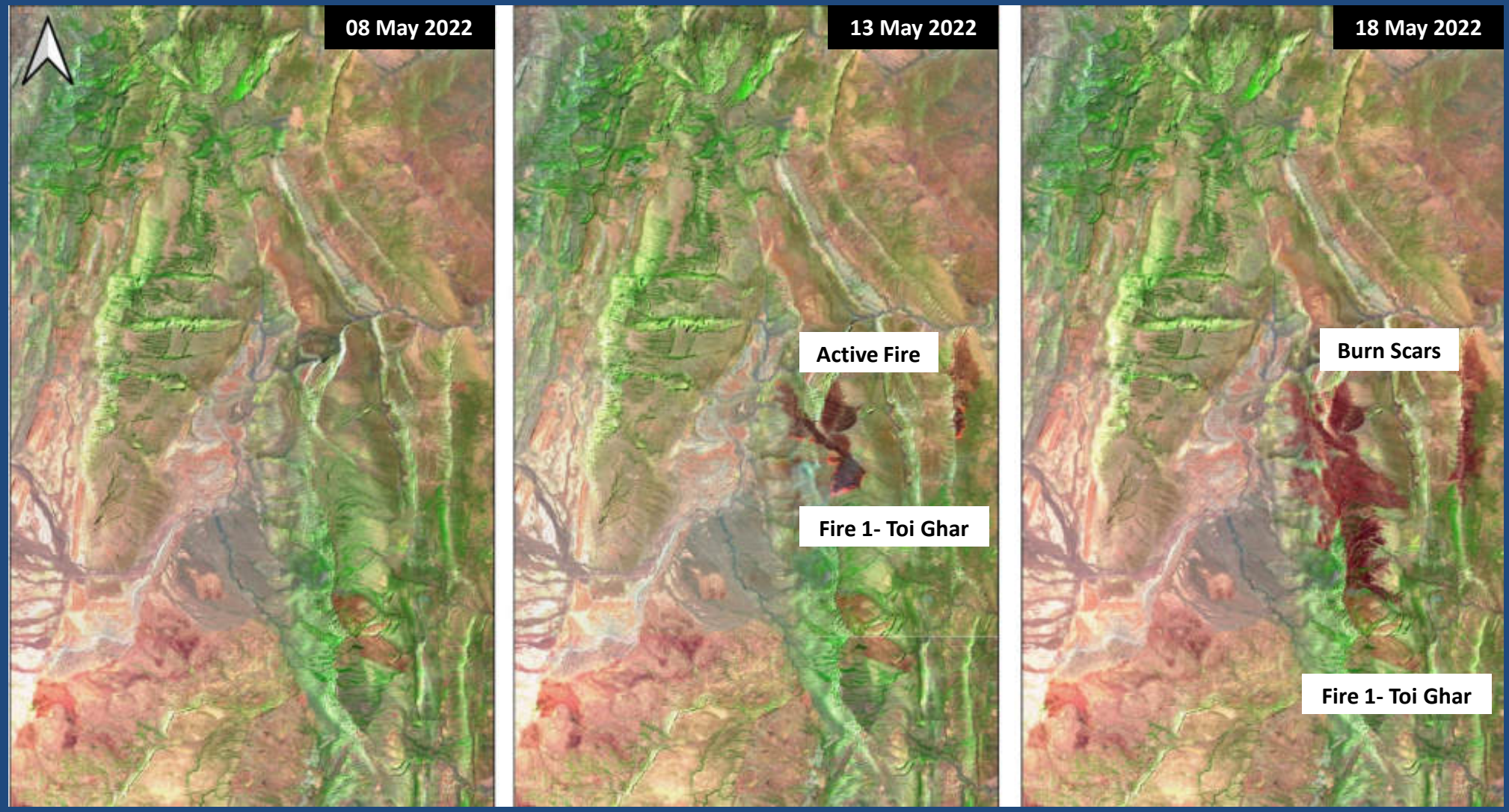


Monitoring of Shishper Glacier Surging



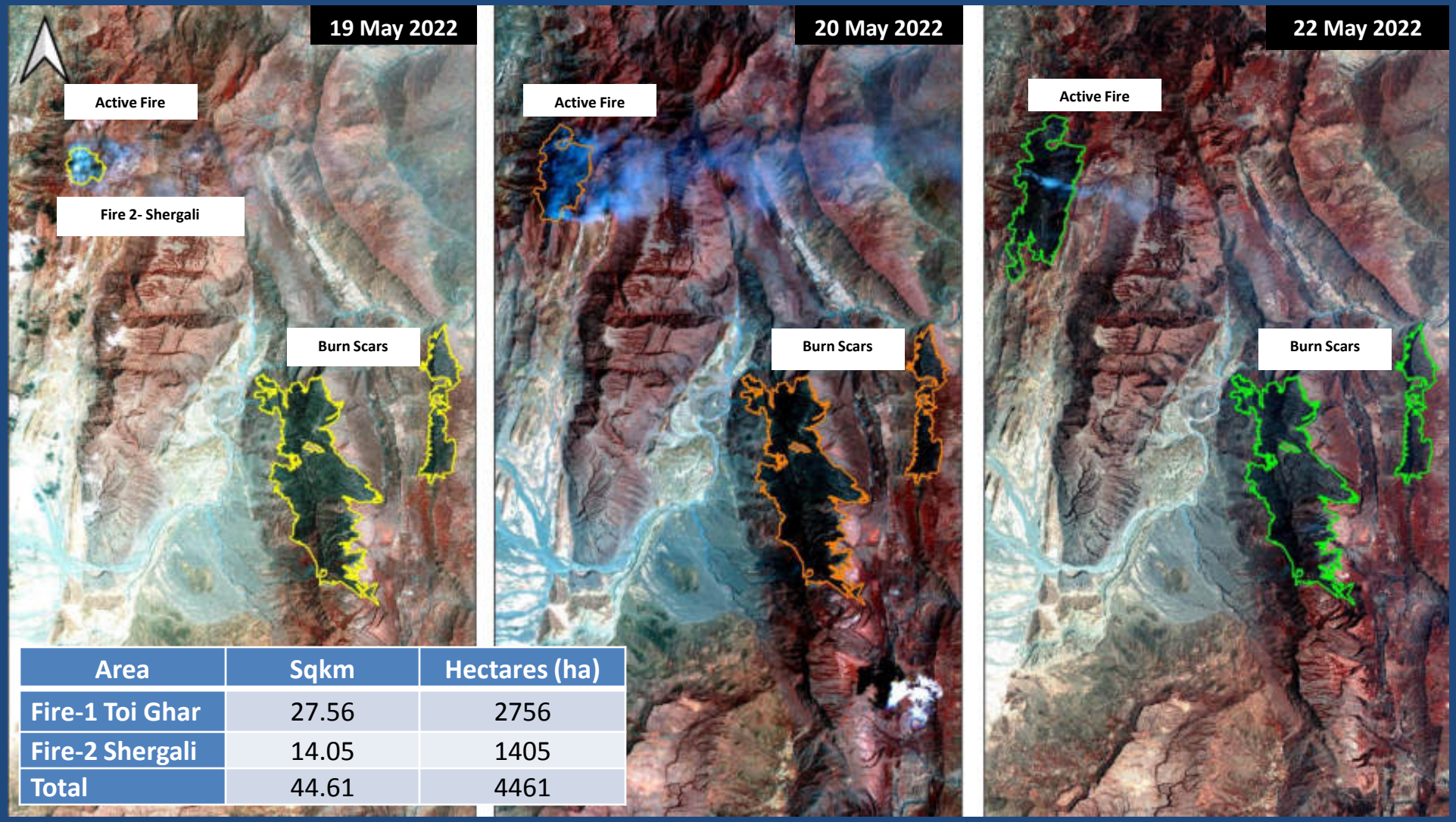
2018-21

Balochistan Forest Fire 2022 - Toi Ghar



Sentinel-2 10m satellite imagery acquired on 08, 13 and 18 May 2022

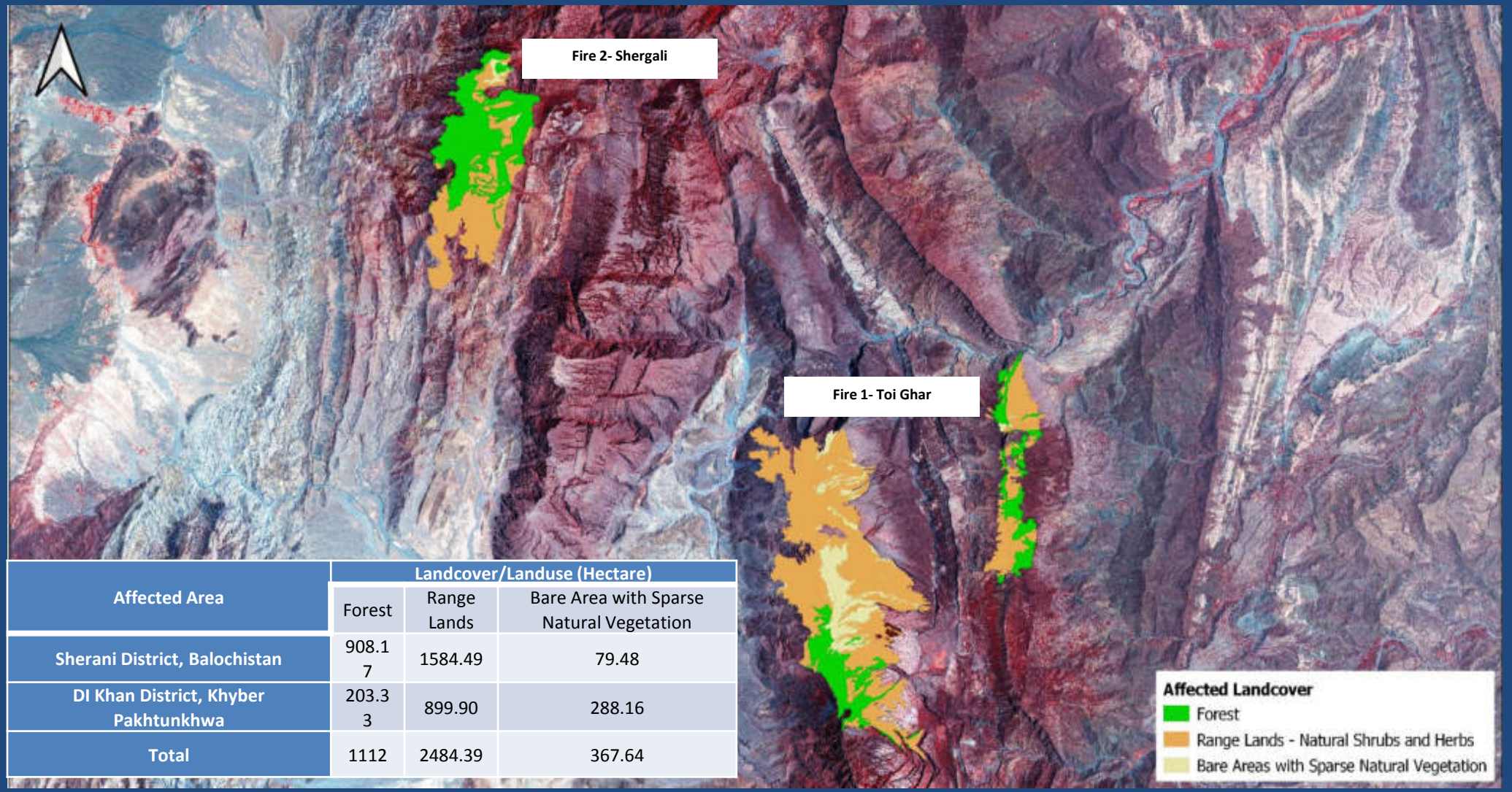
Balochistan Forest Fire 2022 - Toi Ghar and Shergali Forest



Area	Sqkm	Hectares (ha)
Fire-1 Toi Ghar	27.56	2756
Fire-2 Shergali	14.05	1405
Total	44.61	4461

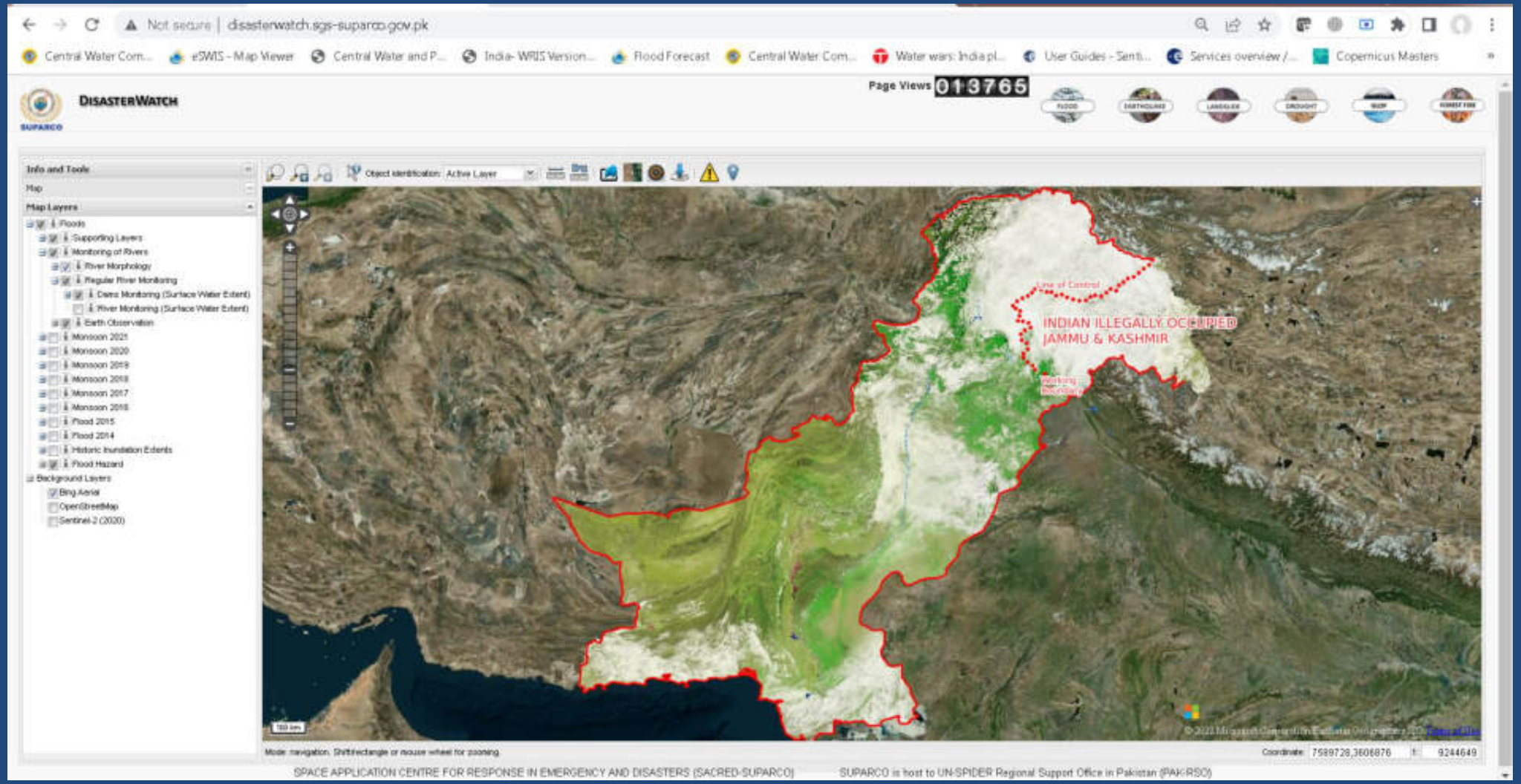
SPOT 1.5m satellite imagery acquired on 19, 20 and 22 May 2022

Balochistan Forest Fire 2022 – Affected Landcover

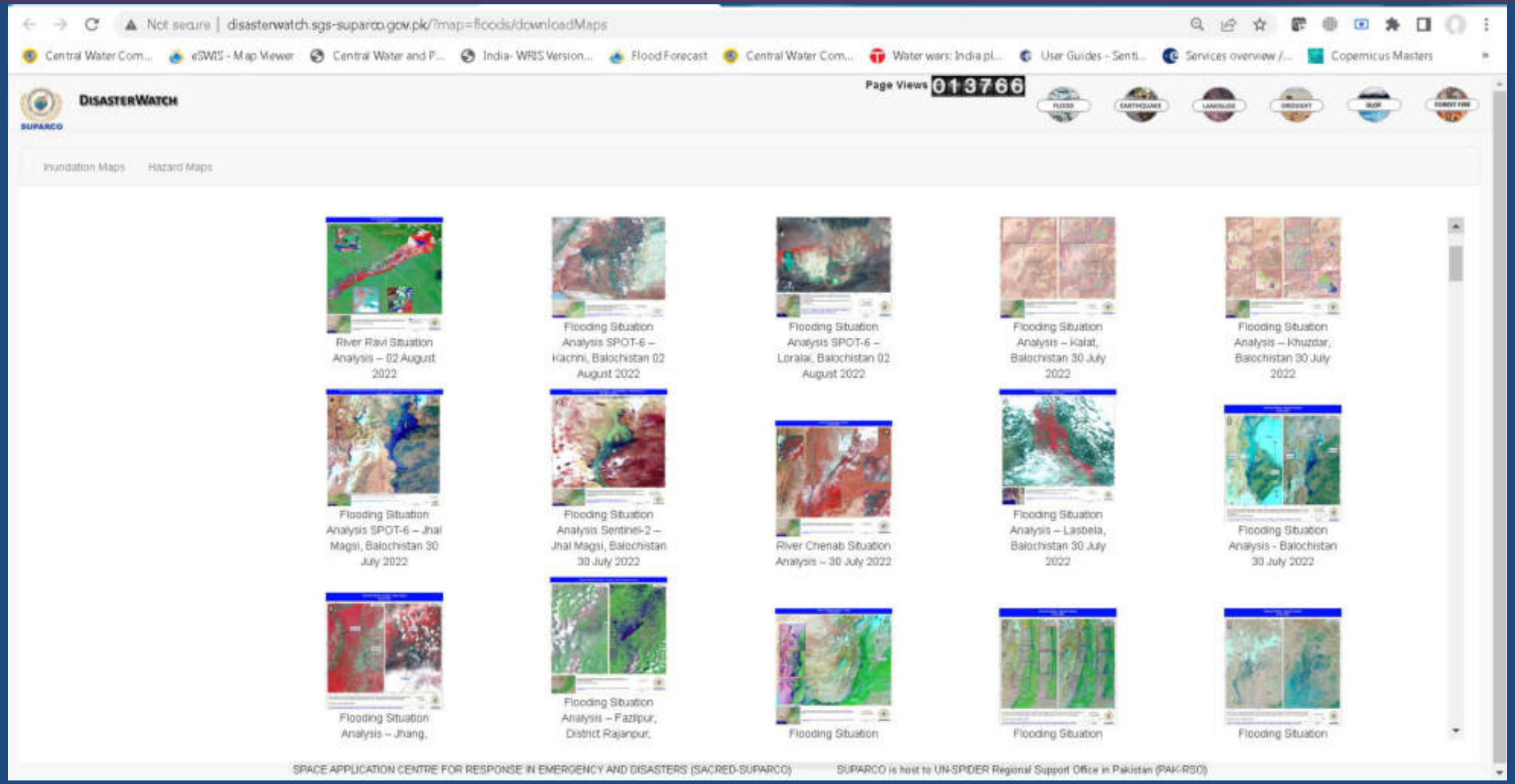


Affected Area	Landcover/Landuse (Hectare)		
	Forest	Range Lands	Bare Area with Sparse Natural Vegetation
Sherani District, Balochistan	908.17	1584.49	79.48
DI Khan District, Khyber Pakhtunkhwa	203.33	899.90	288.16
Total	1112	2484.39	367.64

Near Real Time Support via DisasterWatch



Near Real Time Support via DisasterWatch



Global Agenda's

Shifting of focus from Reactive to Proactive Approach

- Sendai Framework for Disaster Risk Reduction 2015-2030 Priorities for action

  1. Understanding disaster risk;

  2. Strengthening disaster risk governance to manage disaster risk;

  3. Investing in disaster risk reduction for resilience;

  4. Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction.

- Climate Change Agreement (COP21) – **Article 8**
- Sustainable Development Goals (SDGs) 2015-30 – **SDGs 6, 13, and 15**

  SDG13: TAKE URGENT ACTION TO COMBAT CLIMATE CHANGE AND ITS IMPACTS

- National Disaster Management Plan (NDMP) Implementation Roadmap 2015-30

Disaster Risk Assessment – NatCat Model Project

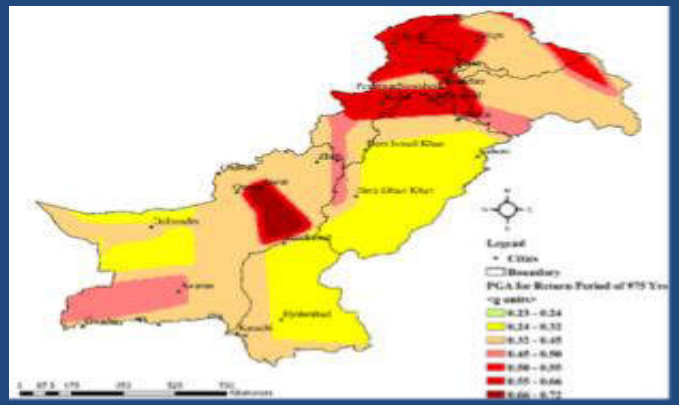
National Catastrophic Model (NatCat) for NDRMF

- Development of Database and Web Application (Risk Calculator)
- Hydro-meteorological Hazard Assessment (Flood, Drought, Cyclone)
- Geo-physical Hazard Assessment (Seismic)
- Exposure of Landcover, Crops and Infrastructure to Hydro-meteorological and Geo-physical Hazards
- Loss and Risk Assessment Model for Hydro-meteorological and Geo -physical Hazards
- Integrated Risk Assessment

NatCat Model Project

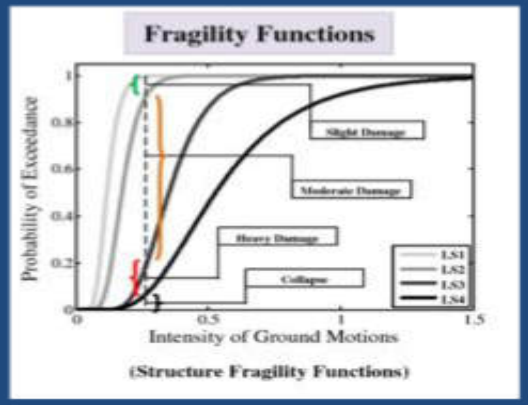
SUPARCO is currently undertaking Development of geo-referenced database for natural catastrophe (NatCat Model) Project for National Disaster Risk Management Fund (NDRMF).

and magnitude.

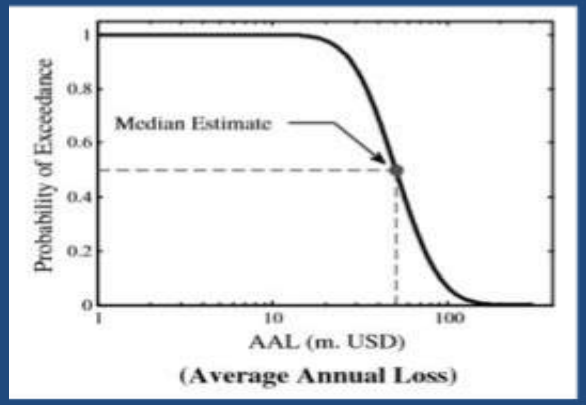


Hazard

Exposure



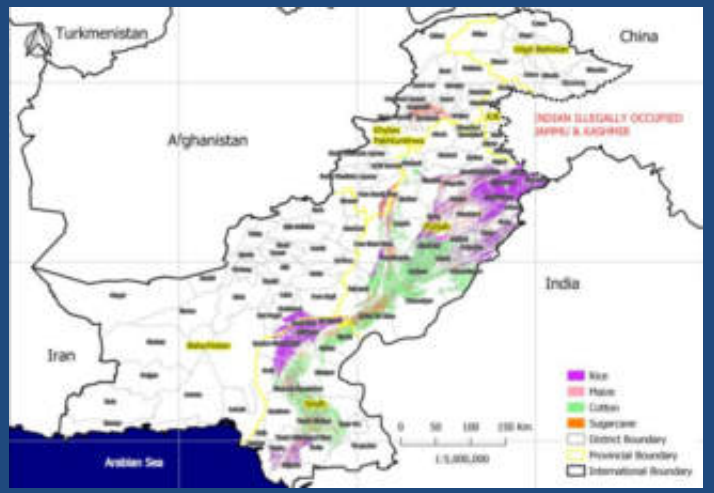
Vulnerability



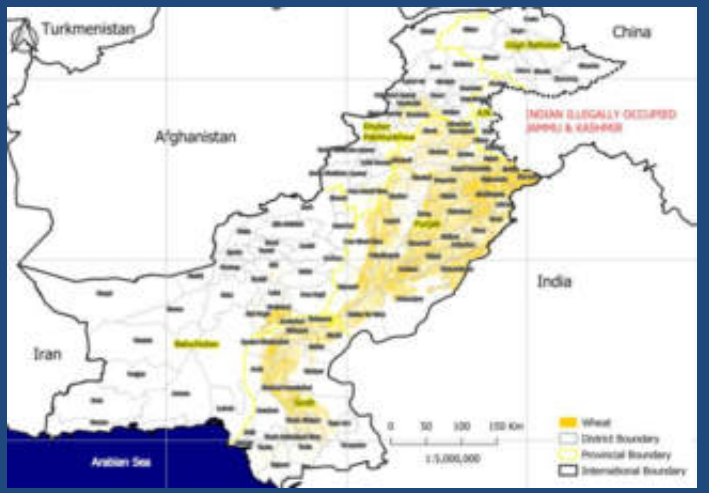
Loss/Risk

Exposure Datasets

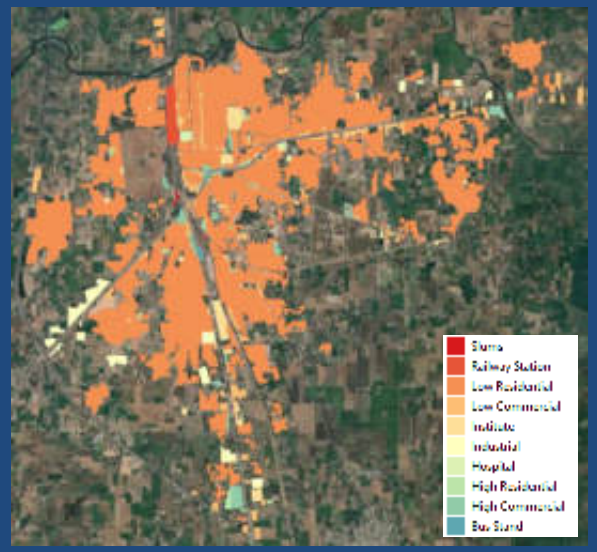
Landcover



Kharif CropMask

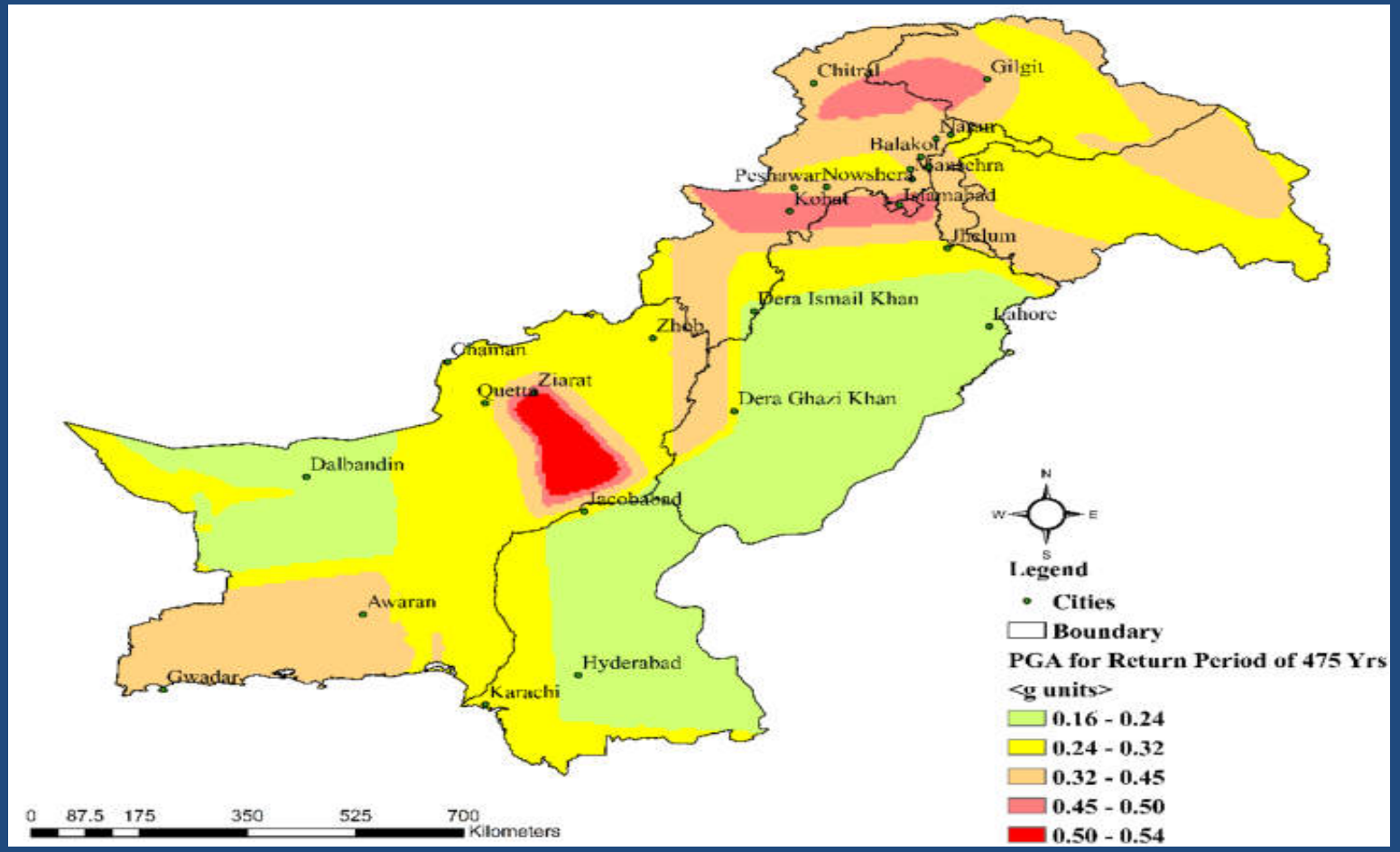


Rabi CropMask



NatCat Project - Seismic Hazard Assessment

475 years



Probabilistic Seismic Hazard Assessment against 95, 475, 975, and 2475 years return periods

Model Outputs

- Peak Ground Acceleration
- Spectral Acceleration
- Onsite Response using Vs30

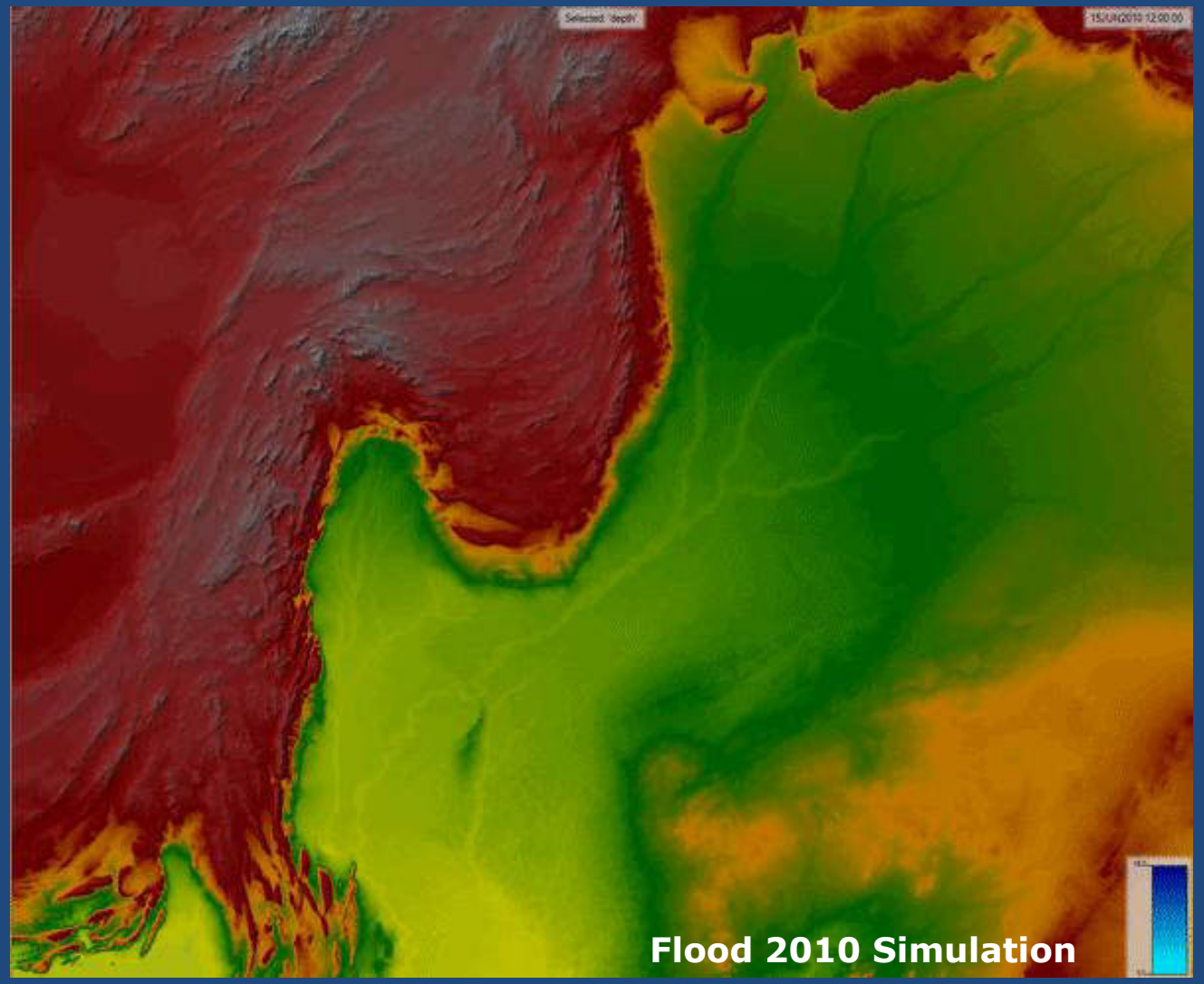
Flood Hazard Assessment

Forecast Models are used as tool for building Early Warning Systems

Key Inputs

Satellite derived data:

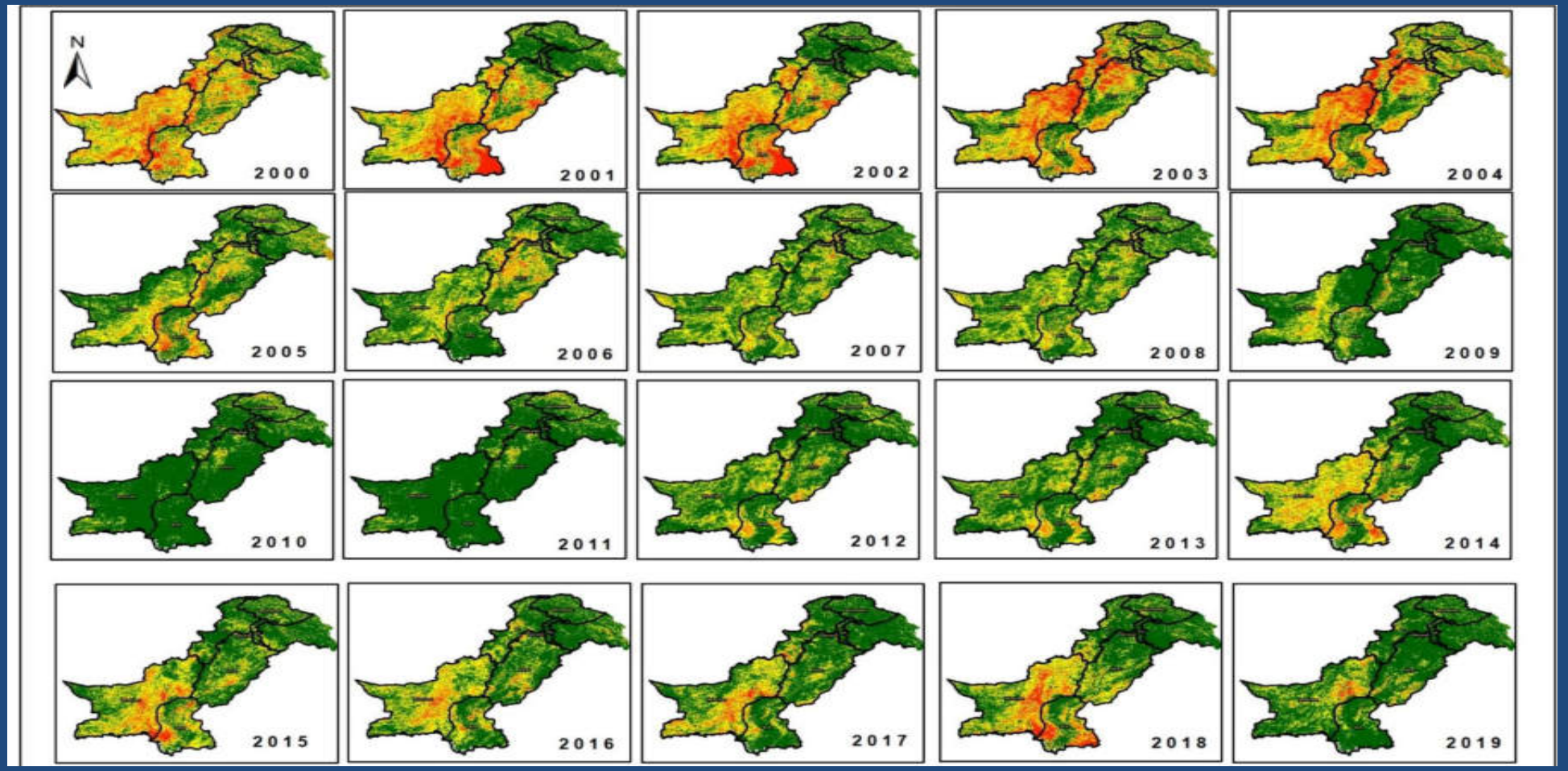
- DEM
- Landcover
- Historical Events
- Hydrographs



Model Outputs

- Flood Extent
- Flood Depth
- Flood Velocity
- Flood Duration

Drought Hazard Assessment

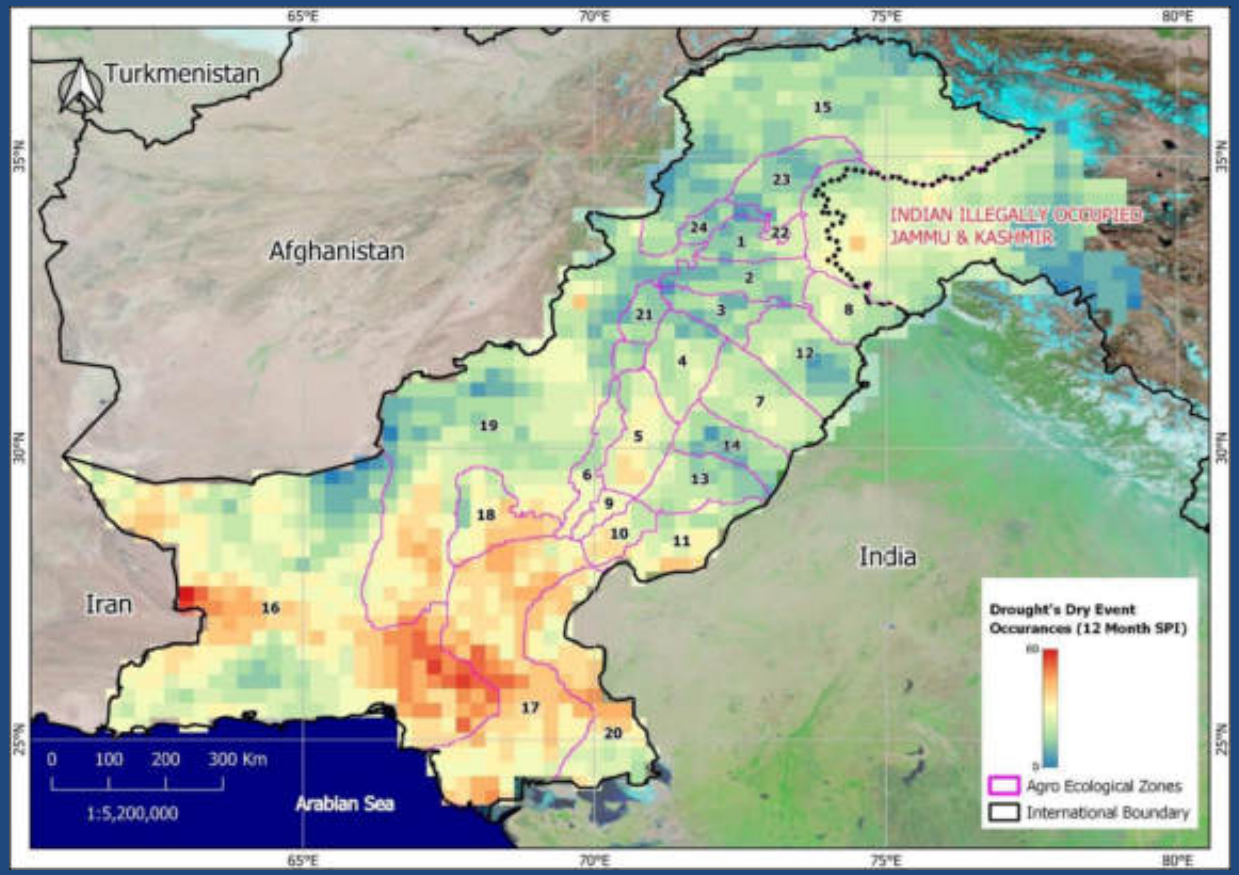


Agriculture Drought

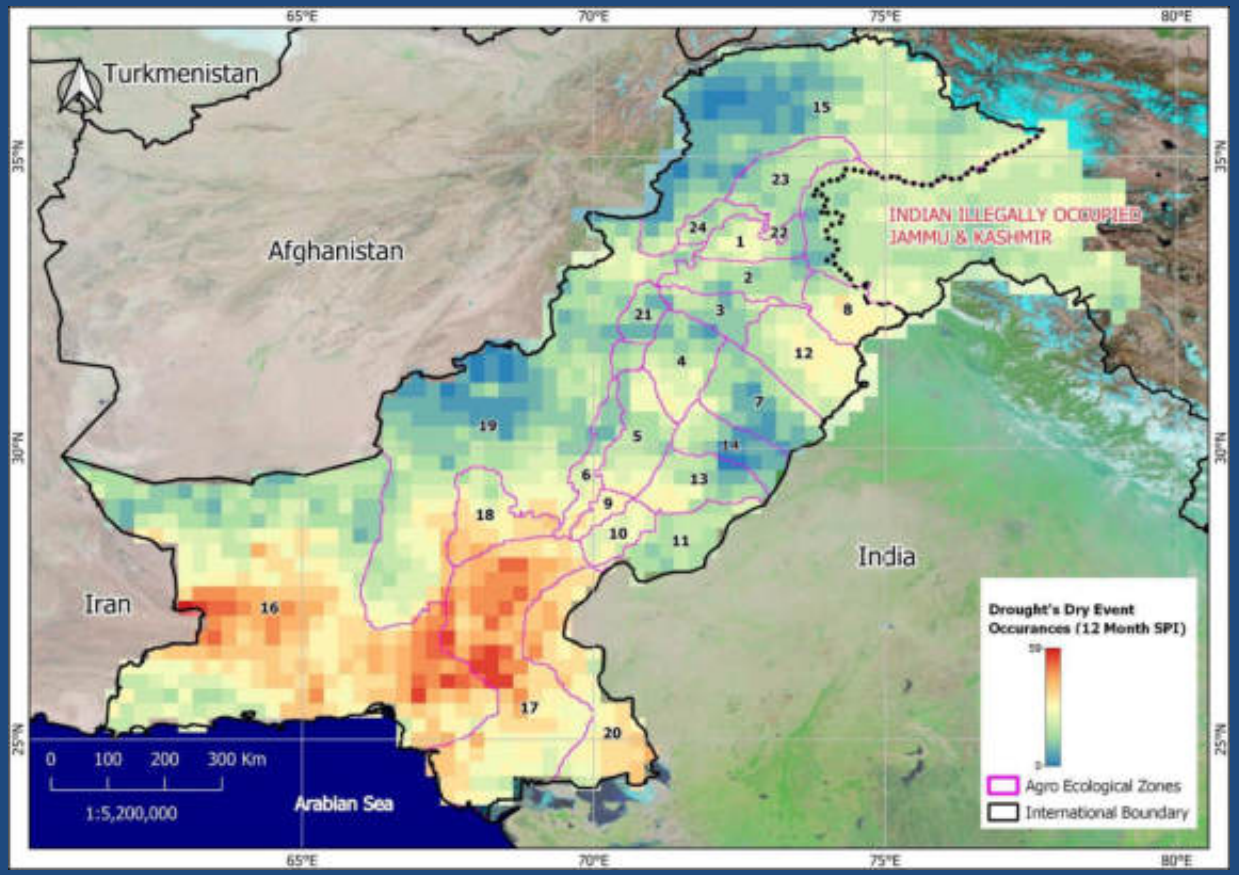
Model Outputs

- Drought Indices
- Drought Hazard Maps
- Drought Severity Maps
- Drought Spatial Extent

Spatial distribution of Drought's Dry events occurrence (%) for 12-SPI

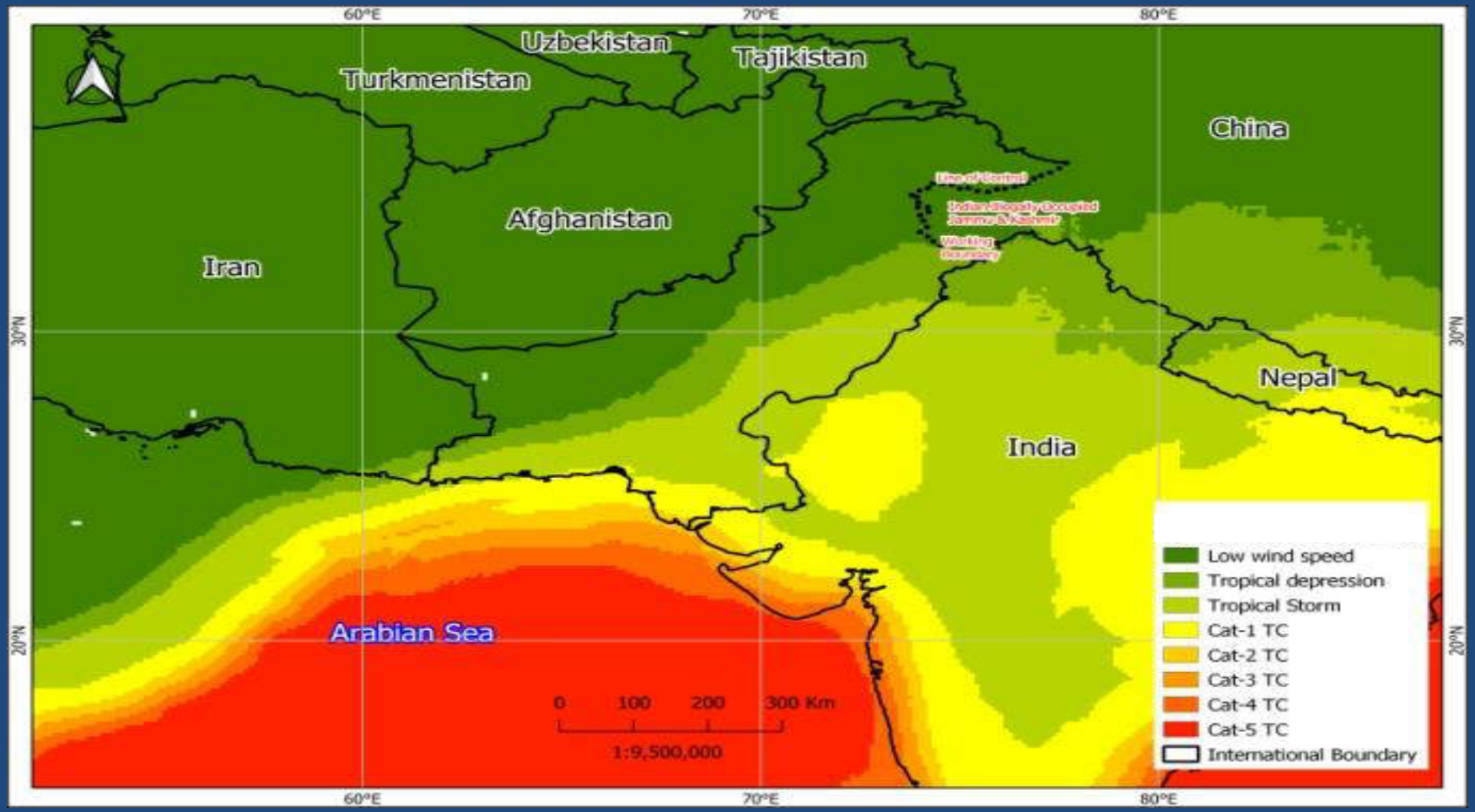


SSP245



SSP585

Cyclone Hazard Assessment – Wind Component



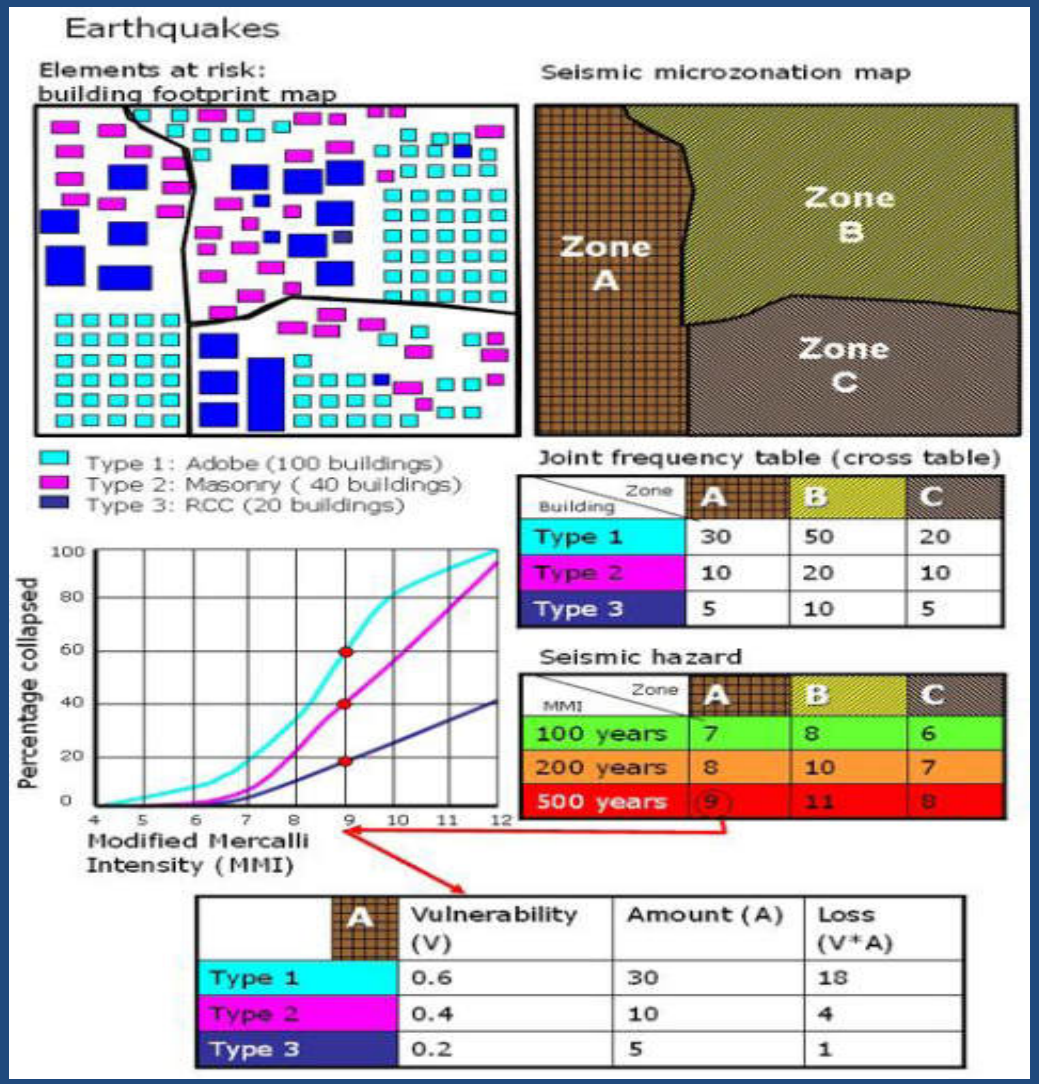
100Years

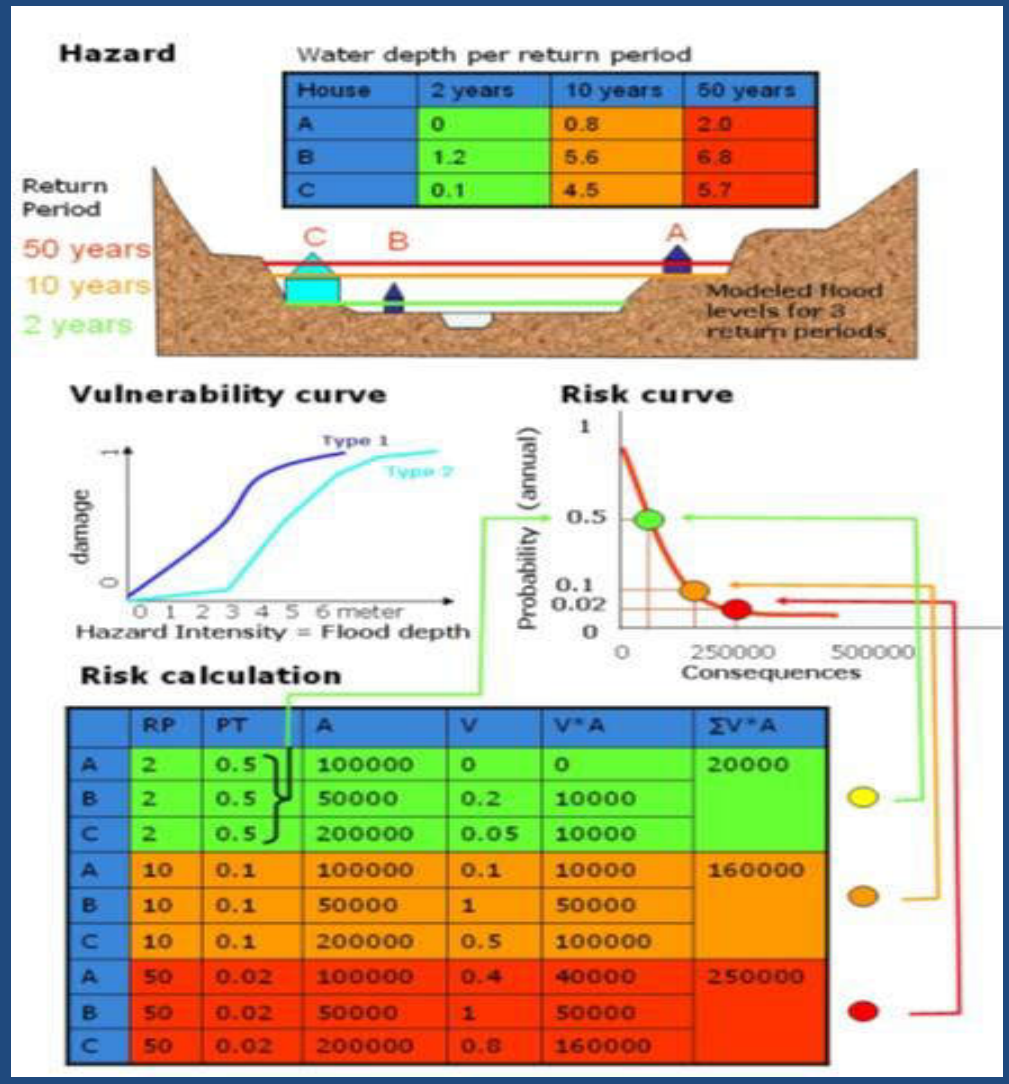
Model Outputs

- Cyclone Tracks
- Cyclone Hazard Maps
- Cyclone Storm Surge intensity Maps

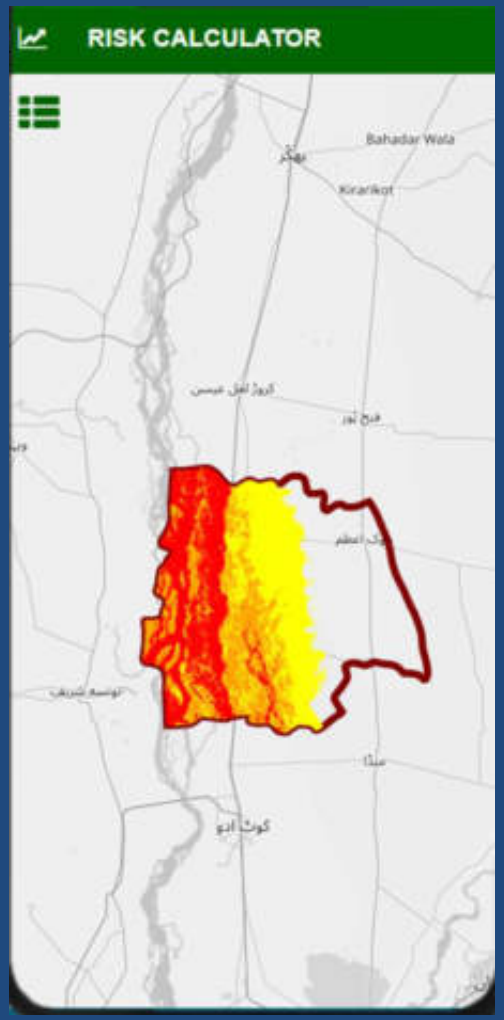
Probabilistic Cyclone Hazard Assessment against 5, 25, 50, 100, 500, 1000, 2000 and 2500 years return periods

Complete Spatial Picture

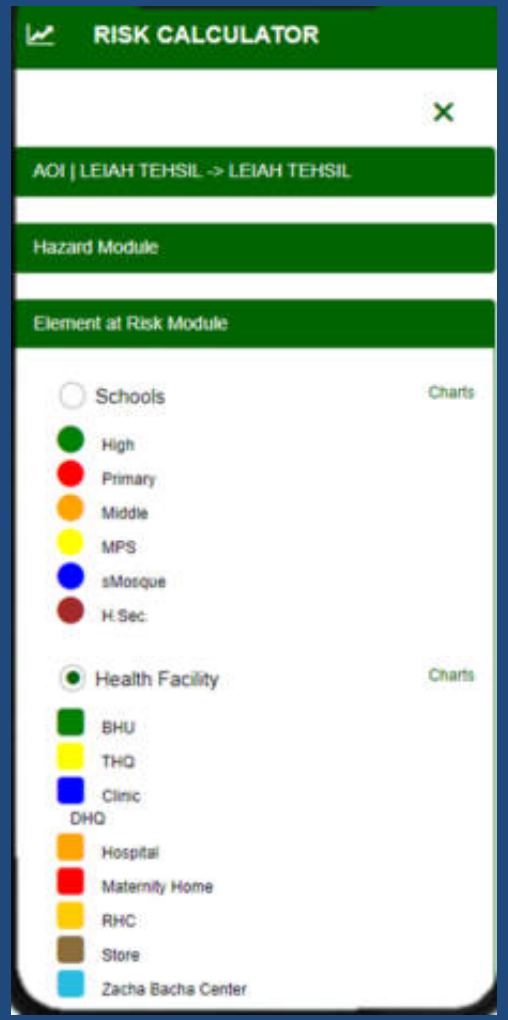




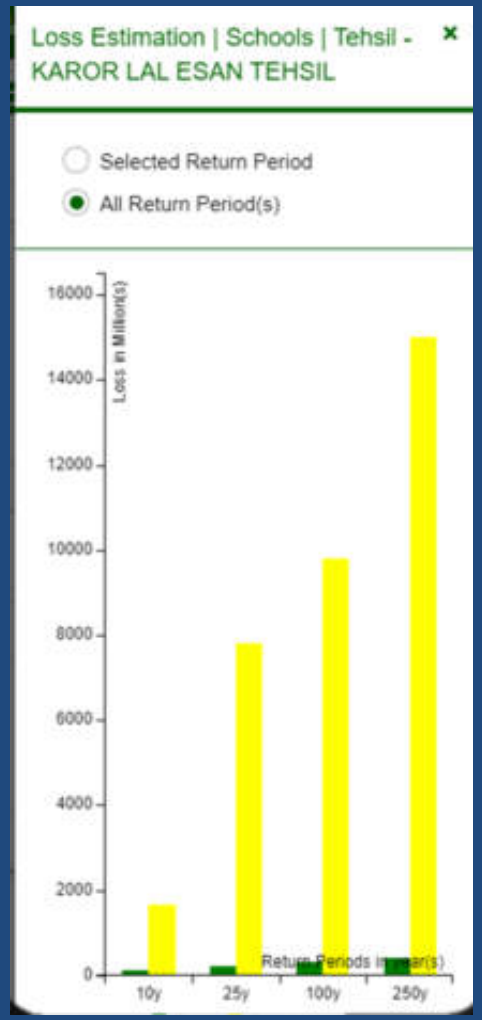
NatCat Risk Calculator - Demo Version



Hazard Module

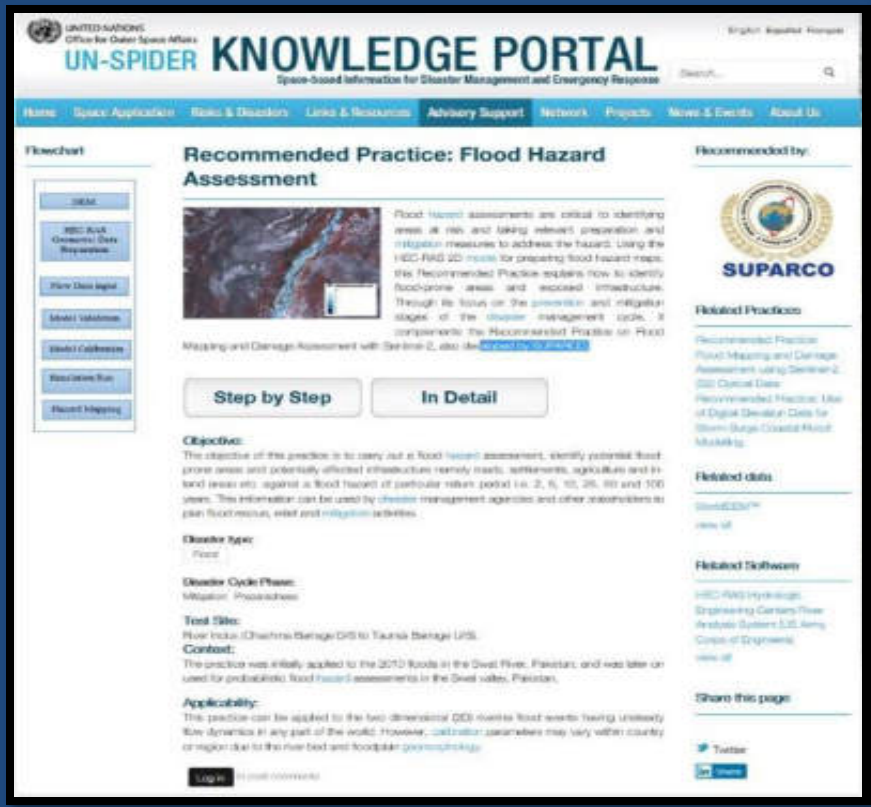


Exposure Module



Loss Module

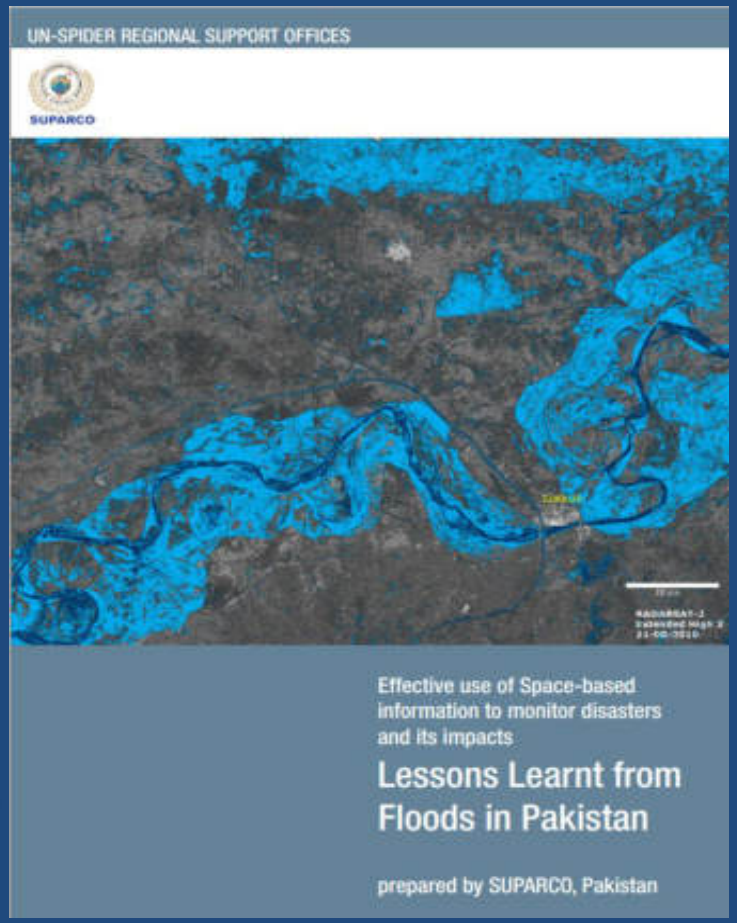
Recommended Practices for UN-SPIDER Knowledge Portal



FLOOD HAZARD ASSESSMENT

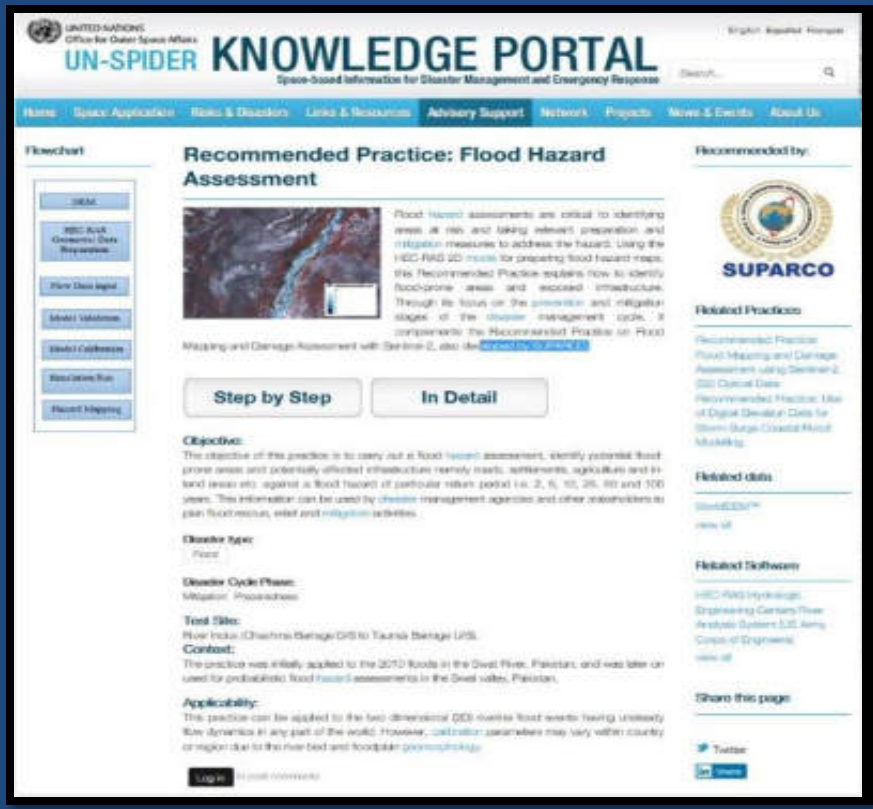
FLOOD MAPPING AND DAMAGE ASSESSMENT

DROUGHT HAZARD ASSESSMENT UNDER PUBLICATION

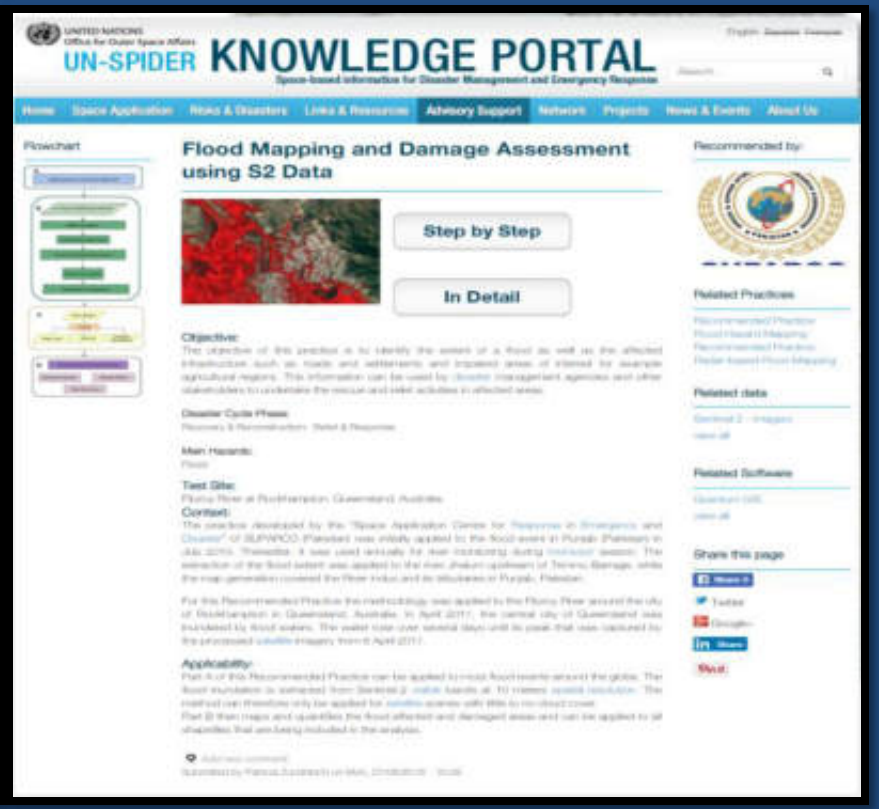


BOOKLET

Recommended Practices for UN-SPIDER Knowledge Portal



FLOOD HAZARD ASSESSMENT



FLOOD MAPPING AND DAMAGE ASSESSMENT

DROUGHT HAZARD ASSESSMENT

Conclusion

- SUPARCO can provide Resource persons for Flood Modeling trainings
- Participation in regional Collaborative projects
- Participation in TAMs
- Capacity Building in the field of SAR data processing and analysis for Disaster monitoring, mapping and damage assessment particularly for earthquake and landslide
- Need for inter RSOs collaborations on regional basis

Conclusion

“Disaster Management is the shared responsibility”