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.**

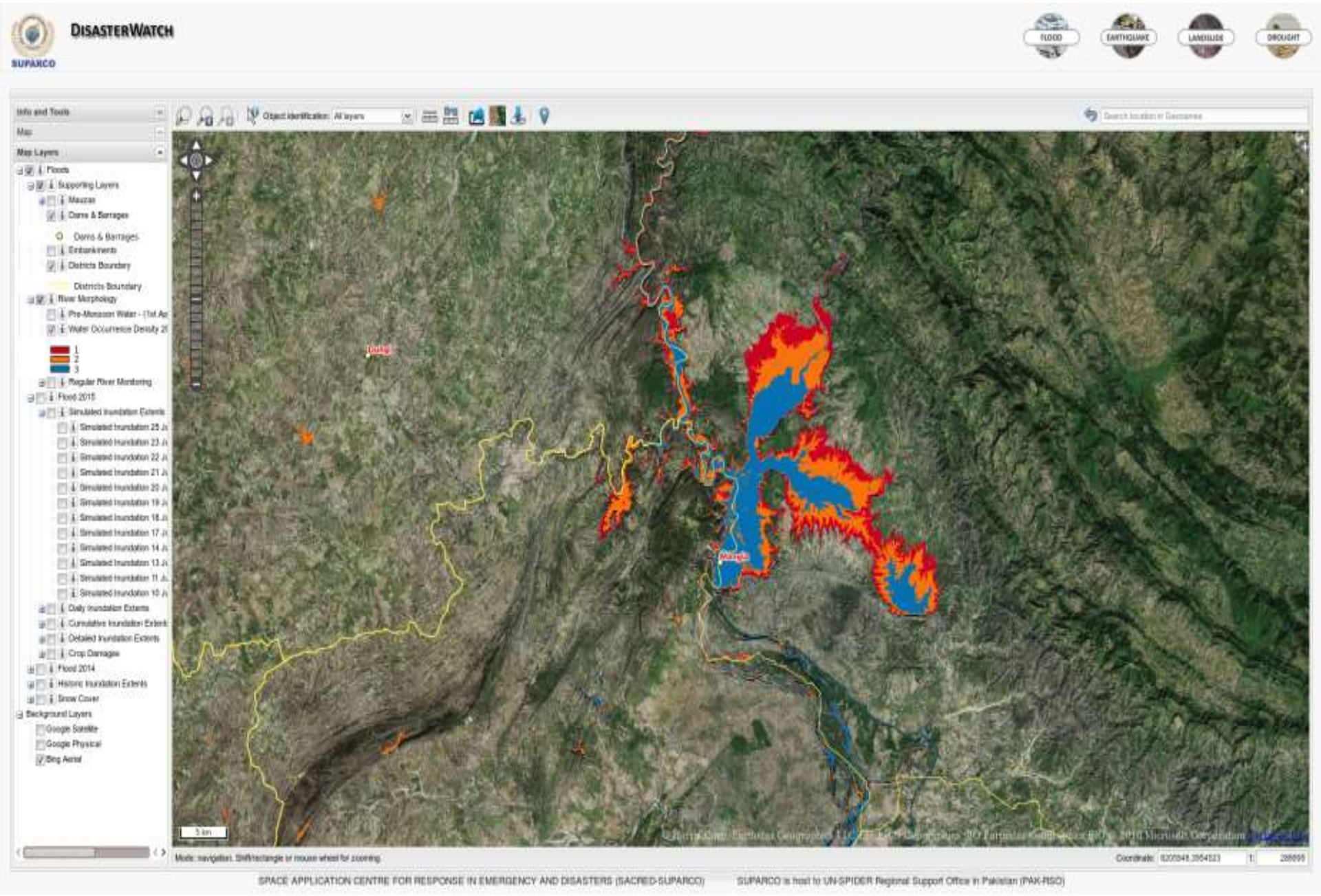
EMAIL: SACRED@SUPARCO.GOV.PK **WEB: DISASTERWATCH.SGS-SUPARCO.GOV.PK**

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)

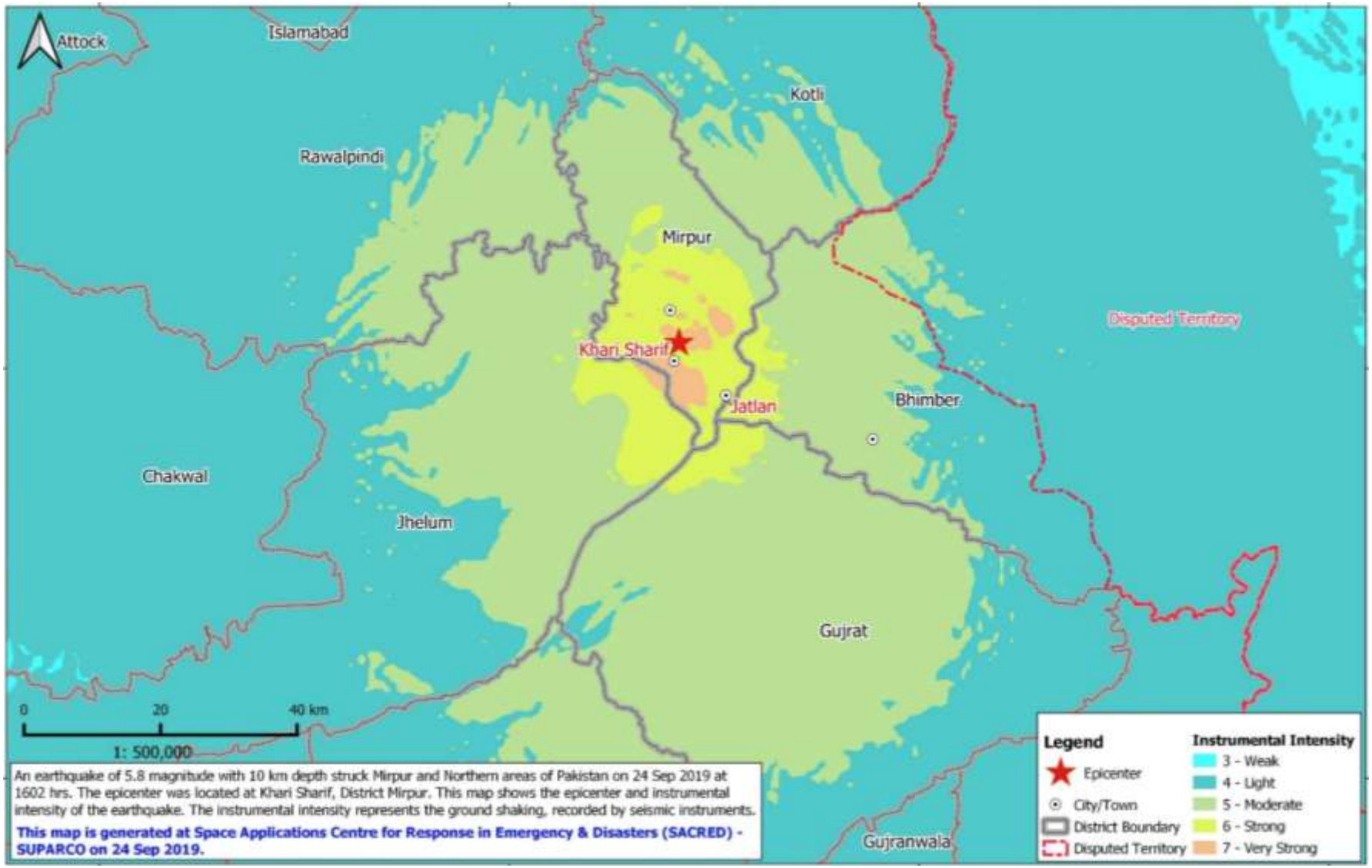
DISASTERWATCH PLATFORM



SPACE APPLICATION CENTRE FOR RESPONSE IN EMERGENCY AND DISASTERS (SACRED-SUPARCO) SUPARCO is host to UN-SPIDER Regional Support Office in Pakistan (PAK-RSO)

MIRPUR EARTHQUAKE , 24 SEP 19

INTENSITY MAP

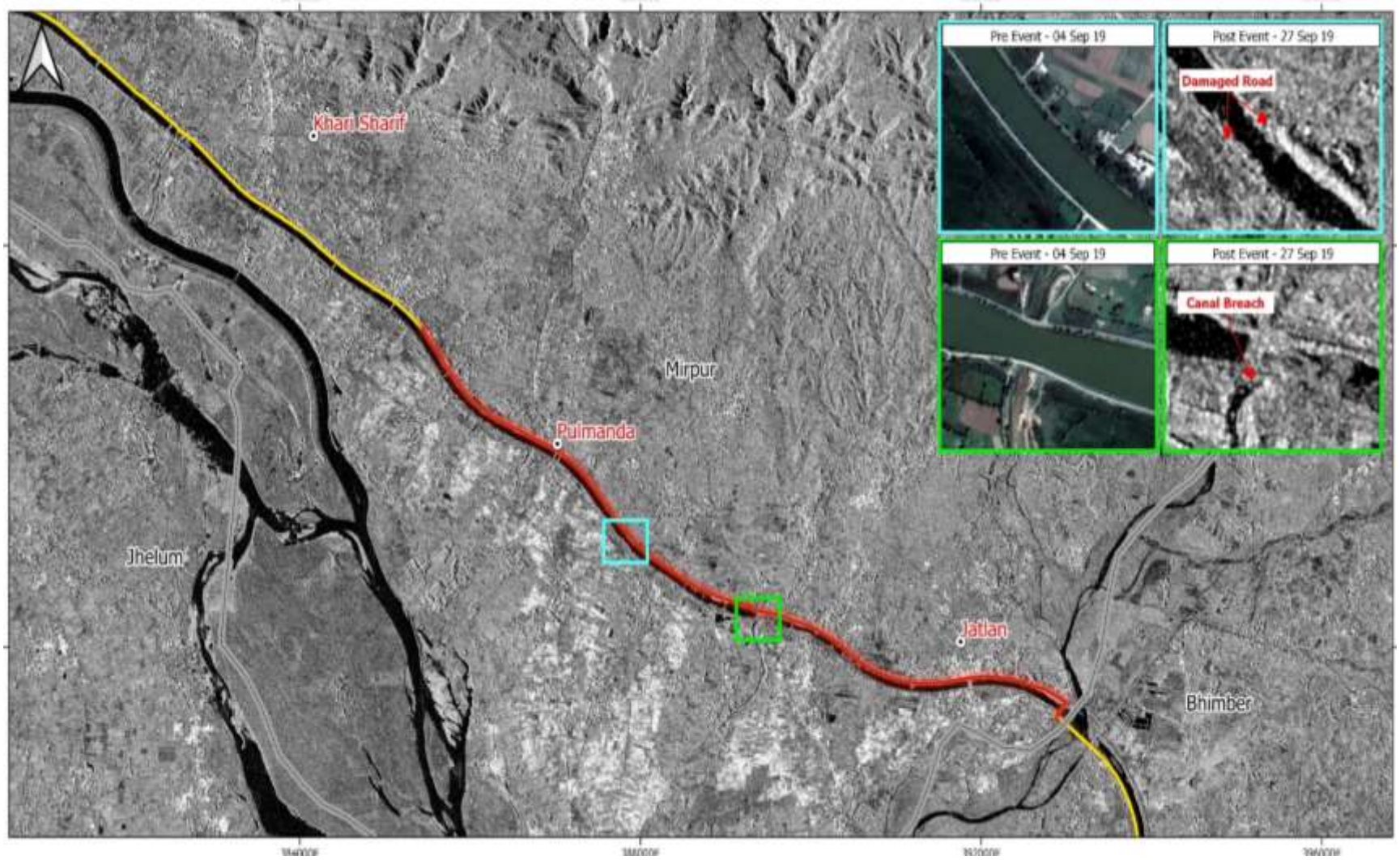


MIRPUR EARTHQUAKE , 24 SEP 19

RAPID DAMAGE ASSESSMENT – PRSS/PLEIADES

MIRPUR EARTHQUAKE , 24 SEP 19

RAPID DAMAGE ASSESSMENT – TERRASAR-X

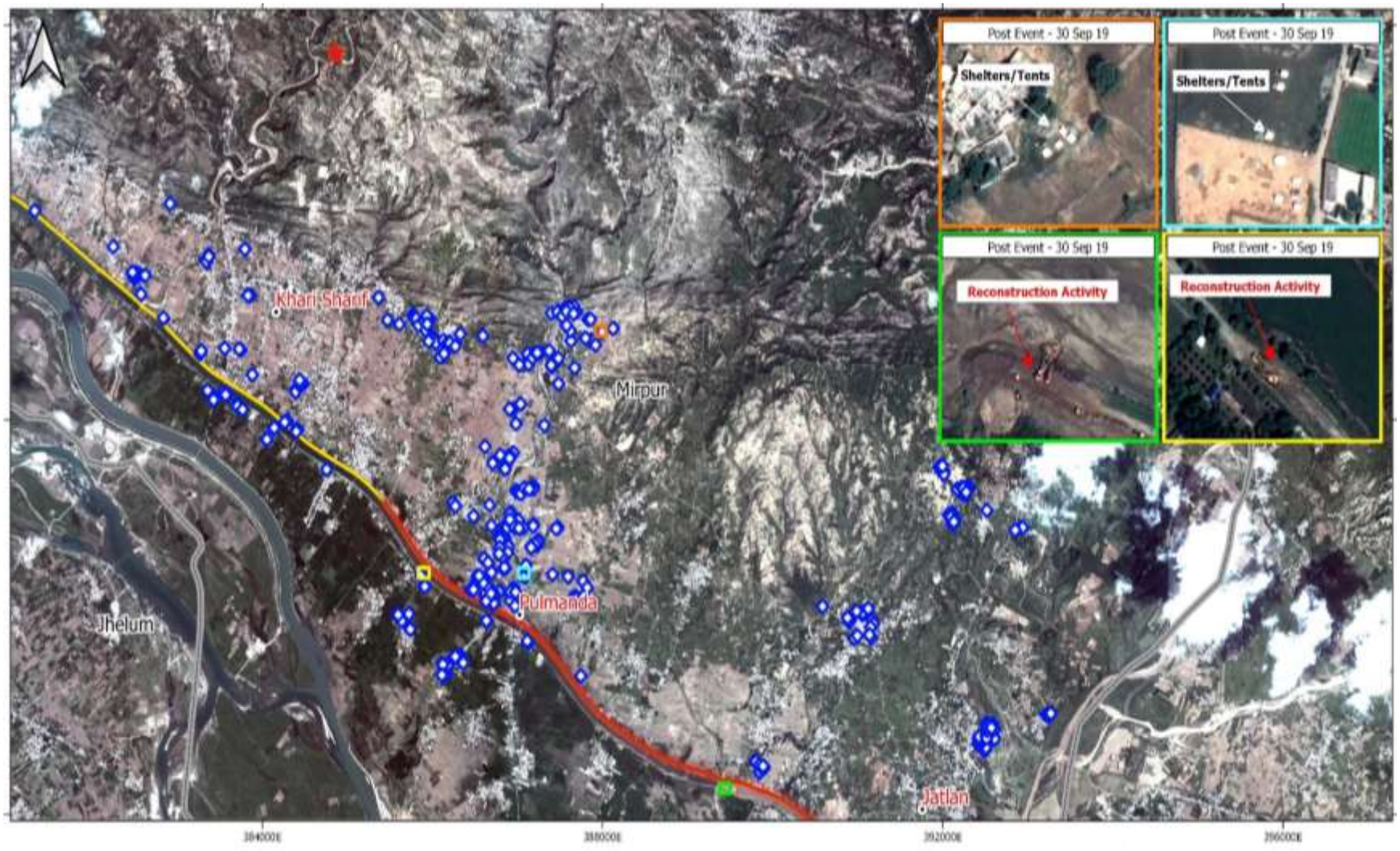


Mirpur Earthquake , 24 Sep 19

Detailed Damage Assessment – Pleiades

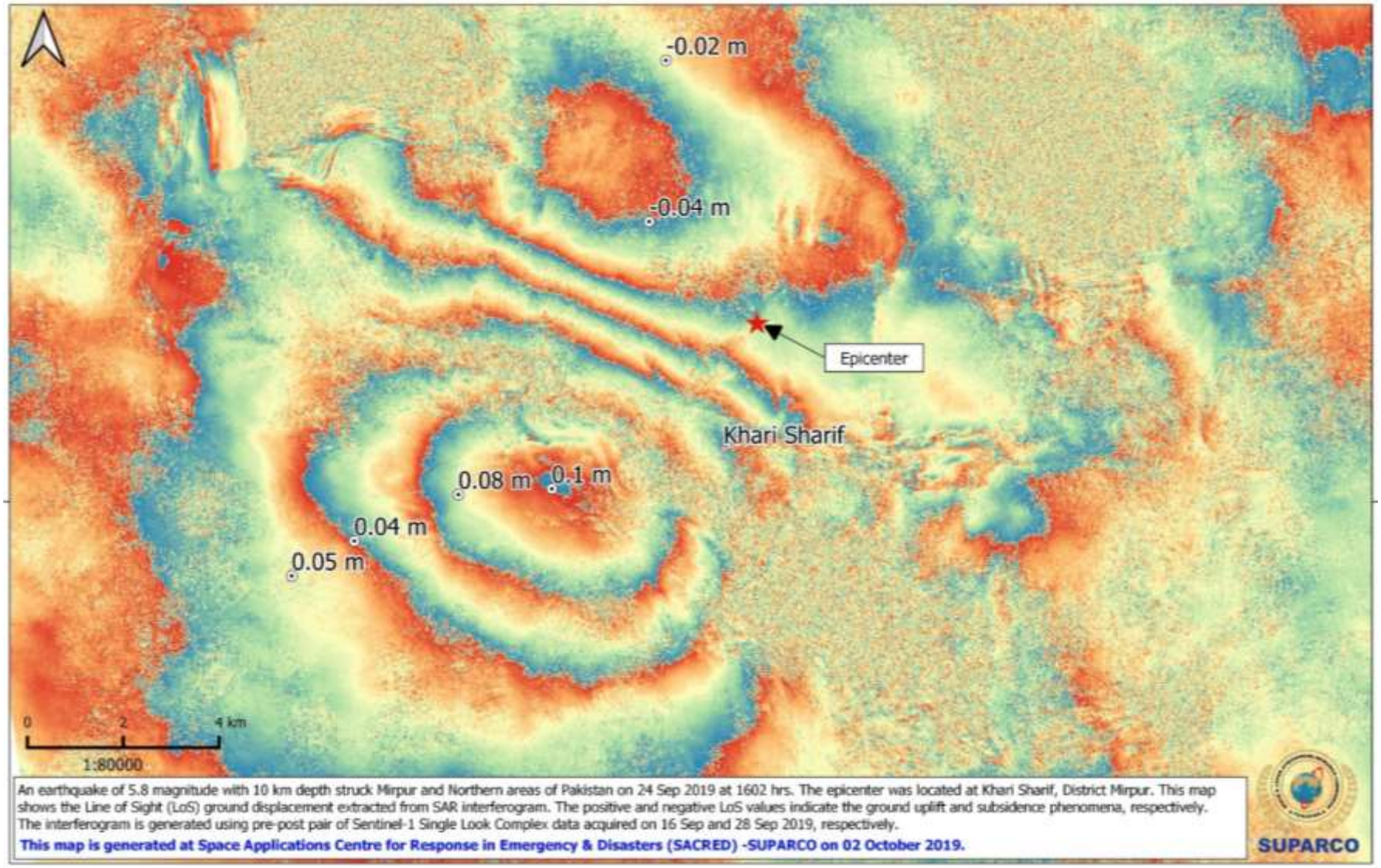
MIRPUR EARTHQUAKE , 24 SEP 19

RECONSTRUCTION/REHABILITATION MONITORING – PLEIADES



MIRPUR EARTHQUAKE , 24 SEP 19

CO-SEISMIC DISPLACEMENT MAP – SENTINEL 1



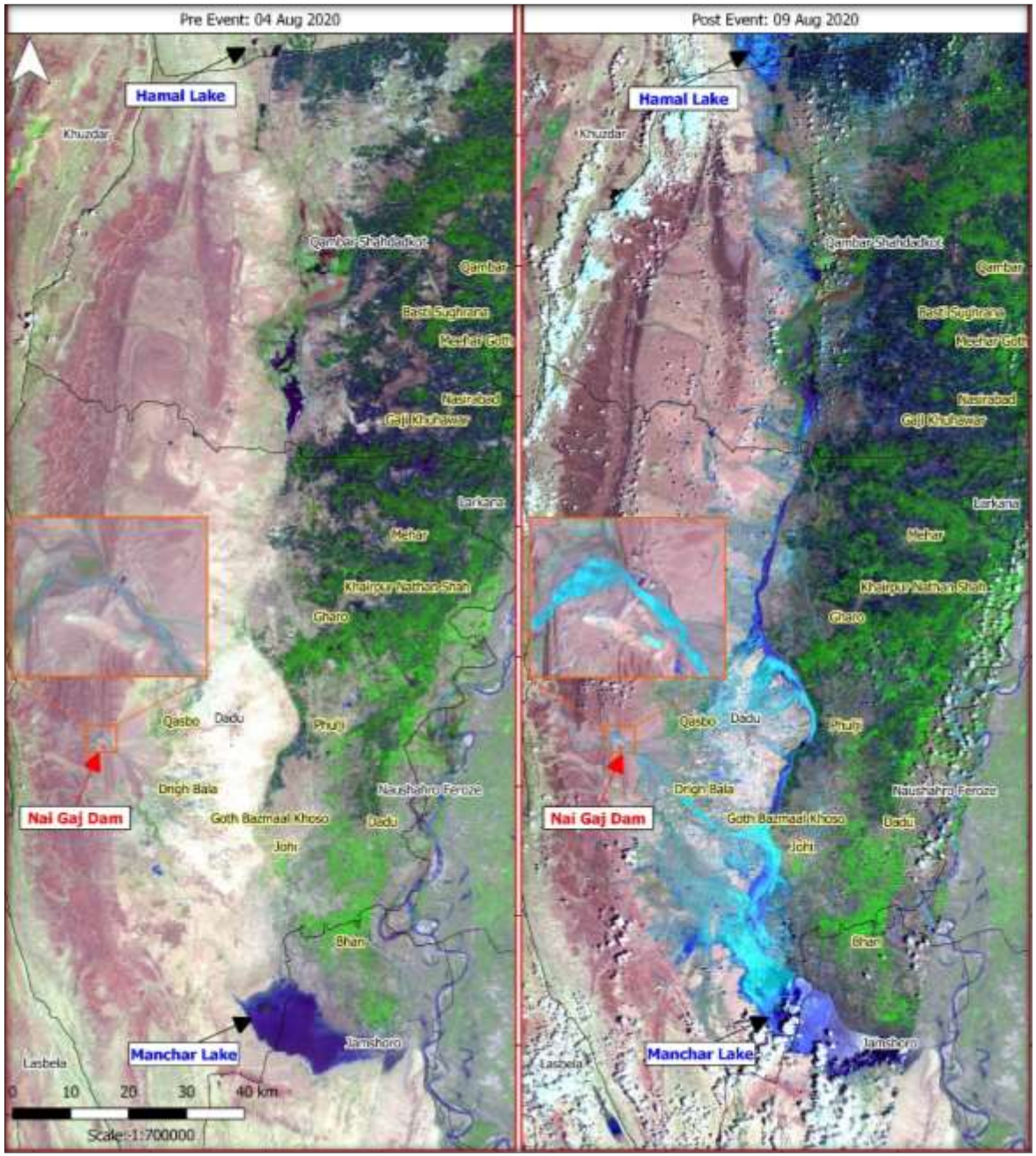
Pre-Monsoon Activities 2020

- Extraction of the pre-monsoon layer of all major rivers and water bodies – June 30, 2020
- Preparation/Updation of the spatial datasets i.e. Landcover, Crop, Road, Settlements etc for rapid mapping and damage assessment – 30 April 2020
- Preparation of the pre-monsoon satellite imagery (Rivers and Hot spots) – 30 April 2020
- Satellite programming for rivers and dams monitoring - June 30, 2020
- HR Deployment Plan – 30 April 2020

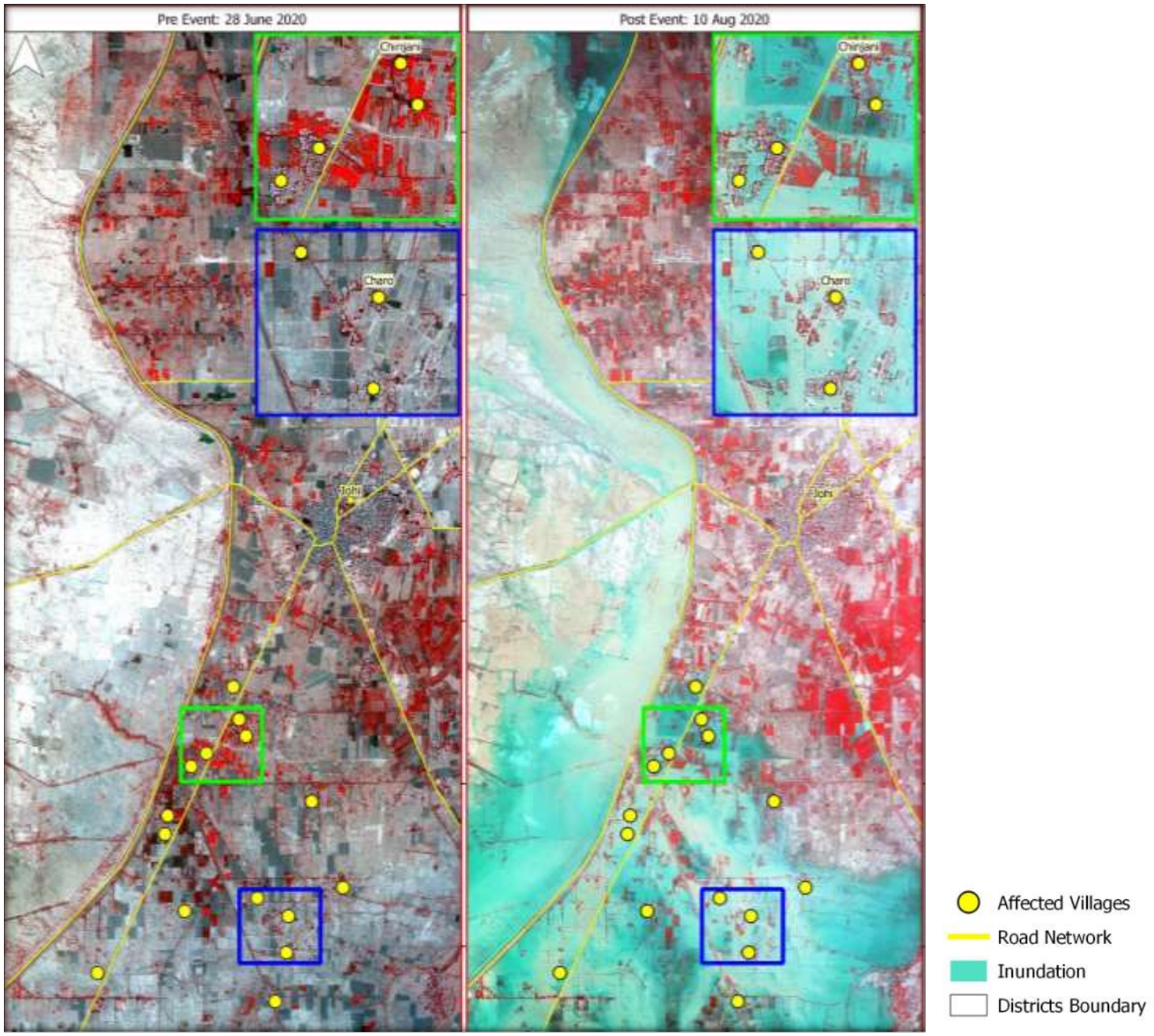
Technical Support During Monsoon

- Near Real time monitoring of Rivers and Dams
- Near Real time monitoring of Hot spots
- Rapid Inundation Mapping
- Rapid Damage Assessment (Crop and Infrastructure)
- Detail Damage Assessment (Crop and Infrastructure)
- Monitoring of Rehabilitation and Reconstruction Work in flood affected areas
- Near real time information provided in the form of exposure, damage maps and stats via DisasterWatch (disasterwatch.sgs-suparco.gov.pk)

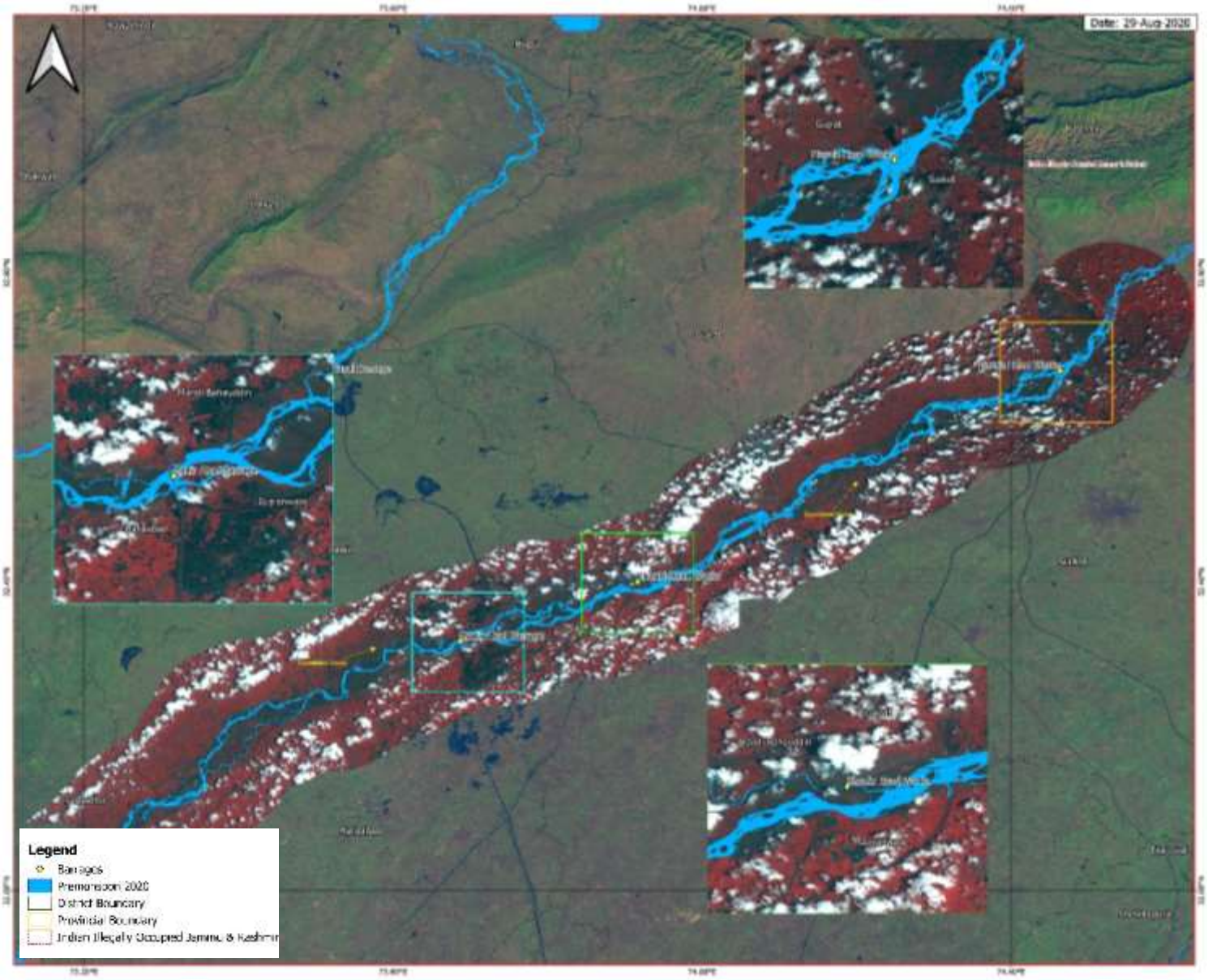
Nai Gaj Dam Breach, dadu – 09 Aug 20



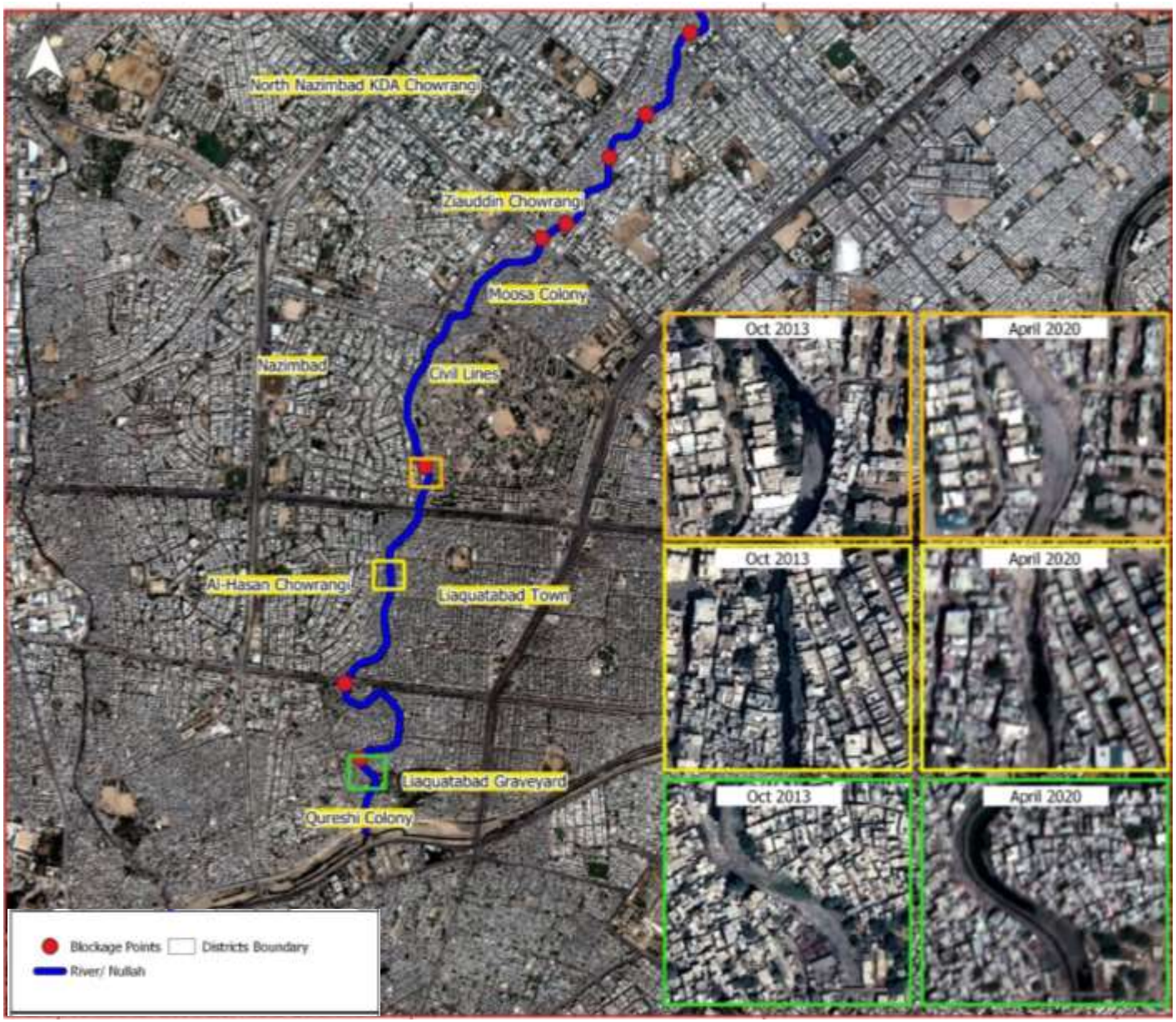
Nai Gaj Dam Breach, dadu – 10 Aug 20



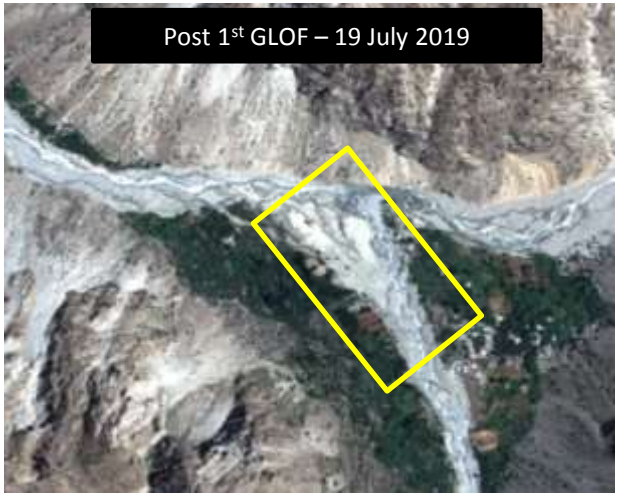
River Chenab Flood – 29 Aug 20



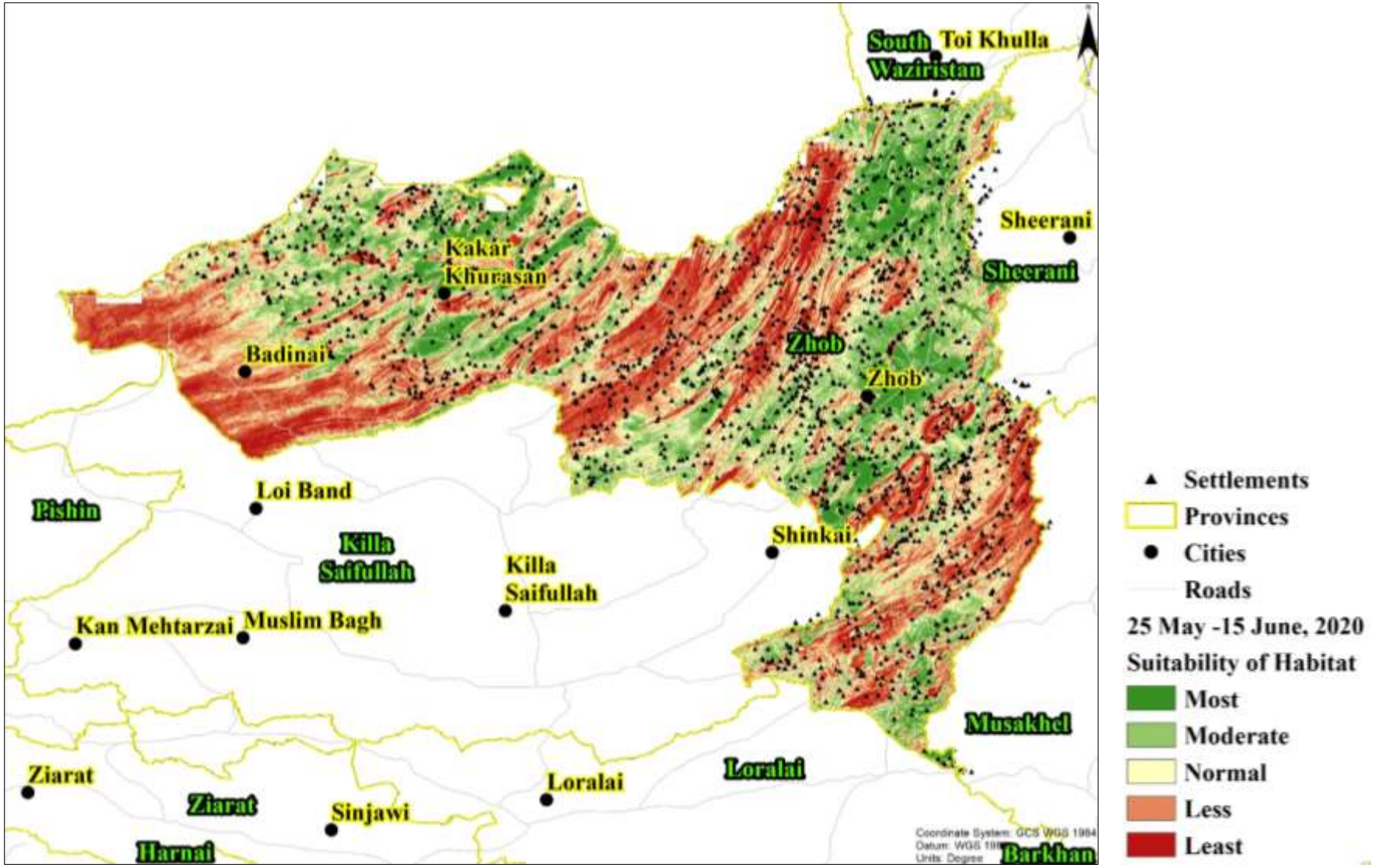
KARACHI URBAN FLOODING – GUJJAR NULLAH



GLOF Event - Golain

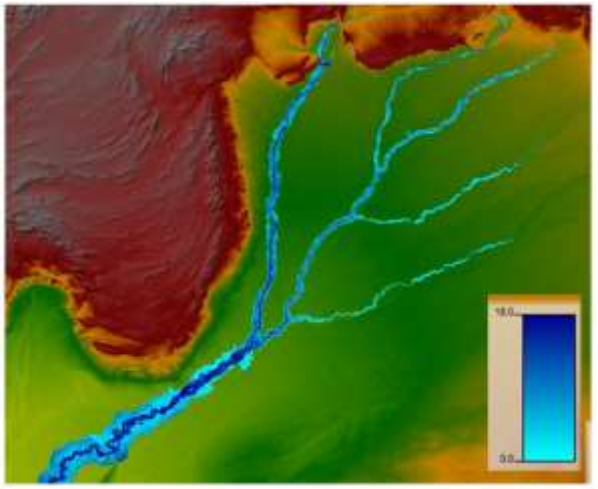


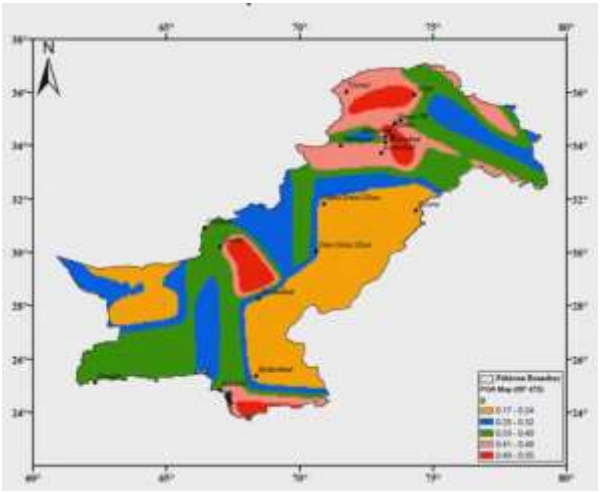
DESERT LOCUST MONITORING



National Catastrophic Model for NDRMF
NatCat Model Project

- NatCat Model will provide quantitative information on the expected levels of loss for natural hazards events of varying types, intensities, and return periods.
- The scope of work includes
  - Development of Database and Web Application
  - 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





CONTRIBUTION IN UN-SPIDER ACTIVITIES

Webinar on space-based inputs for locust early warning and preparedness

Image:©FAO/Sven Torfinn

Event Organisers:
United Nations Office for Outer Space Affairs through its UN-SPIDER programme, and the International Water Management Institute

Date:
12/06/2020

Registration Deadline:
Wednesday, June 10, 2020

Event website:
Webinar recording

Description:
On 12 June, United Nations Office for Outer Space Affairs (UNOOSA), through its UN-SPIDER programme, and International Water Management Institute (IWMI) will be hosting a webinar on "Space-based inputs for Locust early warning and preparedness" as a commitment to promote the use of space technologies in combating a crisis that is mounting on top of the COVID-19 crisis.

The webinar will take place at 10:30-12.30am Vienna, Austria time (UTC+2). Registrations are open until 11.59pm Vienna, Austria time (UTC+2) on 10 June.

During the 90-minute session, experts from UNOOSA, IWMI, India, Pakistan as well as from other international organisations, governments and private agencies will discuss how space applications can strengthen the monitoring and early warning efforts to prevent the locust outbreak in future.

The recording of the webinar is available online.

Background on current locust impact globally

Swarms of desert locusts are threatening large areas of pastures and crops, overwhelming countries in the Horn of Africa, the Middle East, and South Asia. The UN Food and Agriculture Organization (FAO) says these swarms represent the worst infestation in 25 years in Ethiopia and Somalia, in 26 years in India, and the worst in 70 years in Kenya. The crisis has affected 23 countries to date, from Pakistan to Tanzania. This is a single global outbreak, and if it reaches plague levels, it could cover 20 per cent of the earth's landmass.

Farmers across Pakistan and Indian states are suffering the worst plague of locusts in recent history, which has caused billions of dollars in damage and led to fears of long-term food shortages. The locust crisis overlaps with the COVID-19 pandemic, creating a crisis within a crisis. Local agri-food supply chains are already experiencing disruptions, including reduced access to inputs and services, labour movement, transport and roadblocks, and credit or liquidity due to COVID-19. These crises have the potential to generate a condition of famine, disease and poverty.

Space technology including satellite data offers a handy tool for locust impact monitoring, and early warning. The data are used for assessing the current situation, forecasting its developments and planning an effective response at all levels. Satellite-derived vegetation data and essential climate variables derived from, for example MERRA-2 data of NASA's Global Modeling and Assimilation Office (GMAO) are used to alert authorities in preventing the spread of desert locust swarms and helps protect the crops of smallholder farmers. The MODIS-derived dynamic greenness map (250 m), as well as the satellite-based rainfall map, can be used by authorities when moving in the field which is implemented using Google Earth Engine. These are some of the examples of adopting innovative technology for use in the locust affected region.

To find out more about space applications to fight the global crisis, please visit:

- UN-SPIDER Data Application of the Month
- UN-SPIDER COVID-19 page
- International Water Management Institute
- News article on spread of desert locust in South Asia (2 June 2020)
- FAO Desert Locust Situation Update 4 June 2020

Flood modelling in the Indus river using different digital elevation models

Flood hazard assessments are essential to design land-use ordinances or events that minimize the exposure of future critical infrastructure and potential new settlements to such floods. Flood hazard assessments rely on flood modelling, which can be conducted using flood modelling software.

At the request of UN-SPIDER, the Space Applications Centre for Response in Emergency and Disasters (SACRED) of Pakistan's Space and Upper Atmosphere Research Commission (SUPARCO) conducted a comparative analysis of the modelling of floods using two digital elevation models (DEM). The DEM developed by the United States National Aeronautics and Space Administration (NASA) based on its Shuttle Radar Topography Mission (SRTM) and WorldDEM™ developed by Airbus Defence and Space GmbH.

Both data sets are digital surface models (DSM) which represent the surface of the Earth including buildings, infrastructure and vegetation.

This comparison was conducted using the HEC-RAS River Analysis System software developed by the Hydrologic Engineering Center (HEC) of the United States Army Corps of Engineers. Flood modelling was conducted in the segment of the Indus river between the Chashma and the Taunsa barrages. This article presents the results of this comparison.

The Indus River

The Indus river is the main river of Pakistan. It originates in the Tibetan plateau and flows through the country reaching the Arabian Sea near the city of Karachi. It is one of the longest rivers in Asia, with a length of nearly 2,000 kilometers. For this case study, the segment of the Indus river between the Chashma and the Taunsa barrages was used for flood modelling.

Data and Methods

The aim of this analysis has been to compare the results of hydrological modelling of floods between the Chashma and the Taunsa barrages using as inputs two digital surface models (DSM):

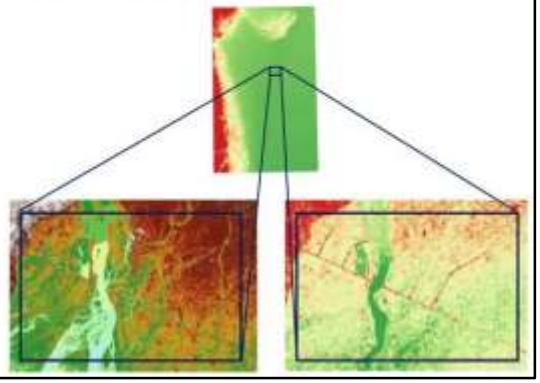
- The digital elevation model WorldDEM™ developed by Airbus Defence and Space GmbH, and
- The digital elevation model developed from SRTM of NASA.

Table 1 presents the characteristics of these two digital elevation models:

PARAMETER	WORLDDEM™	SRTM DSM
XY coordinate system	GCS WGS 1984	GCS WGS 1984
Vertical coordinate system	EGM2008 geoid height	EGM 1996 geoid height
Resolution	0.4 arc sec (approx. 12m)	1 arc sec (approx. 30m)
Vertical accuracy	2m (relative) / 4m (absolute)	16m (with 90% confidence)
Data acquisition date	2011 - 2015	2000

Results

While both DSMs can be used to carry out the flood modelling analysis, it is important to keep in mind that they were developed on the basis of space missions conducted at different times. The SRTM data and WorldDEM™ data are at least 10 years apart. Due to the different acquisition dates, there are differences in the river morphology as well as changes of the surface in the area of interest (AOI). This can be seen in Figure 1.



Recommended Practices for UN-SPIDER Knowledge Portal

Flood Hazard Assessment

Flood Mapping and Damage Assessment

Drought Hazard Assessment

WAY FORWARD

- Capacity building on Flood Hazard Mapping via MOOC
- Recommended practice of Landslide susceptibility mapping.
- Participation in TAMs
- SUPARCO can provide Resource persons for Flood Modeling trainings
- Capacity Building in the field of SAR data processing and analysis for Disaster monitoring, mapping and damage assessment particularly for earthquake and landslide
- Participation in regional Collaborative projects