

Monitoring of Indus River Monsoon Season

**1st Joint Project Team Meeting For Sentinel Asia
STEP 3 (JPTM13)**

27 - 29 November 2013, Bangkok, Thailand

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SUPARCO**

Sequence of Presentation

- **Brief Introduction to SUPARCO**
- **History and statistics of River Indus**
- **Flooding in River Indus in the last few years**
- **SUPARCO's Role and Contribution in monitoring and Flood Management activities**
- **Conclusions**



SUPARCO - National Space Agency



Mandate

- **Carry out R&D activities in the field of Space Sciences & Technology and promote peaceful space applications for socio-economic development of the country**
- **Prepare and propose long term and short term space programs and plans to the government**
- **Advise the government in all space related matters**
- **Liaise with national & international agencies**

Some Important Facts and Statistics-River Indus

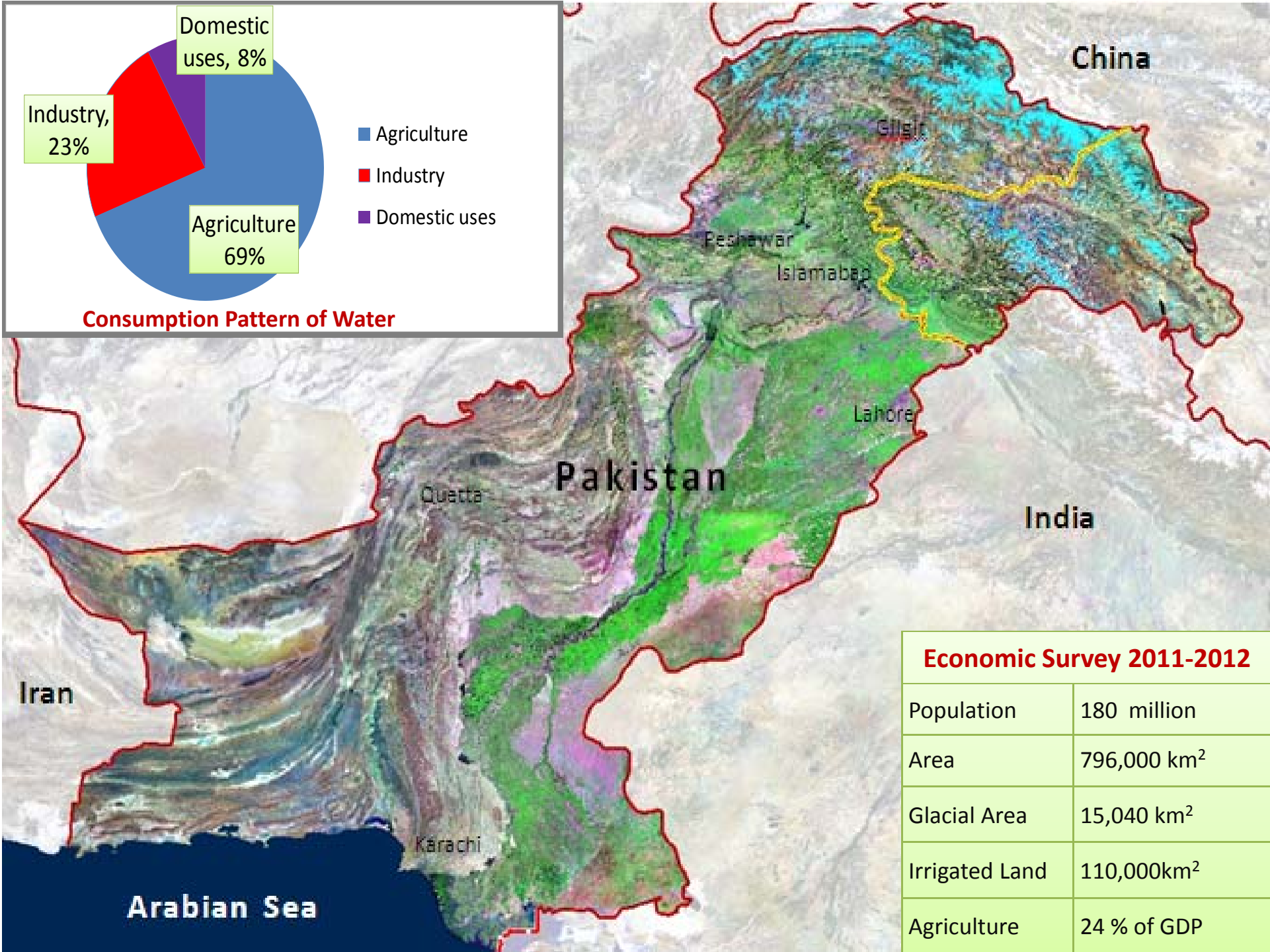
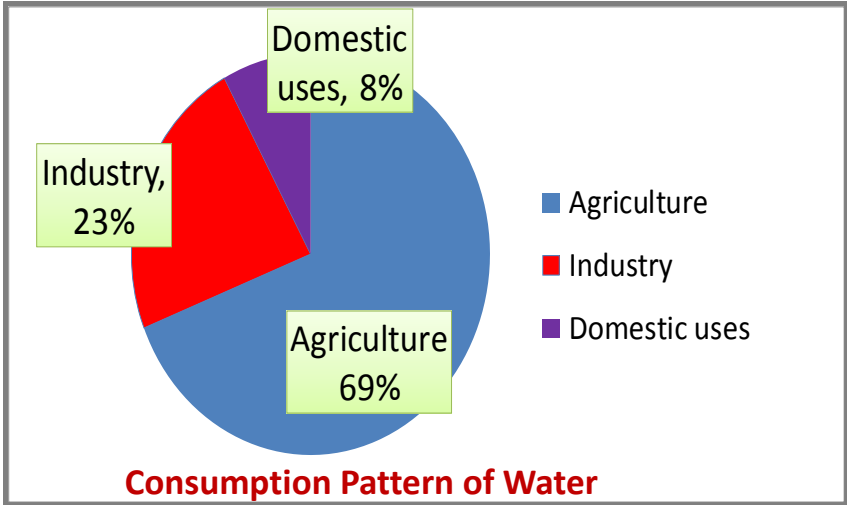
➤ **Indus River** is one of the major rivers of the world that drains one of Asia's chief catchment basins and is ranked as the 12th largest river basin on Earth.

➤ Originates from Tibetan Plateau, the third largest ice sheet formation in the world and flowing through [India](#) and [Pakistan](#) to discharge to the [Arabian Sea](#).

➤ Flow of the persistent Indus:

- a. Meltwaters from the Tibetan [ice field](#).
- b. Snowfall and snowmelt from higher elevation of the watershed and
- c. periodic monsoonal rains that lead to periodic flooding in the basin.



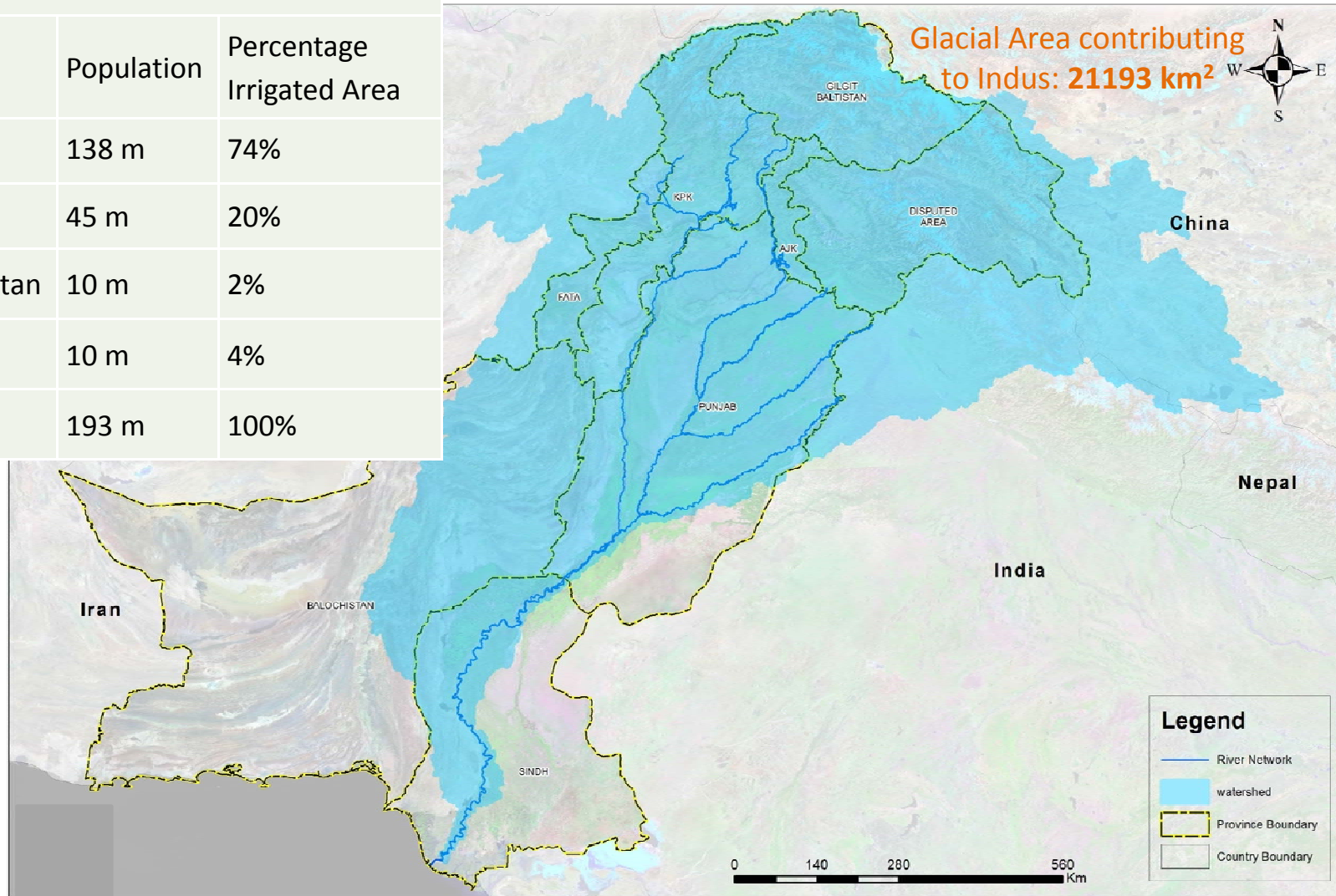


Economic Survey 2011-2012	
Population	180 million
Area	796,000 km ²
Glacial Area	15,040 km ²
Irrigated Land	110,000km ²
Agriculture	24 % of GDP

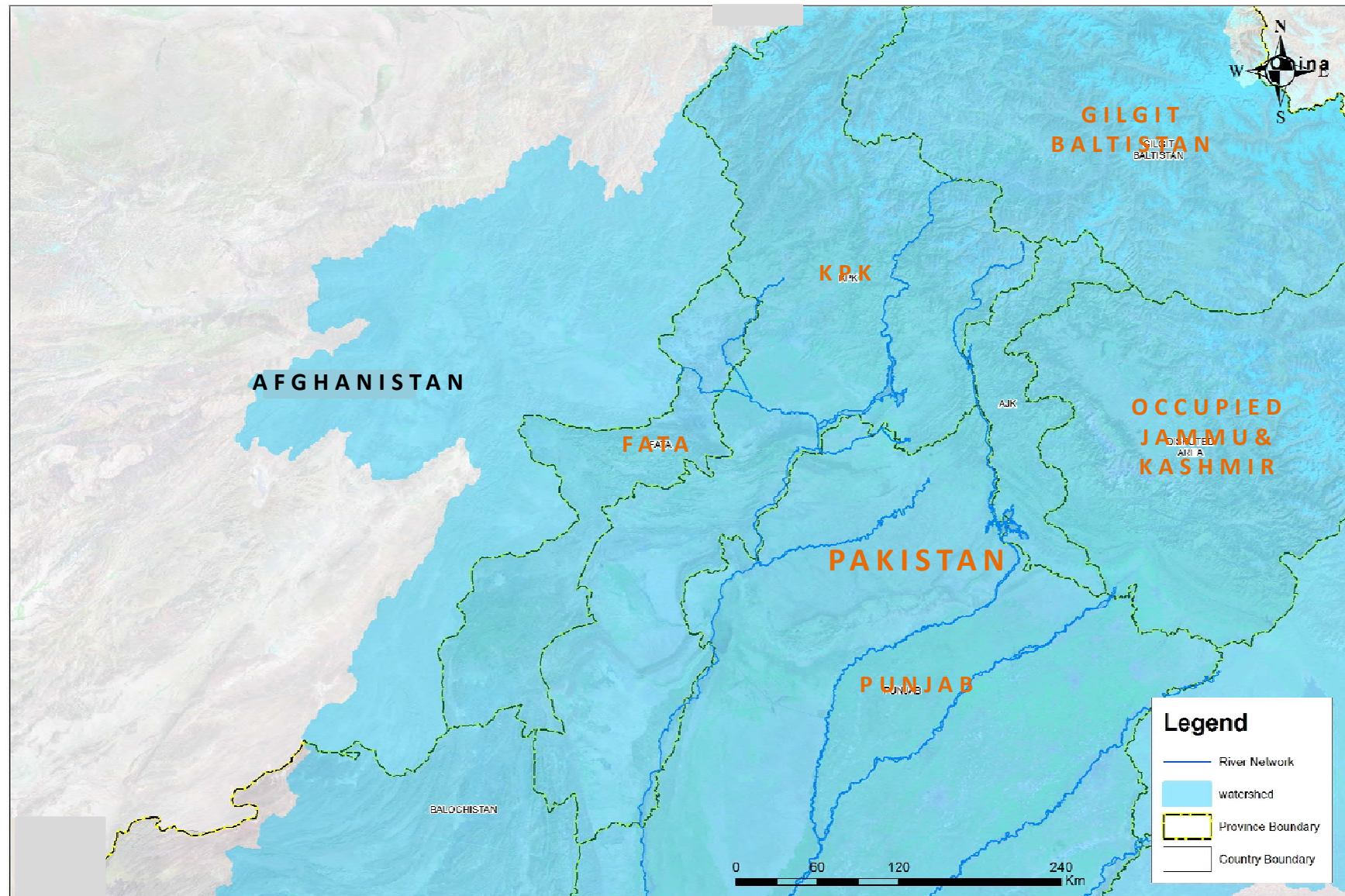
INDUS RIVER SYSTEM

Indus River Basin

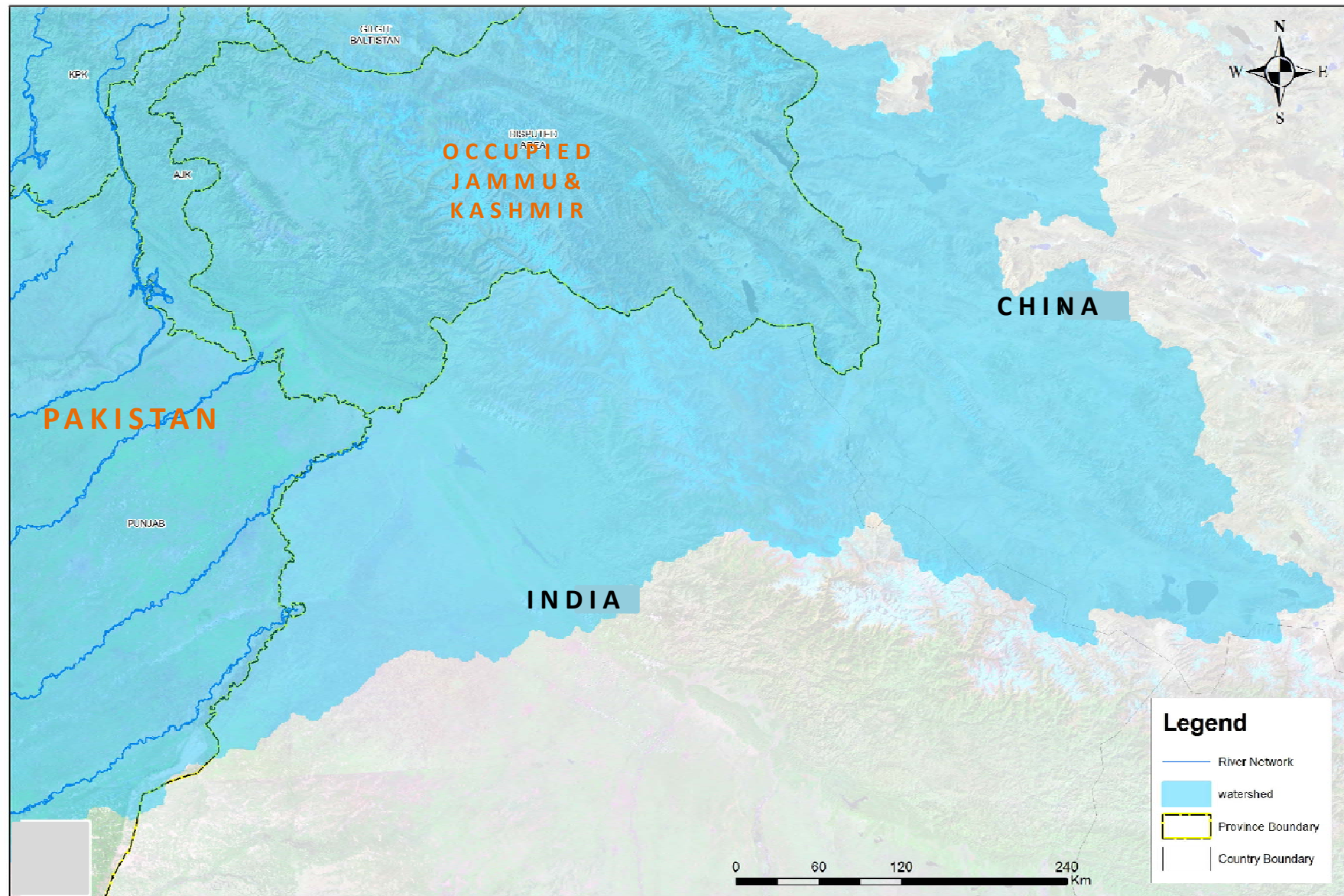
	Population	Percentage Irrigated Area
Pakistan	138 m	74%
India	45 m	20%
Afghanistan	10 m	2%
China	10 m	4%
Total	193 m	100%



INDUS RIVER BASIN (PAKISTAN - AFGHANISTAN)



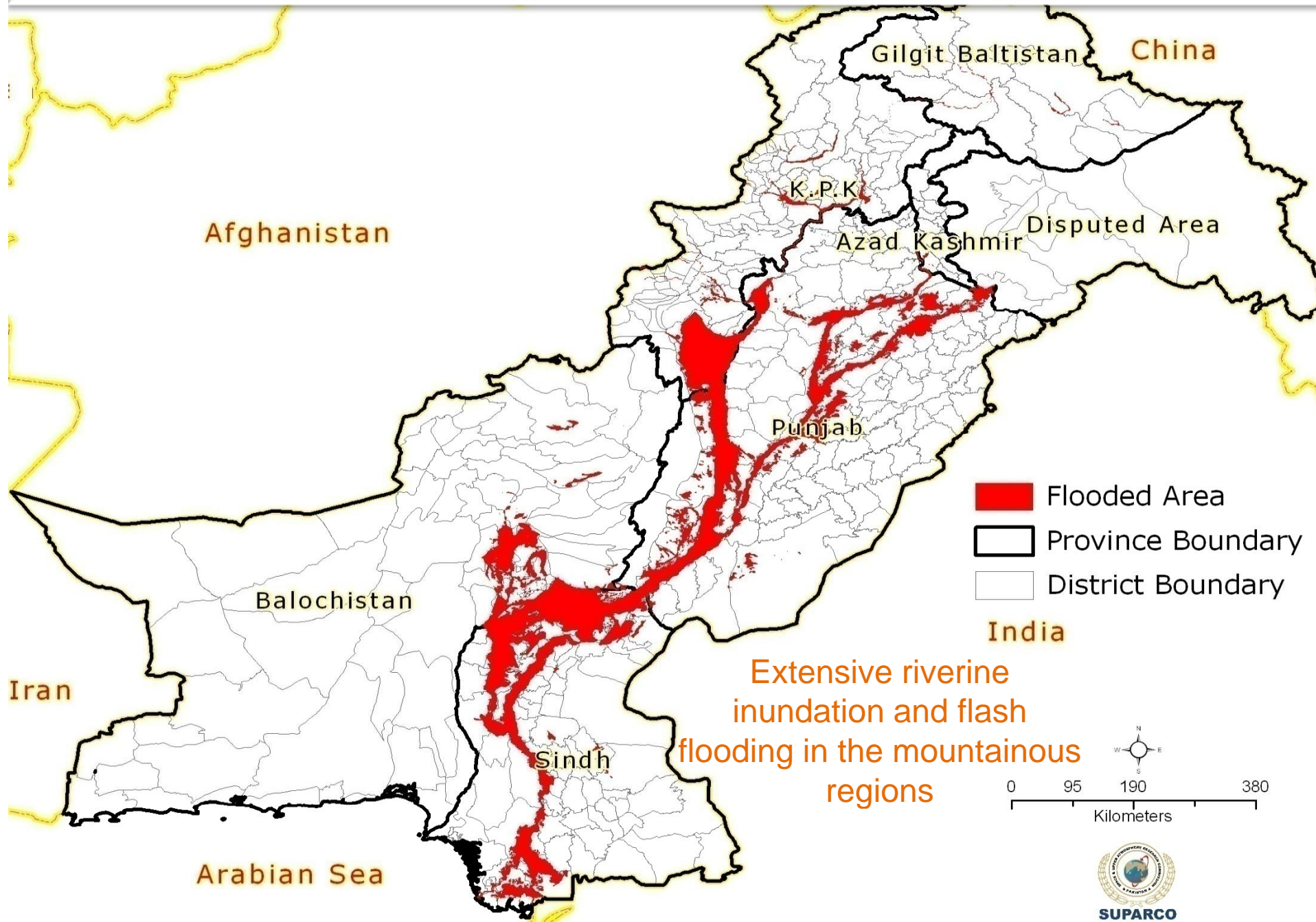
INDUS RIVER BASIN (PAKISTAN – INDIA-CHINA)



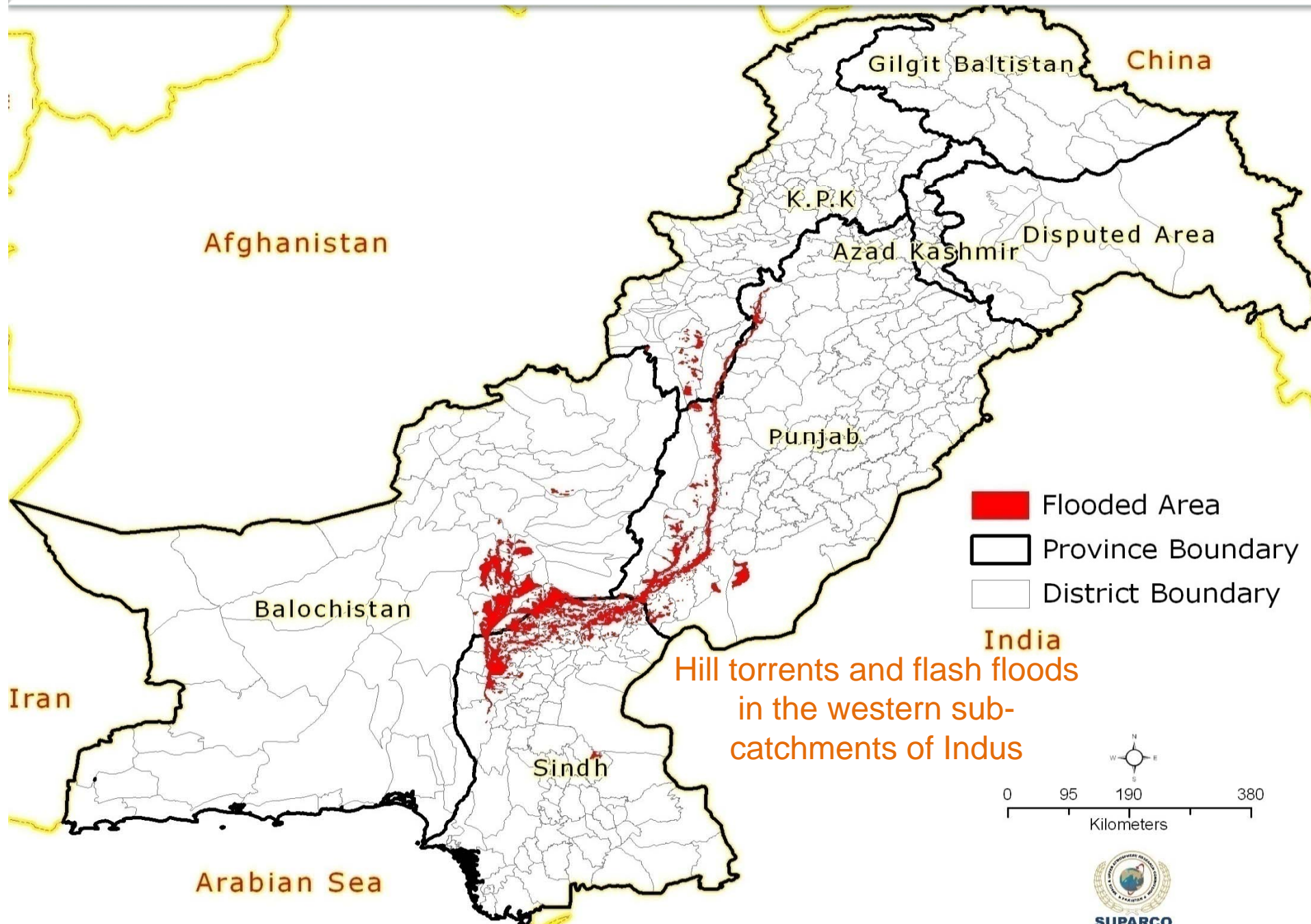
Areas Prone to Flooding



Flood Extent - 2010

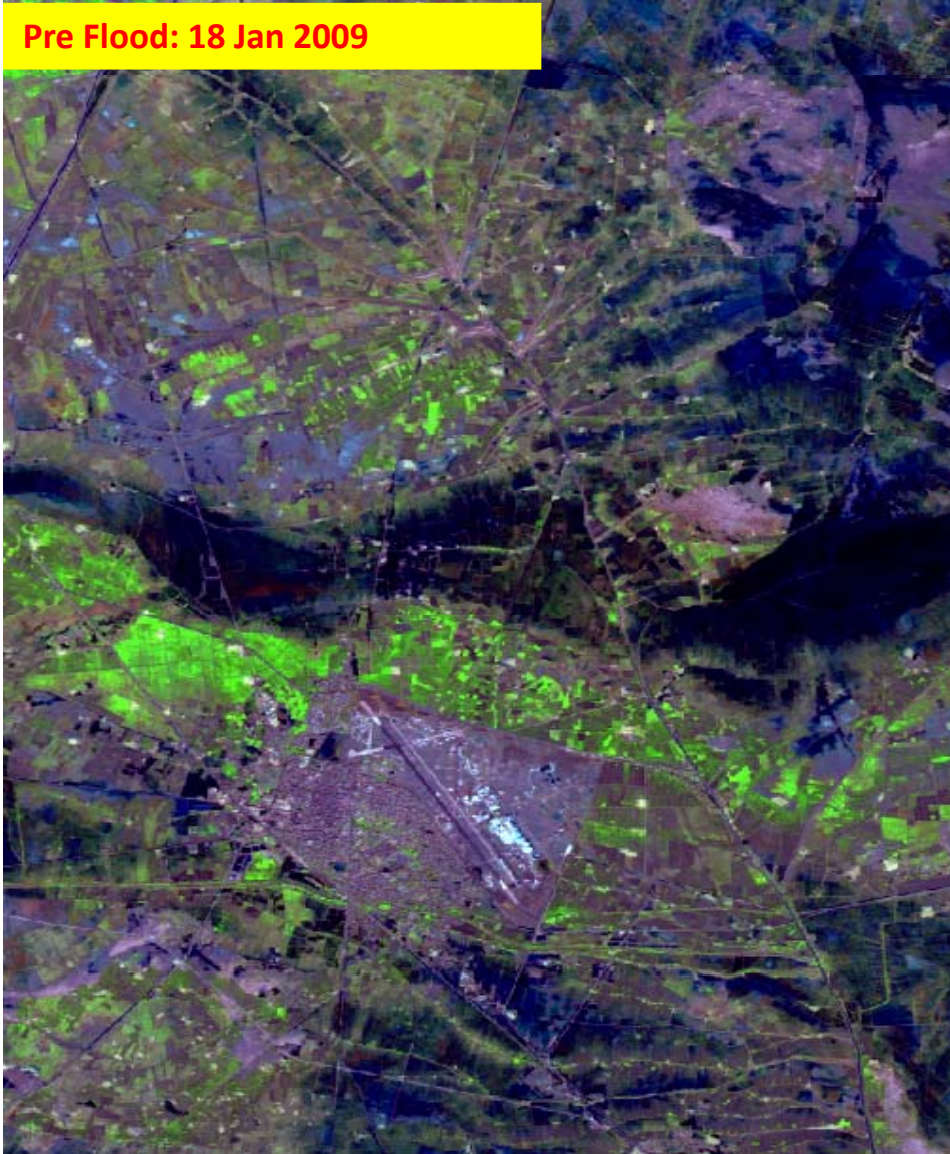


Flood Extent - 2012

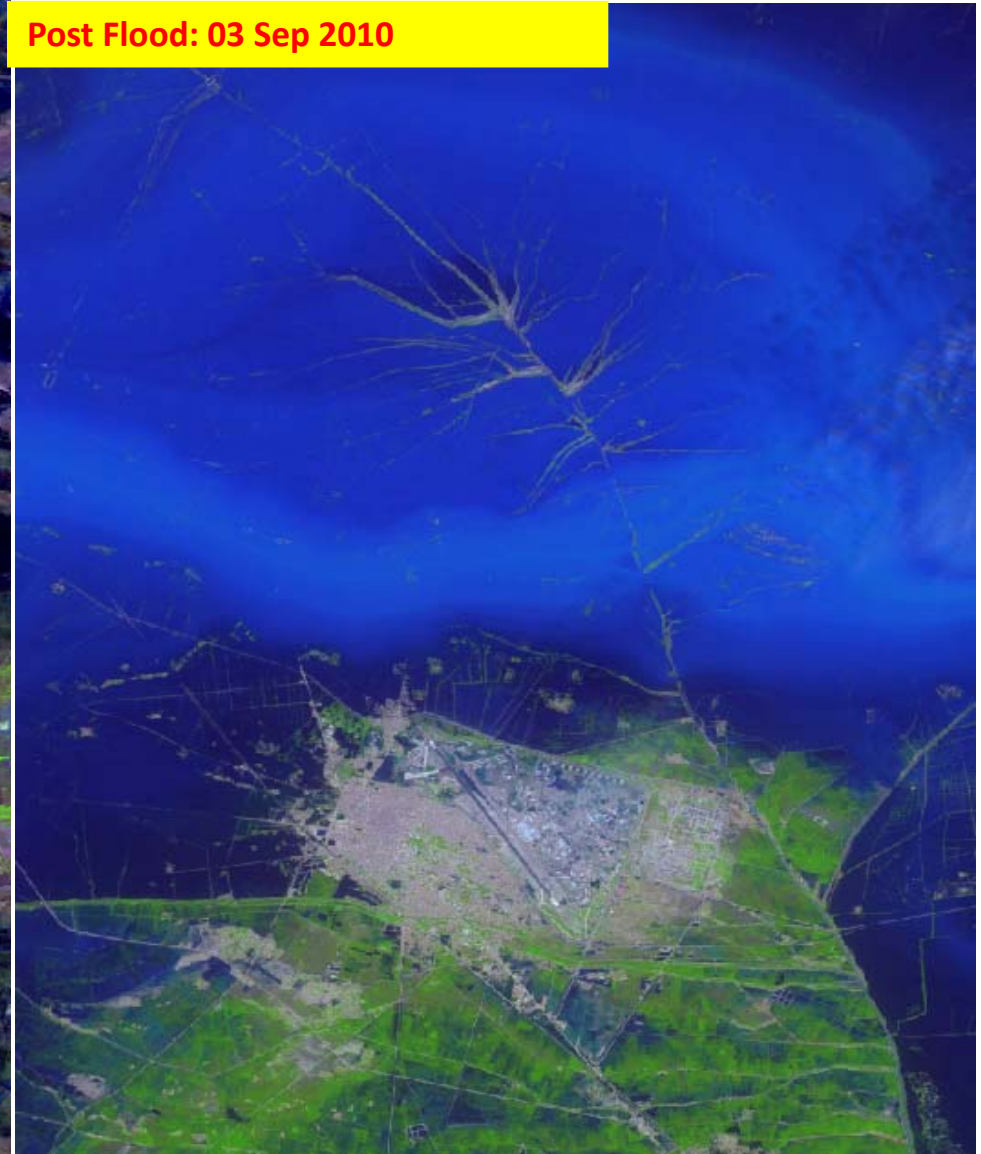


Jacobabad

Pre Flood: 18 Jan 2009



Post Flood: 03 Sep 2010



Qambar Shahdadkot

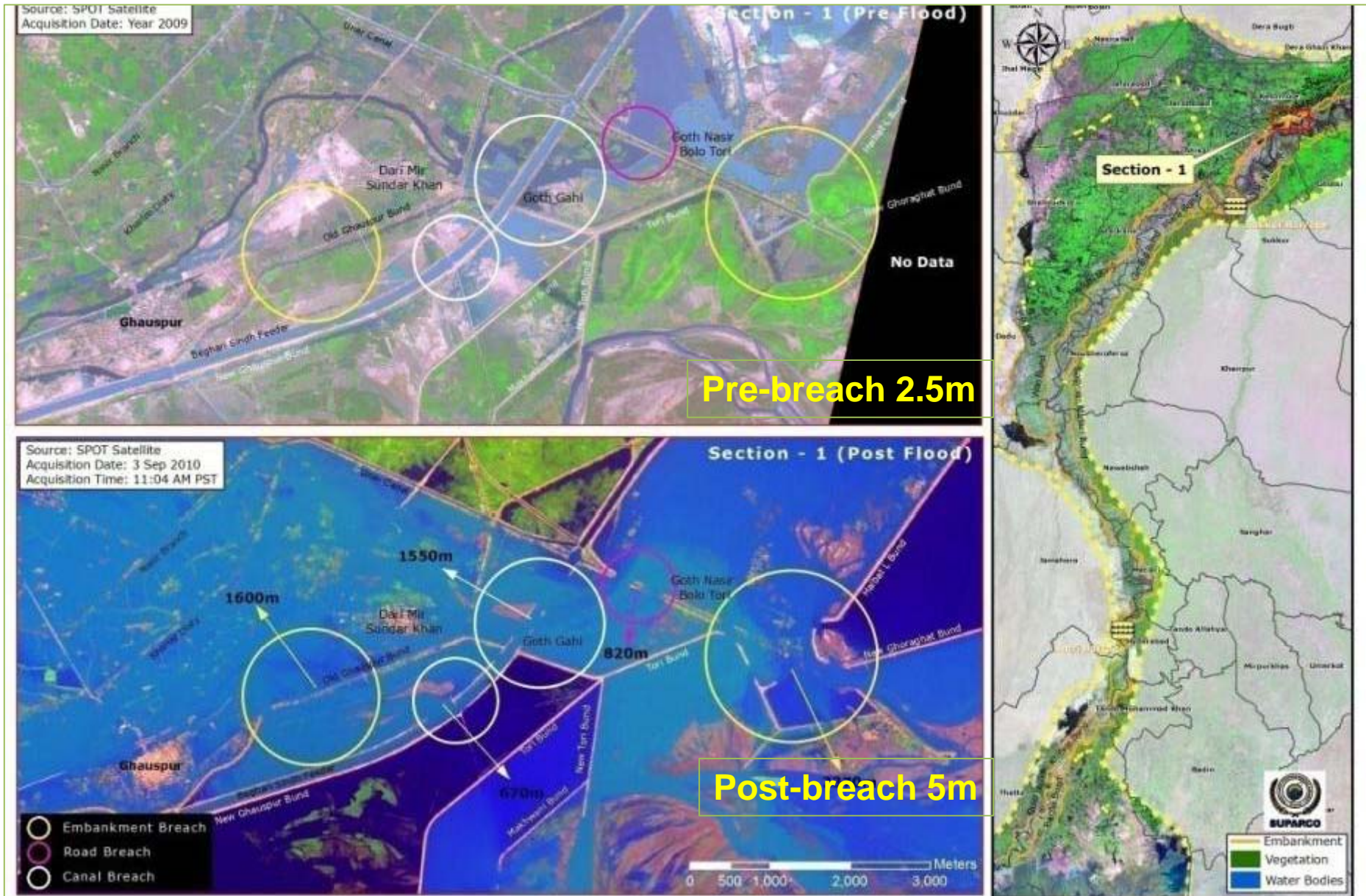
Pre Flood: 01 Jun 2010



Pre Flood: 27 Aug 2010



Tori Breaches – District Kashmir



Guddu Barrage on River Indus-Pre and Post Monsoon

Pre Flood: 02 June 2010

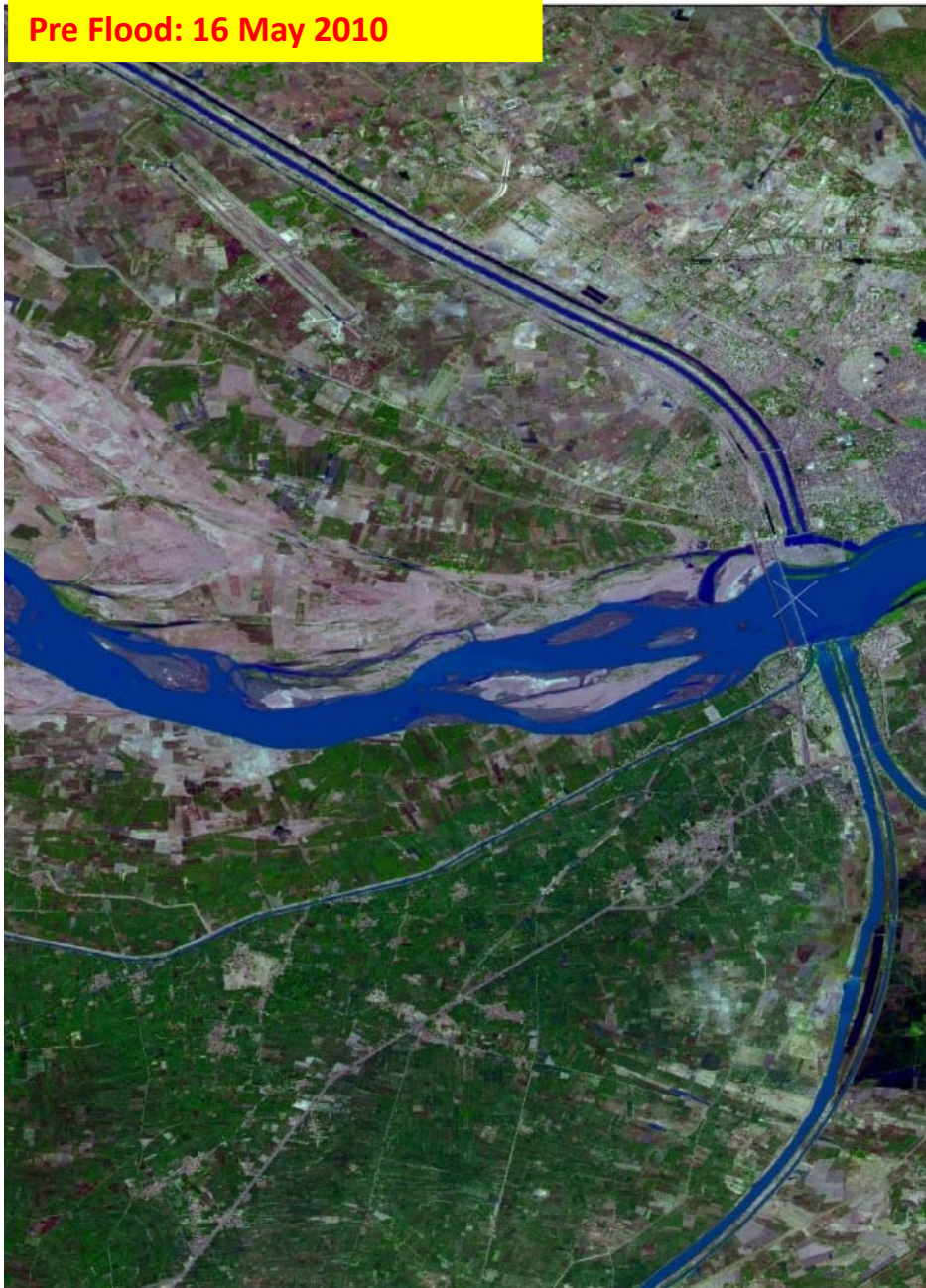


Post Flood: 12 Aug 2010



Sukkur Barrage on River Indus –Pre and Post Monsoon

Pre Flood: 16 May 2010



Post Flood: 13 Aug 2010

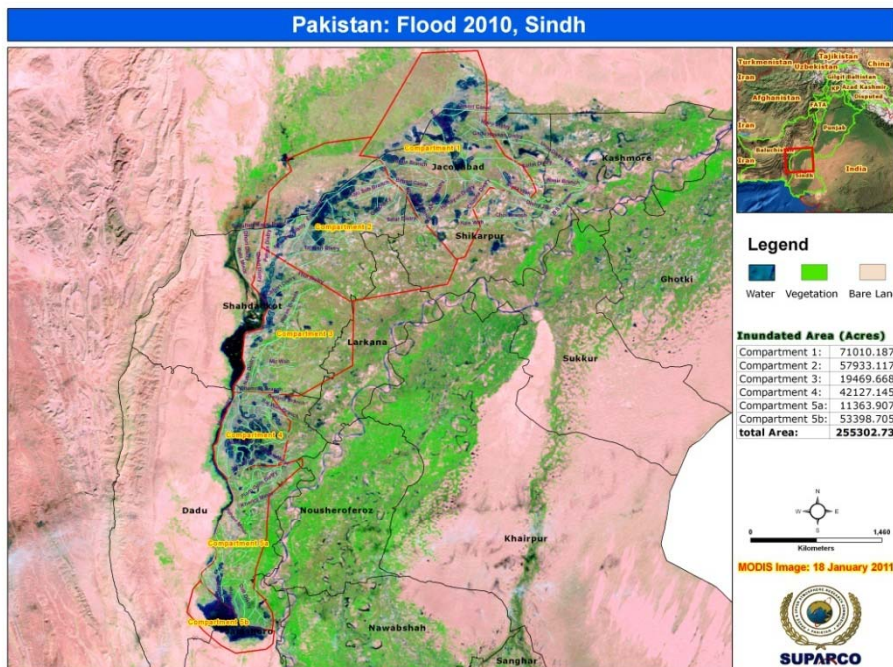
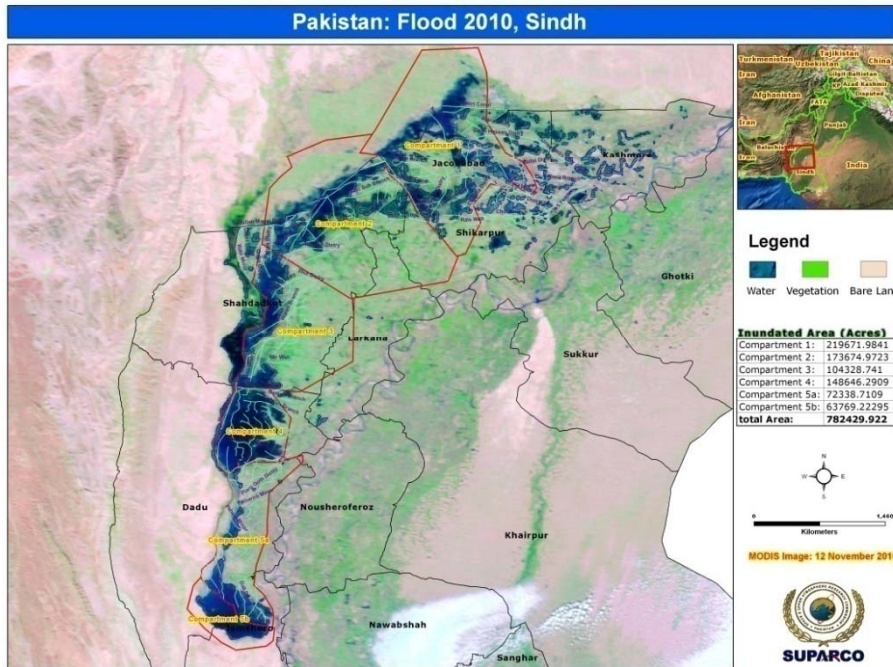


Ponded Water in Sindh (Floods – 2010)

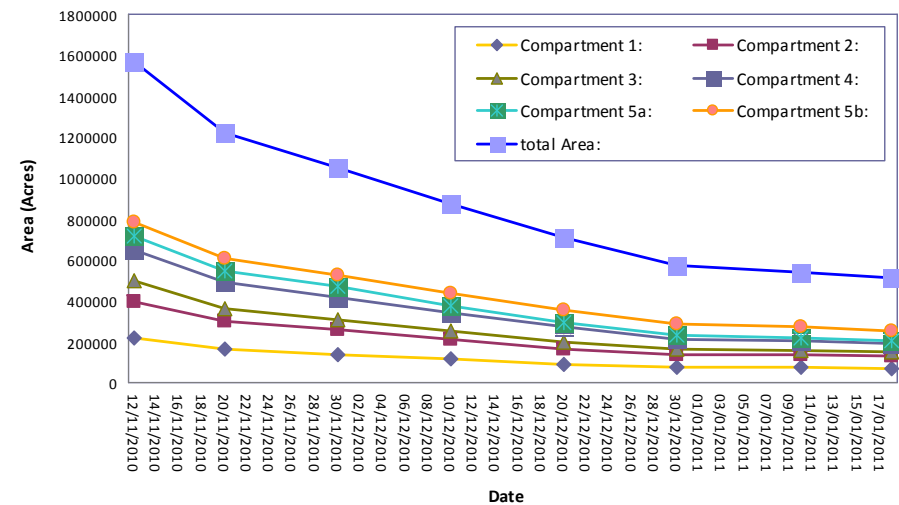
- Assessment of ponded water in Sindh was provided to the relevant Government departments on daily basis from 12 November 2010 to 03 January 2011
- Satellite maps of the ponded areas provided by SUPARCO were used for planning of dewatering activities by Sindh Government

Sindh Dewatering Program

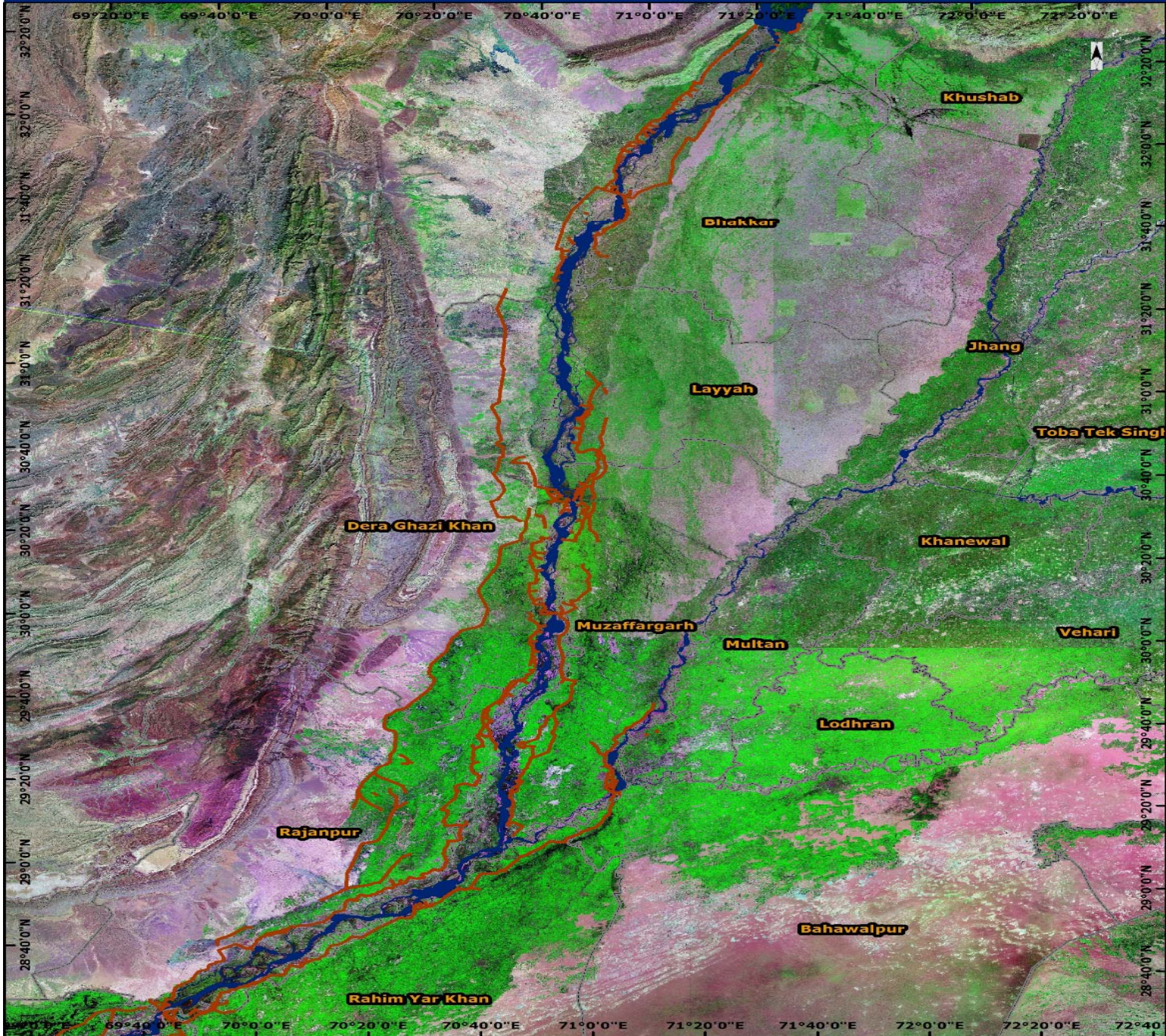
Daily flood extent maps were produced by utilizing data from remote sensing satellites



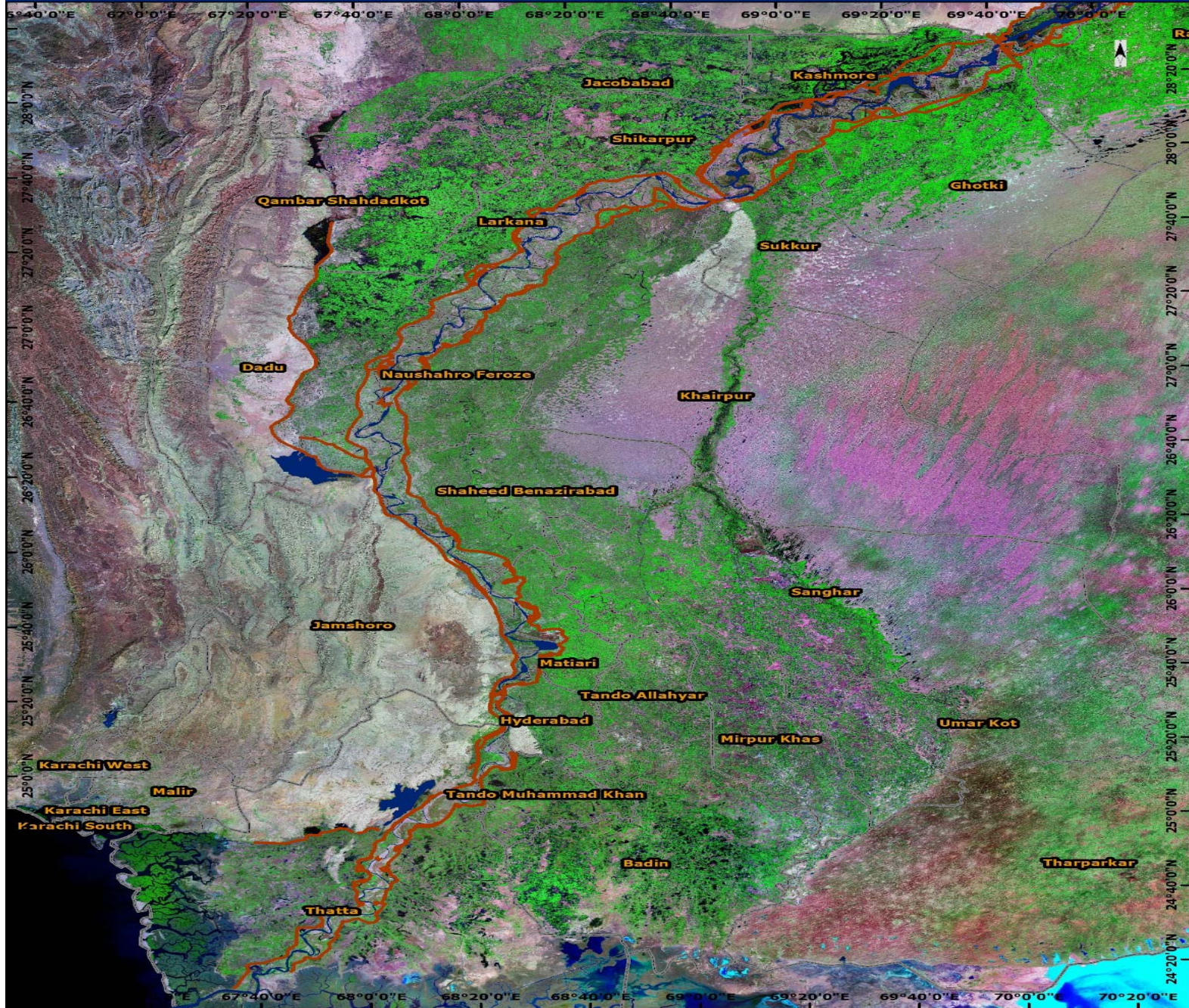
Graphical Representation of Flood Water Reduction in Sindh



Indus River Embankments-Punjab

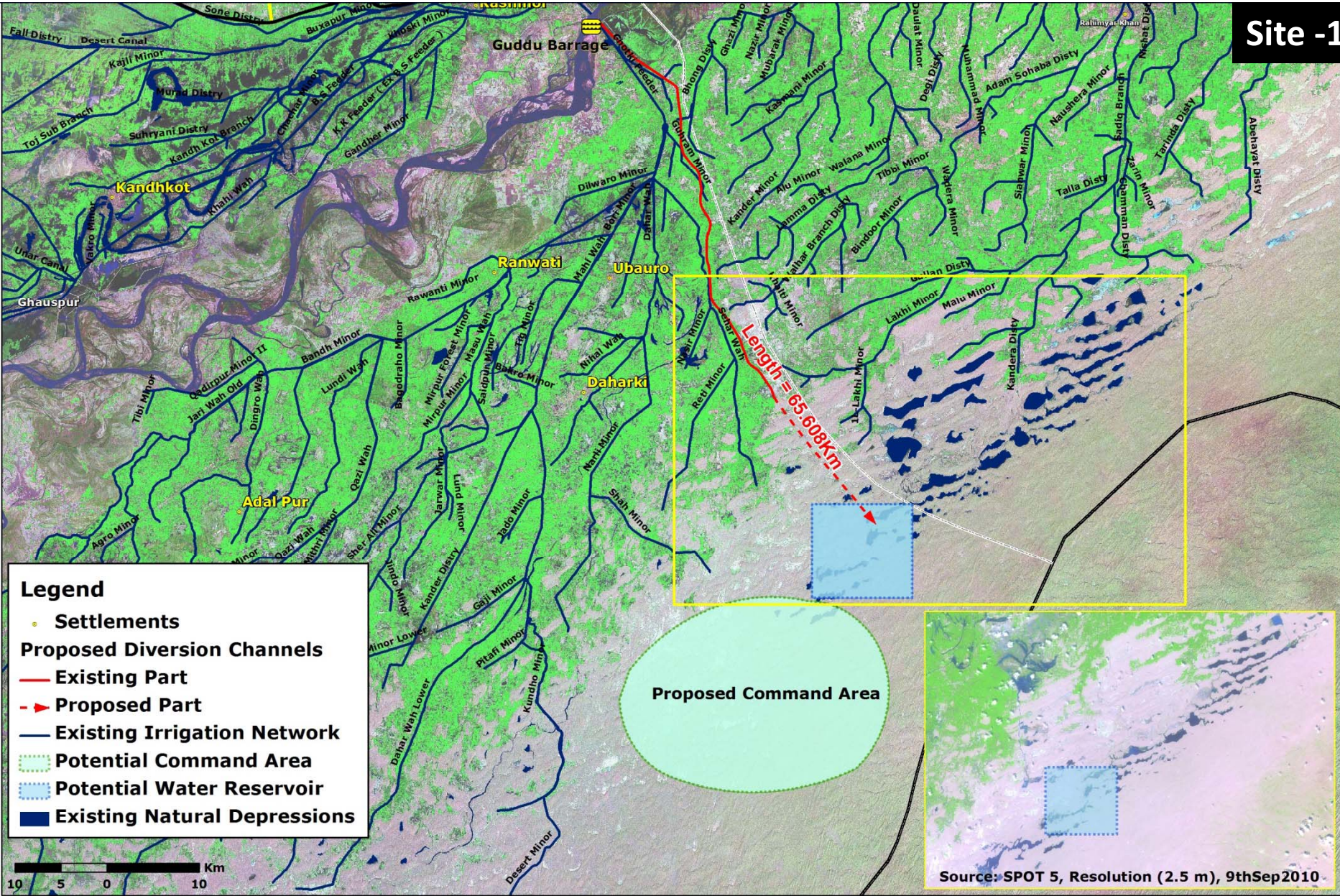


Indus River Embankments-Sindh

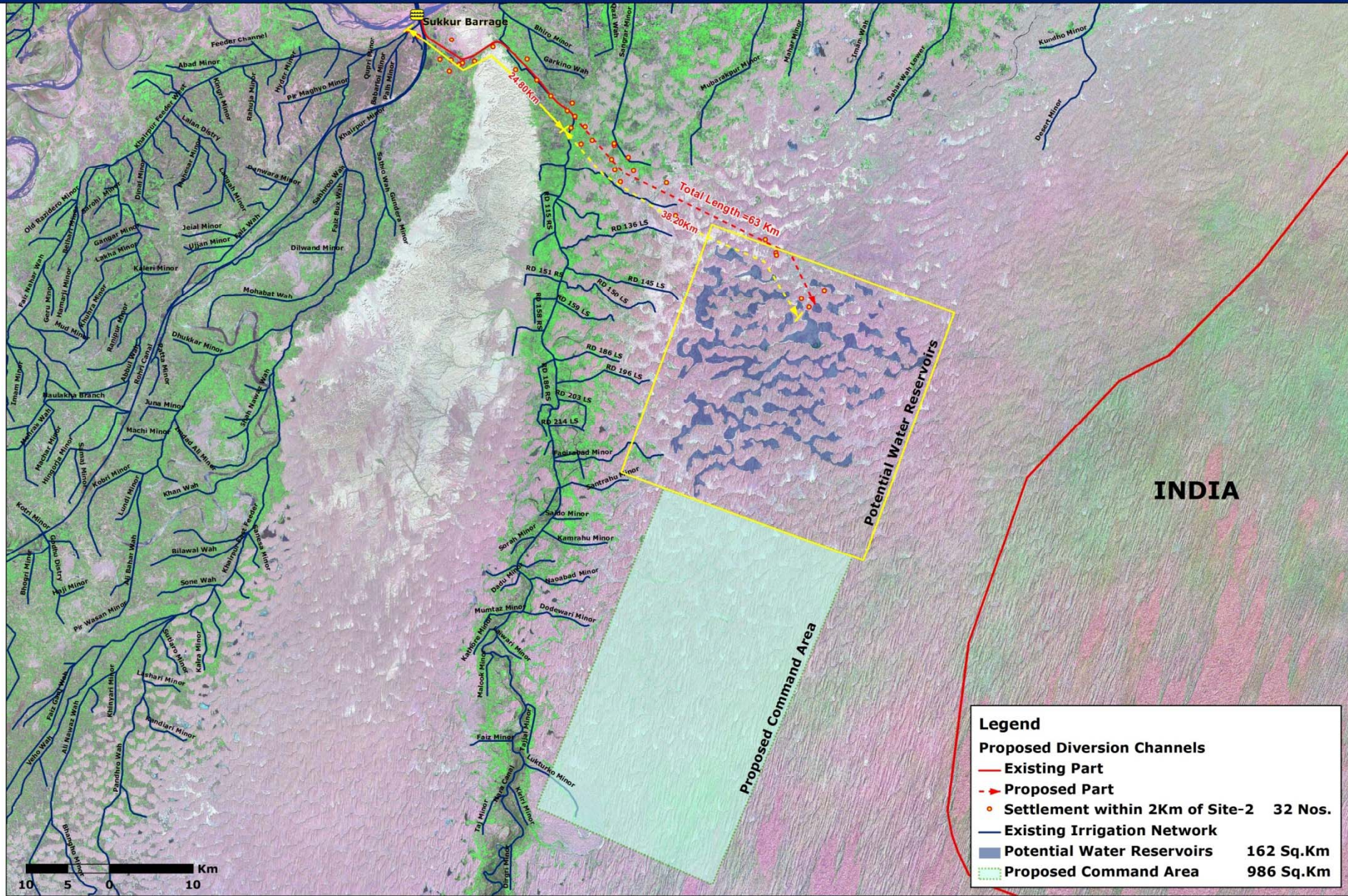


Proposed Channel for Diversion of Flood Water: Upstream of Guddu Barrage

Site -1



Proposed Channels For Diversion of Flood Water: From Sukkur Barrage, Site-2



Strategic Strengthening of Flood Warning and Management Capacity of Pakistan

✓ Project Associates

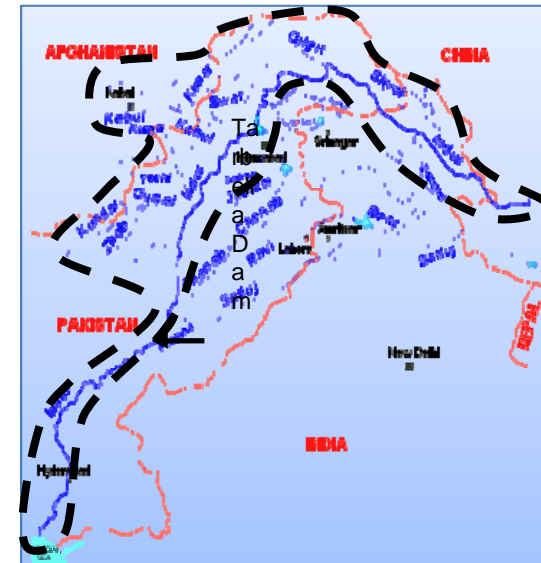
- SUPARCO/PMD/UNESCO/JAXA

✓ Objectives

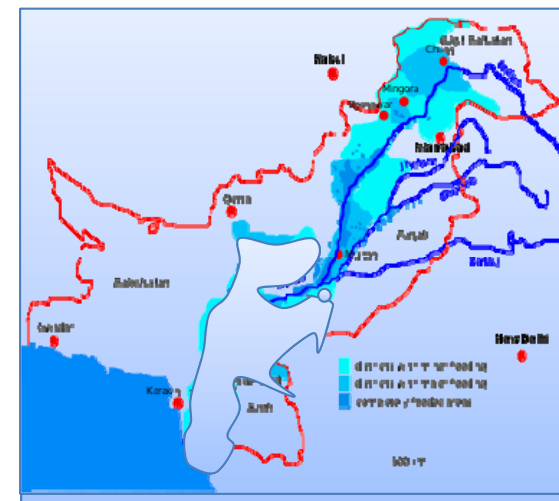
- Development of Indus-Integrated Flood Analysis System (IFAS)
- Update flood hazard maps by using satellite data including newly flood affected areas
- Test operation in 2013

✓ Time frame

- 1-1/2 years (2011-2013)



Geographic area to be covered by Indus-IFAS (enclosed by dotted lines)



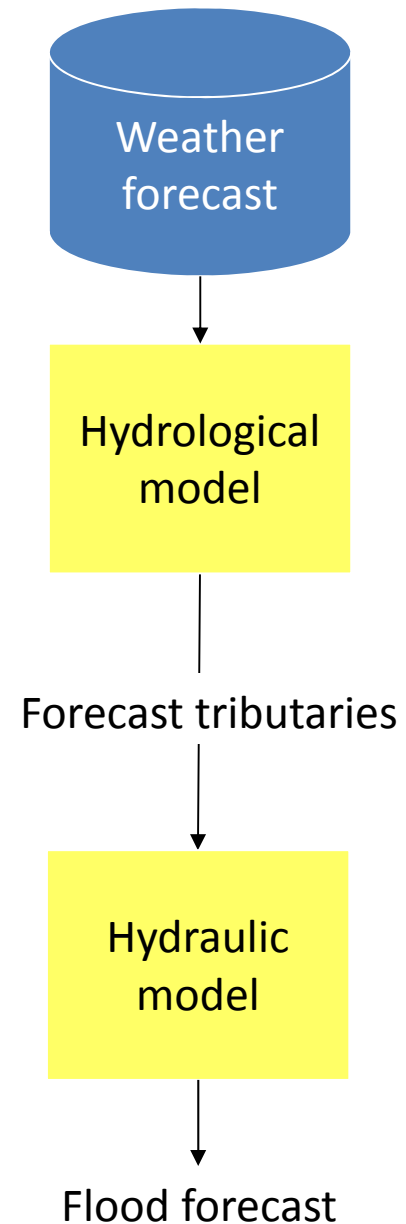
Proposed Flood Hazard Mapping Area (Lower Indus)

River Forecasting Model

The Model

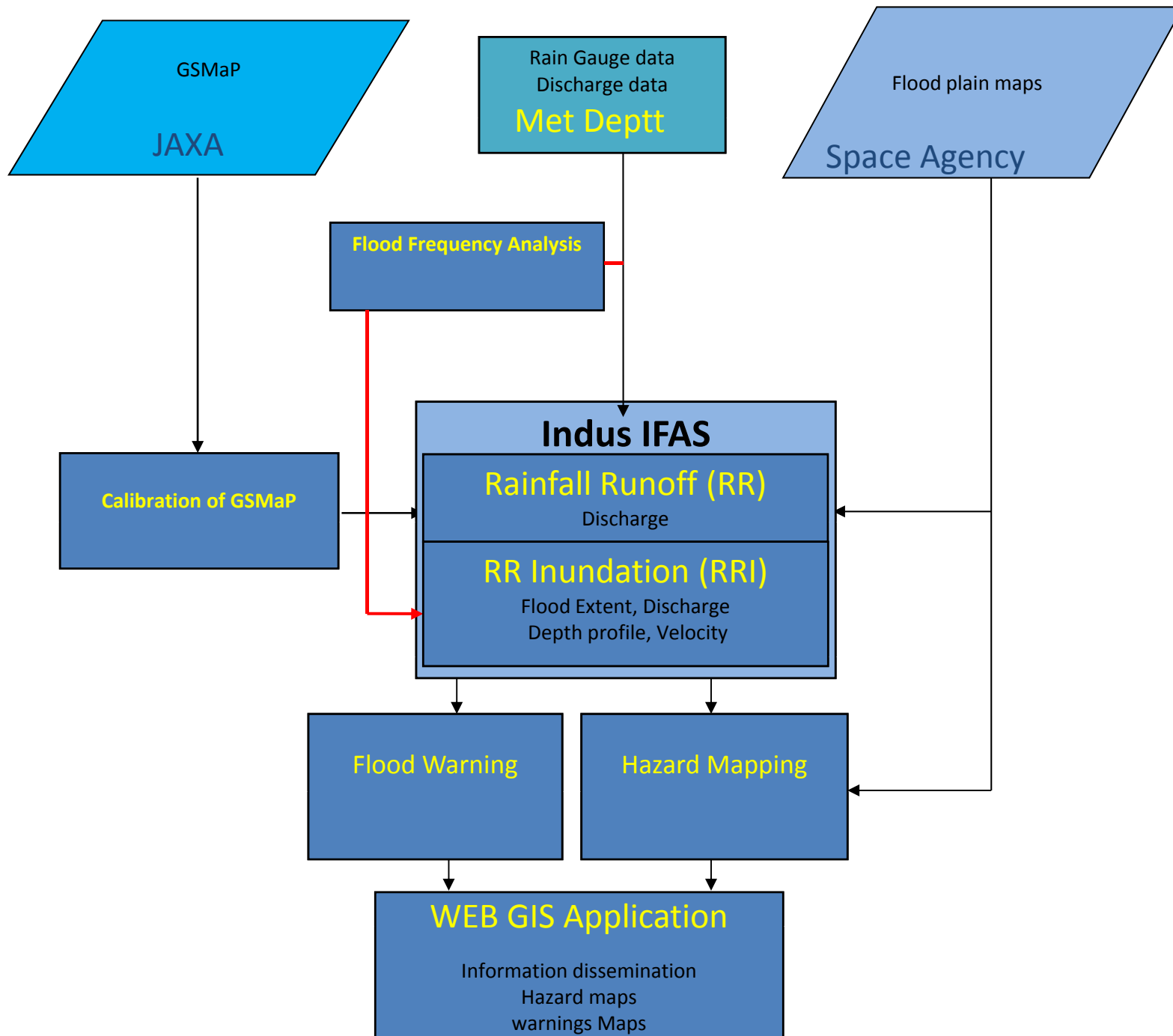
The basic objective of a river forecast model is to estimate the amount of runoff water, to compute the routing, how the water will move downstream from one forecast point to the next, and to predict the flow of water at a given forecast point throughout the forecast period.

The model incorporates the satellite rainfall data combined with water discharge at various stations and RS data to predict/forecast the possible flooding event.



Study Area





Indus river basin – flood modelling challenges

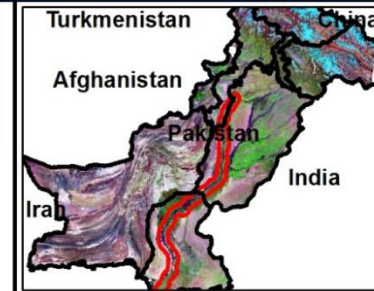
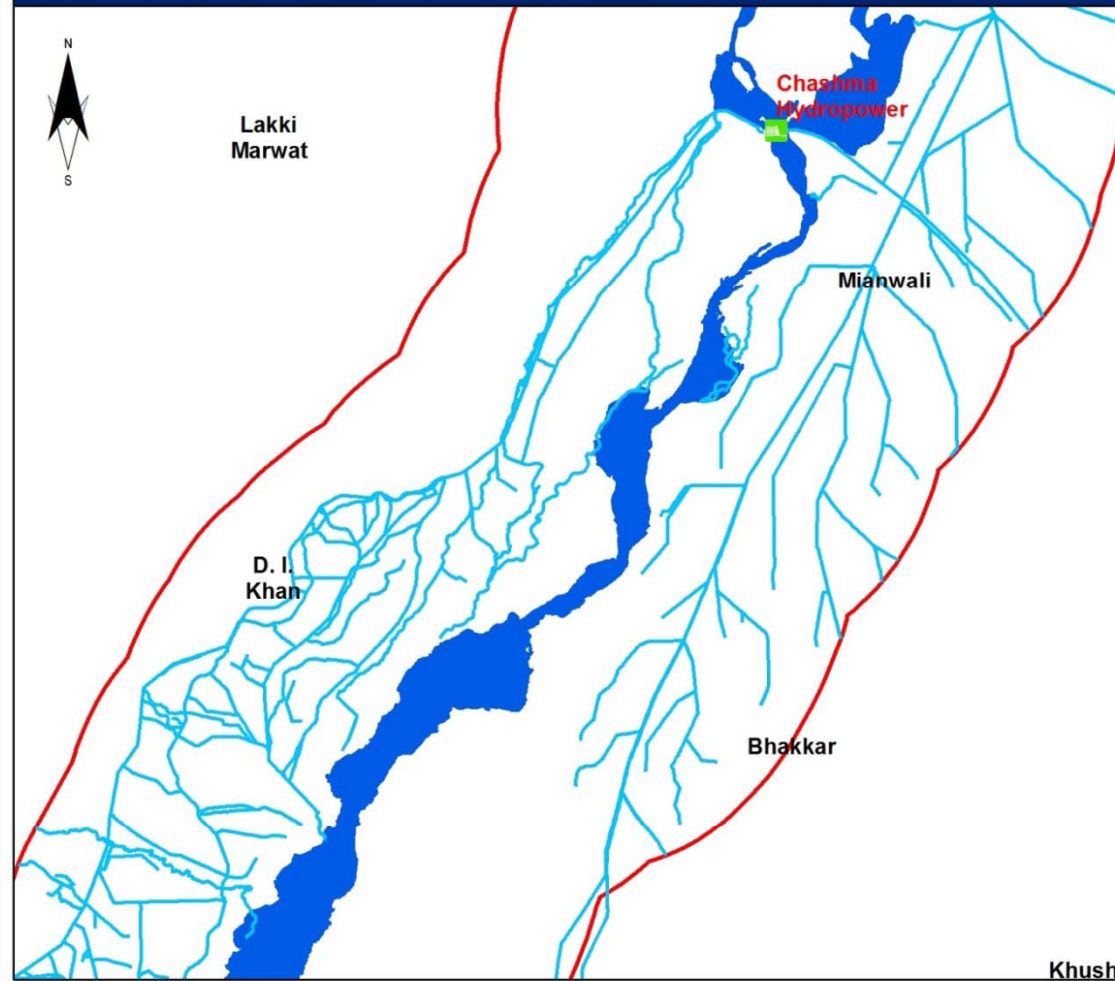
- ✓ Indus is categorized as a ‘Poorly-gauged’ basin.
- ✓ Poor rain gauge density, coarse temporal resolution
- ✓ Few discharge gauge stations on tributaries
- ✓ Large number of sub-catchments have no discharge gauge stations
- ✓ Highly heterogeneous topography and soil characteristics

Flood Plain Hazard Mapping

Flood Plain Mapping
Road Network

Flood Plain Mapping
Settlements

Flood Plain Mapping
Irrigation



Legend

- Irrigation
- Dams & Barrages
- Indus river
- Buffer 20Km

This analysis is based on SPOT-5 Satellite imagery acquired at Satellite Ground Station, SUPARCO Islamabad

Projection: UTM Zone 42 N
Datum: WGS84



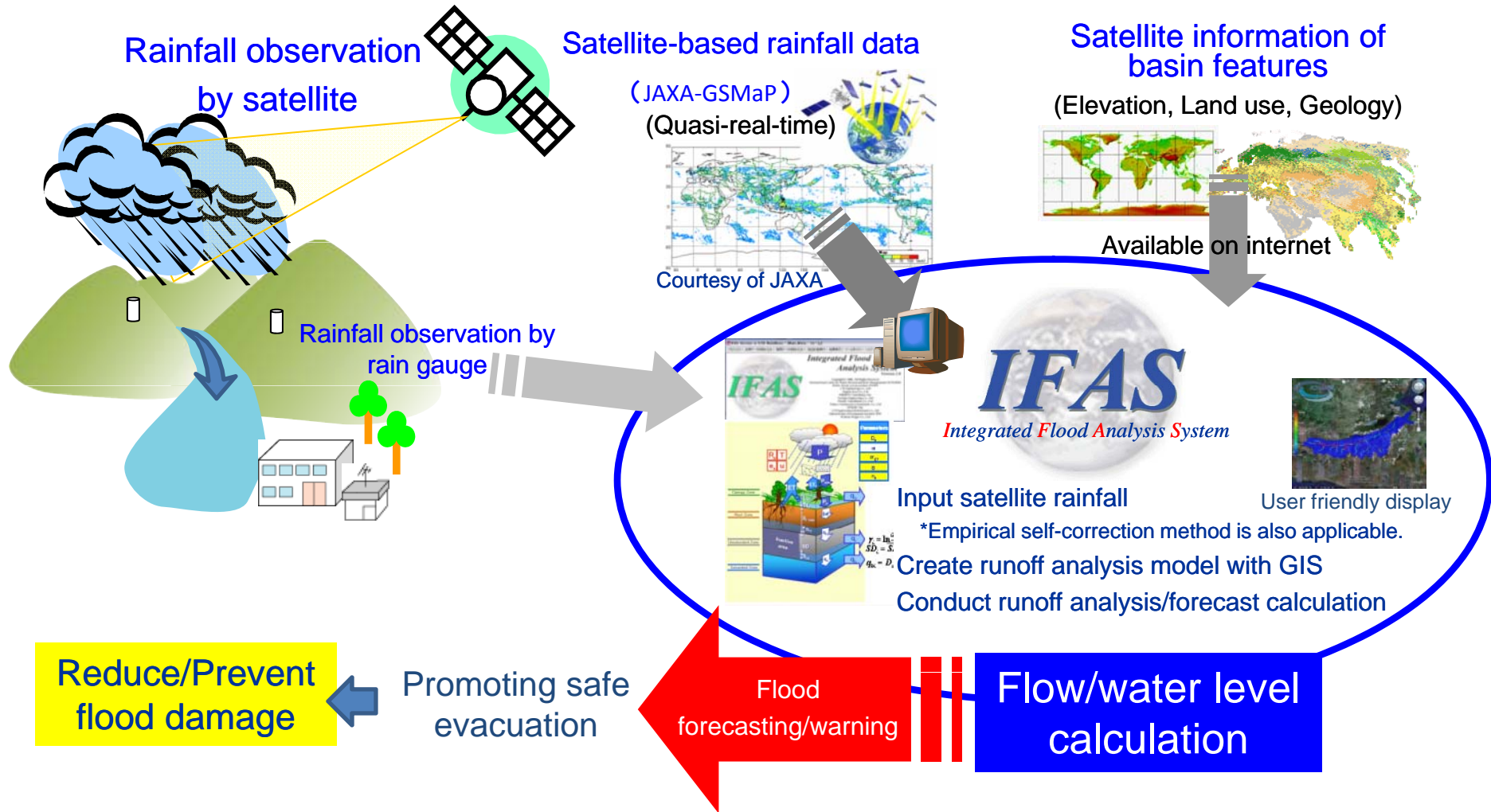
Khushab



SUPARCO

Integrated Flood Analysis System (IFAS)

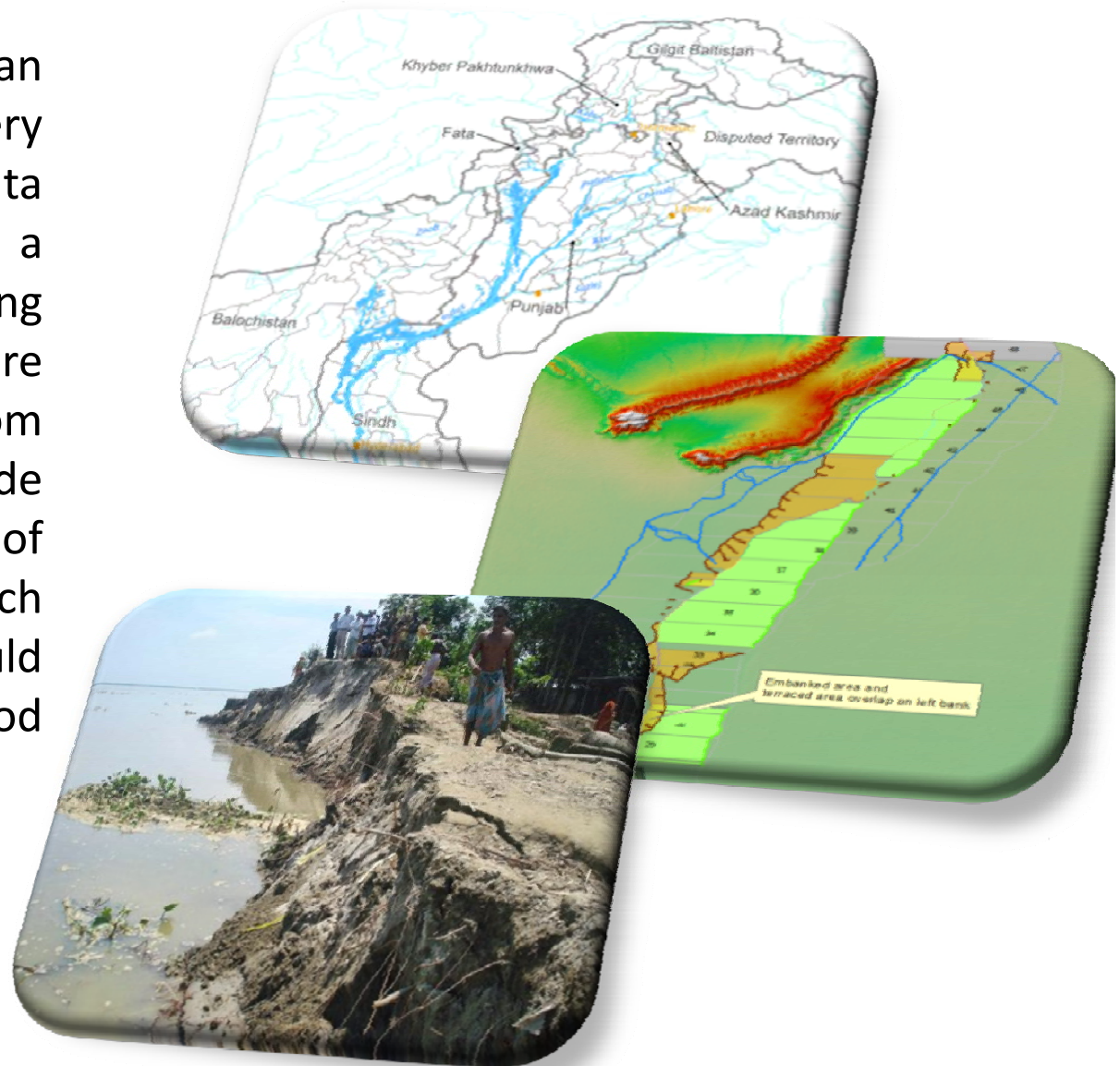
Flood forecasting system using satellite data



Flood Warning Modelling on the Indus River

(FAO/ University of Southampton (UoS) /SUPARCO/WAPDA)

As part of the FAO Pakistan Floods Relief and Early Recovery Response Plan, The GeoData Institute, UoS is coordinating a River Bank Erosion Modelling and Impacts on Agriculture Project on the Indus River from Chashma to Taunsa to provide early warning of hot spots of erosion, embankment breach and agricultural losses. It would also provide input to flood hazard maps



Flood / Erosion Modelling & Impacts on Agriculture on the Indus River

✓ Project Associates

- FAO/SUPARCO/ WAPDA/University of Southampton-UK

✓ Objectives

- Bank erosion modelling for test areas of the Indus River(Chashma to Taunsa)
- Bank erosion historical analysis of the Indus River for modeling
- Atlas of impacts and recovery of agriculture
- Capacity development of SUPARCO officials

✓ Time frame

- 1-1/2 years (2011-2013)



Conclusion

- International/bilateral cooperation among countries, regional and international organizations needs to be enhanced to better manage natural disaster mitigation and relief efforts.
- SUPARCO shares its experience and expertise with international community through International platforms like Sentinel Asia, UN-SPIDER Program, ICIMOD and other International organizations.
- SUPARCO shall keep to support all regional and international efforts initiated for minimizing the damages and sufferings face up to mankind in the event of natural disasters

An aerial photograph showing a large-scale flooding of a village. The water is murky brown and covers most of the landscape, leaving only the rooftops of buildings and some trees visible. The buildings are small, rectangular structures with flat roofs. In the background, a city skyline is visible under a clear blue sky. The text "Thank You" is centered in the image in a large, bold, black font.

Thank You