Managing Extreme Floods in Pakistan

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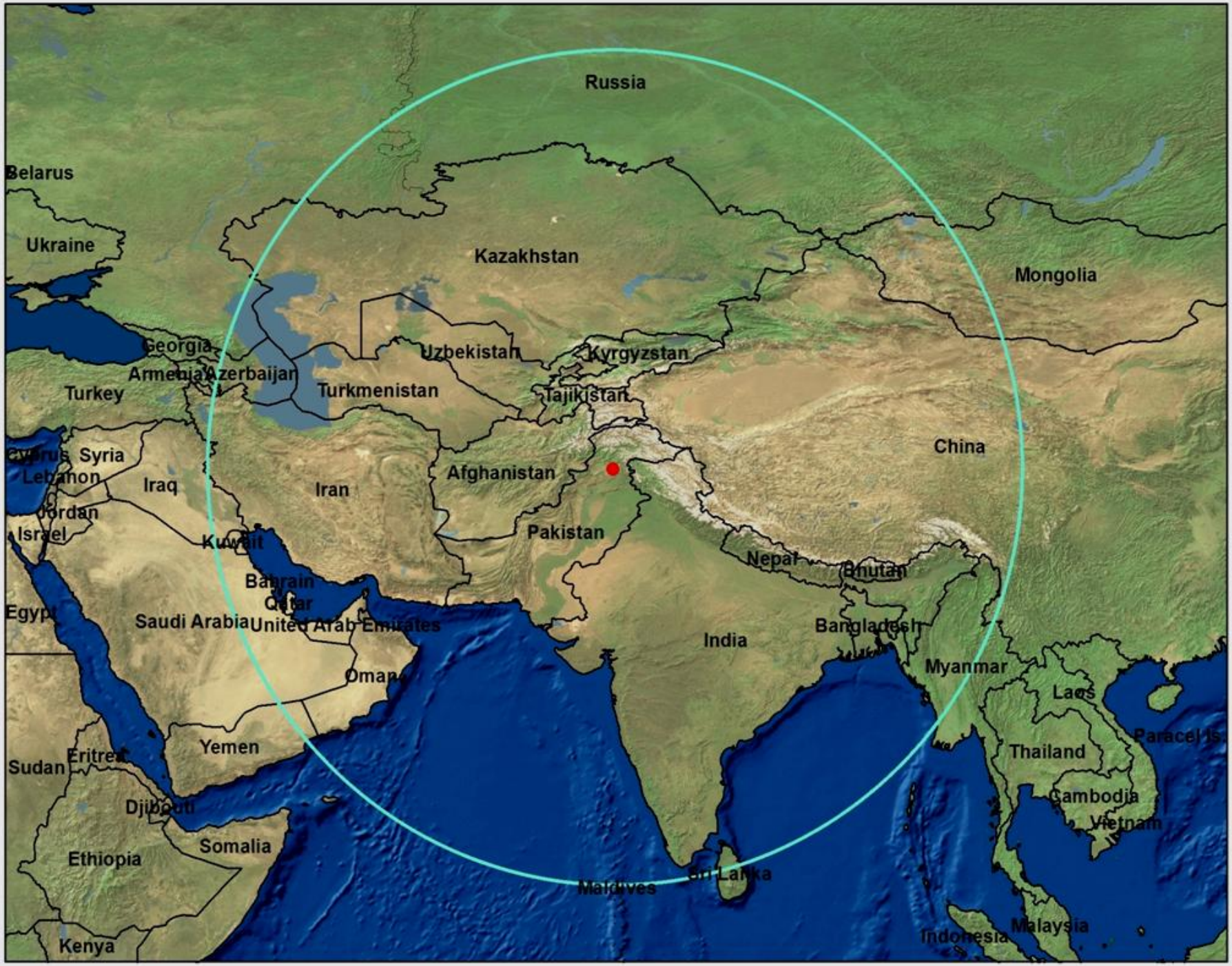
United Nations Educational, Scientific and Cultural Organization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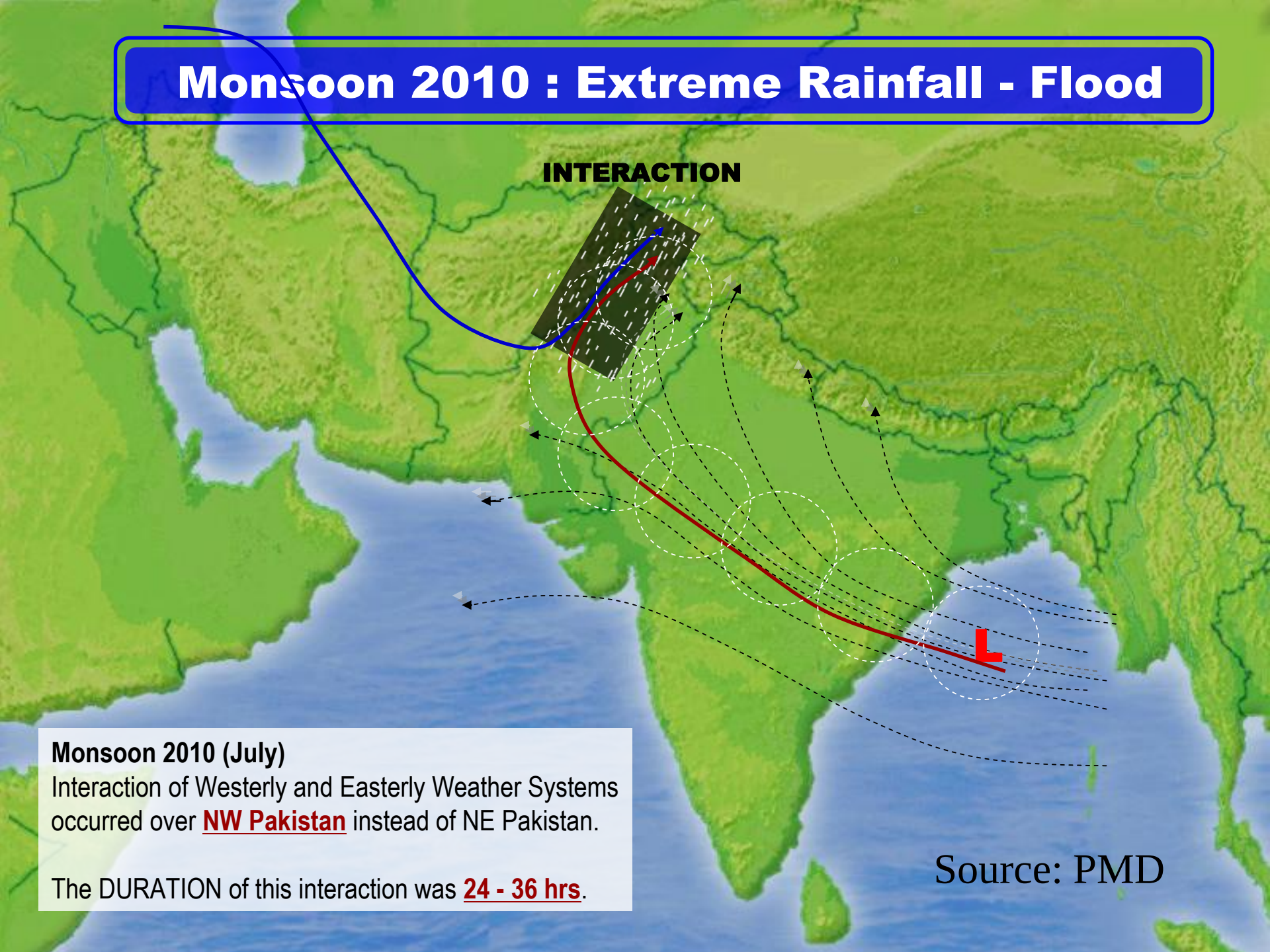
Sudan
Cambodia
Djibouti
Vietnam
Somalia
Ethiopia
Sri Lanka
Maldives
Malaysia
Indonesia
Kenya

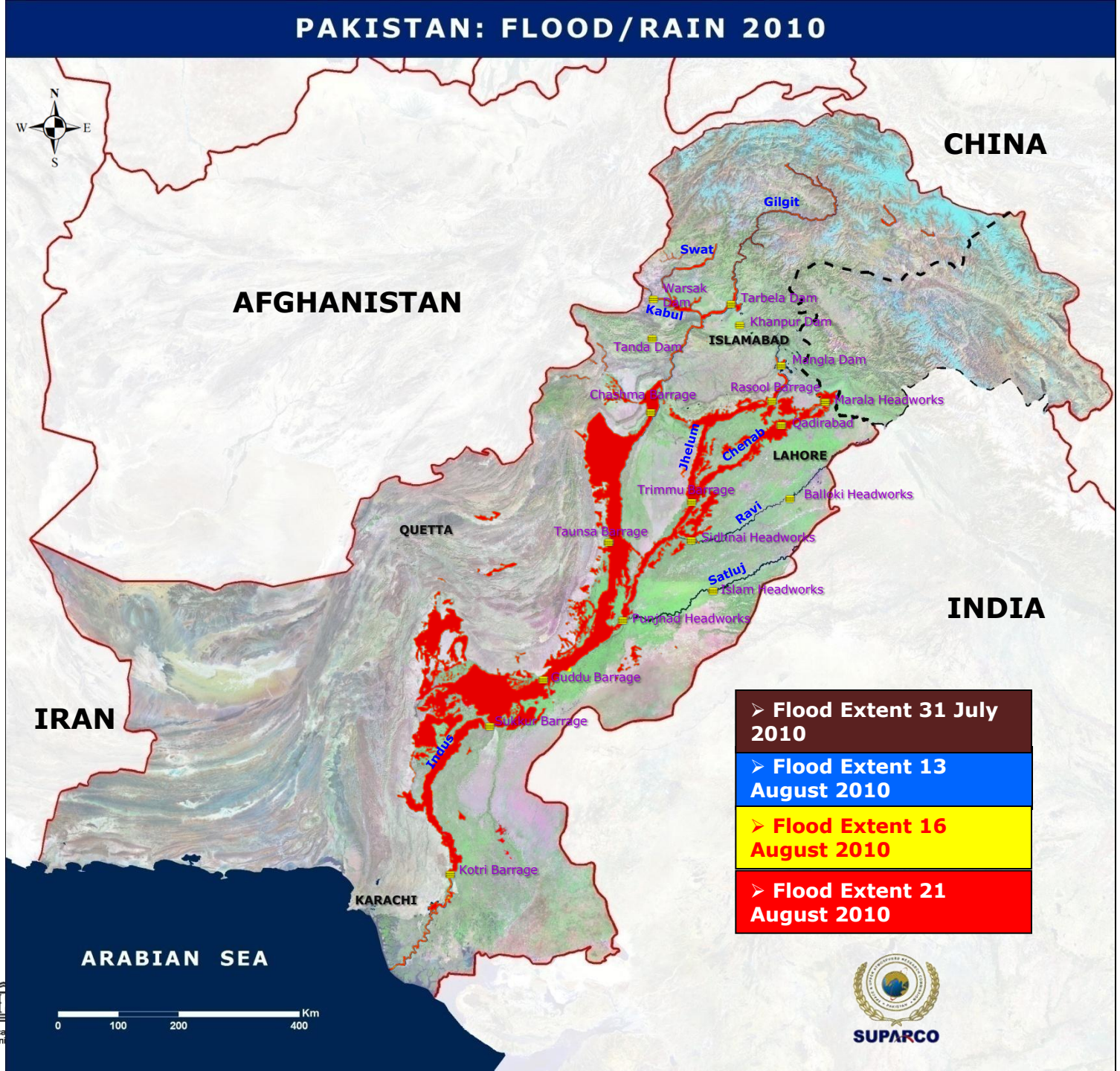
Monsoon 2010 : Extreme Rainfall - Flood



Monsoon 2010 (July)
Interaction of Westerly and Easterly Weather Systems occurred over **NW Pakistan** instead of NE Pakistan.

The DURATION of this interaction was **24 - 36 hrs**.

Source: PMD



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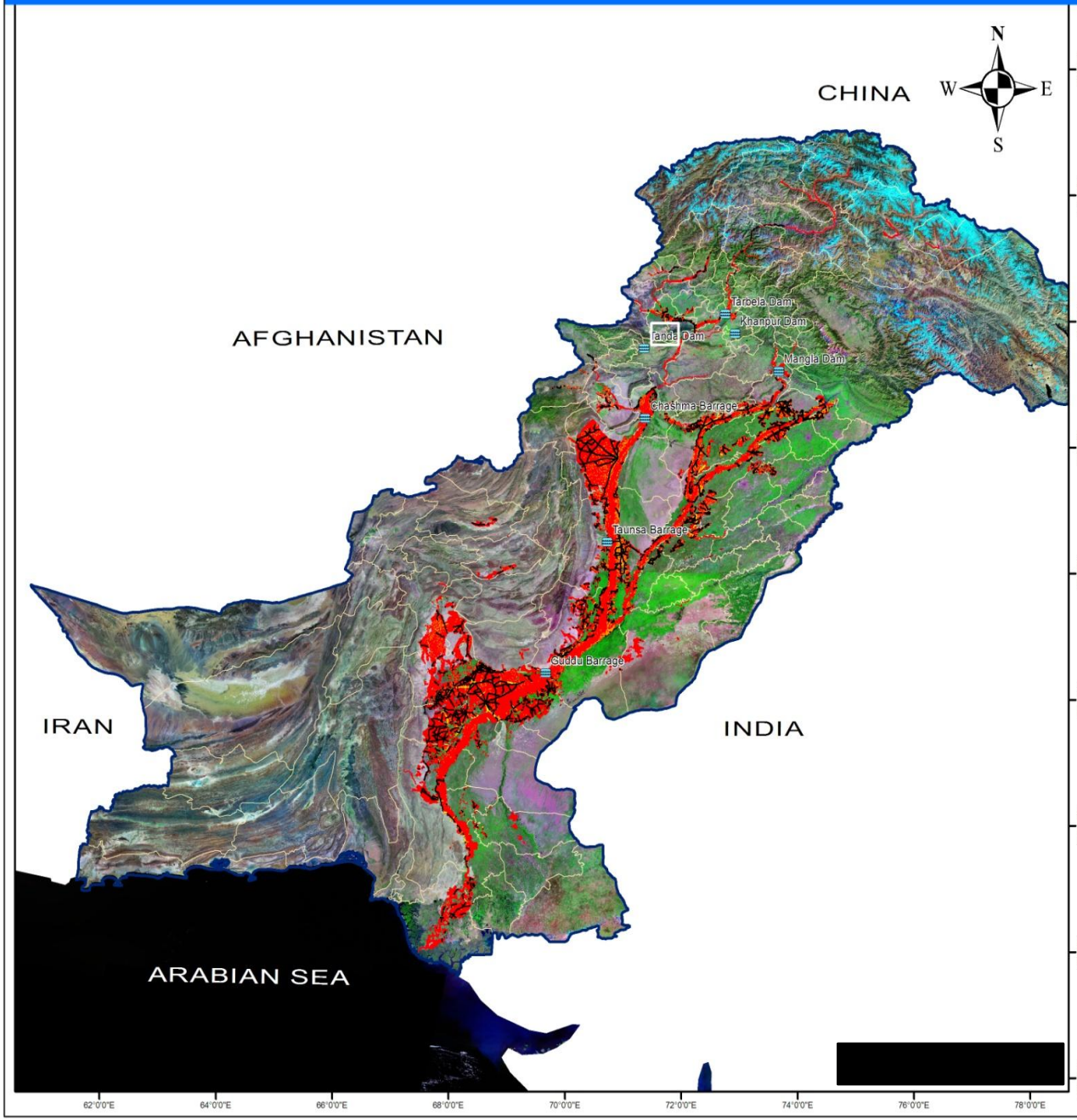
Pakistan: Flood / Rain 2010



These statistics are outcome of preliminary analysis based on rapid mapping

Dams & Barrages
Affected Road
Affected Railway Line
Affected Settlement
District Boundary
Flood Extent

Total Flooded Area:	67903 Sq Km
Affected Roads:	10522 Km
Affected Railway Line:	1630 Km
Affected Settlement:	13777
Affected Agriculture Area:	19409 Sq Km
Affected Houses:	450610

Except Gilgit Baltistan

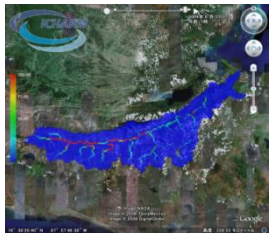
SUPARCO ICIMOD Sentinel Asia UNOSAT unitar USGS UNSPIDER JAXA afer

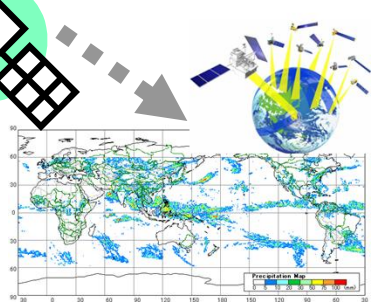
0 125 250 500 Km

Flood Forecasting anf Early Warning System

Satellite-based rainfall

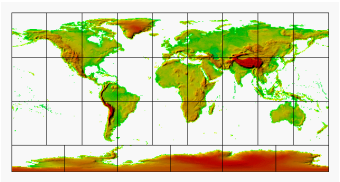
Rainfall observation by satellite



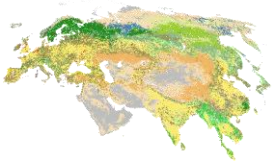


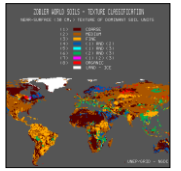
Global GIS data

Geological data for river channel creation (Elevation)



Geophysical data for parameter estimation (Land use, Soil type)





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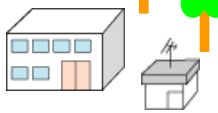
Delivered on Internet

Reducing loss of life and property

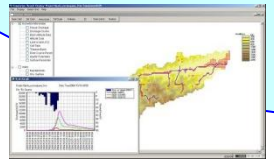


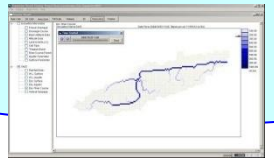
Flood forecasting warning

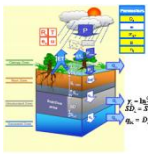
Smooth evacuation

IFAS (Integrated Flood Analysis System)

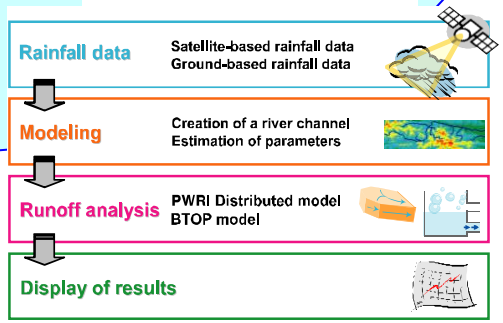
1. Utilization of not only ground-based but also satellite-based rainfall data
2. Implementation of multi runoff analysis engines
3. GIS functions to create hydrologic model from global/local data
4. Visualization of flood forecasting results
5. Free distribution







Main structure of IFAS



Application l issues

Need for hydrological and geophysical data
Local capacity in using flood forecasting system

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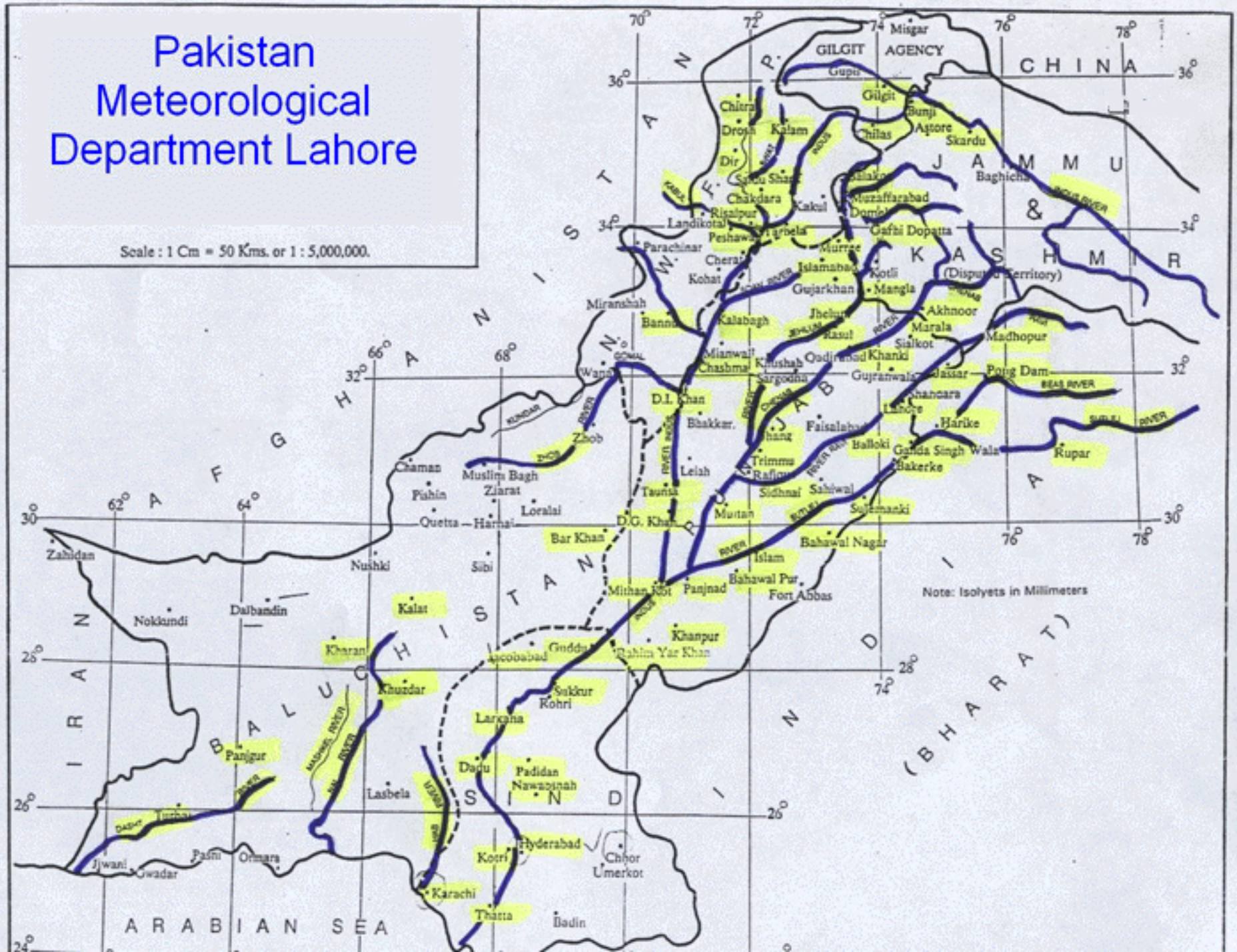
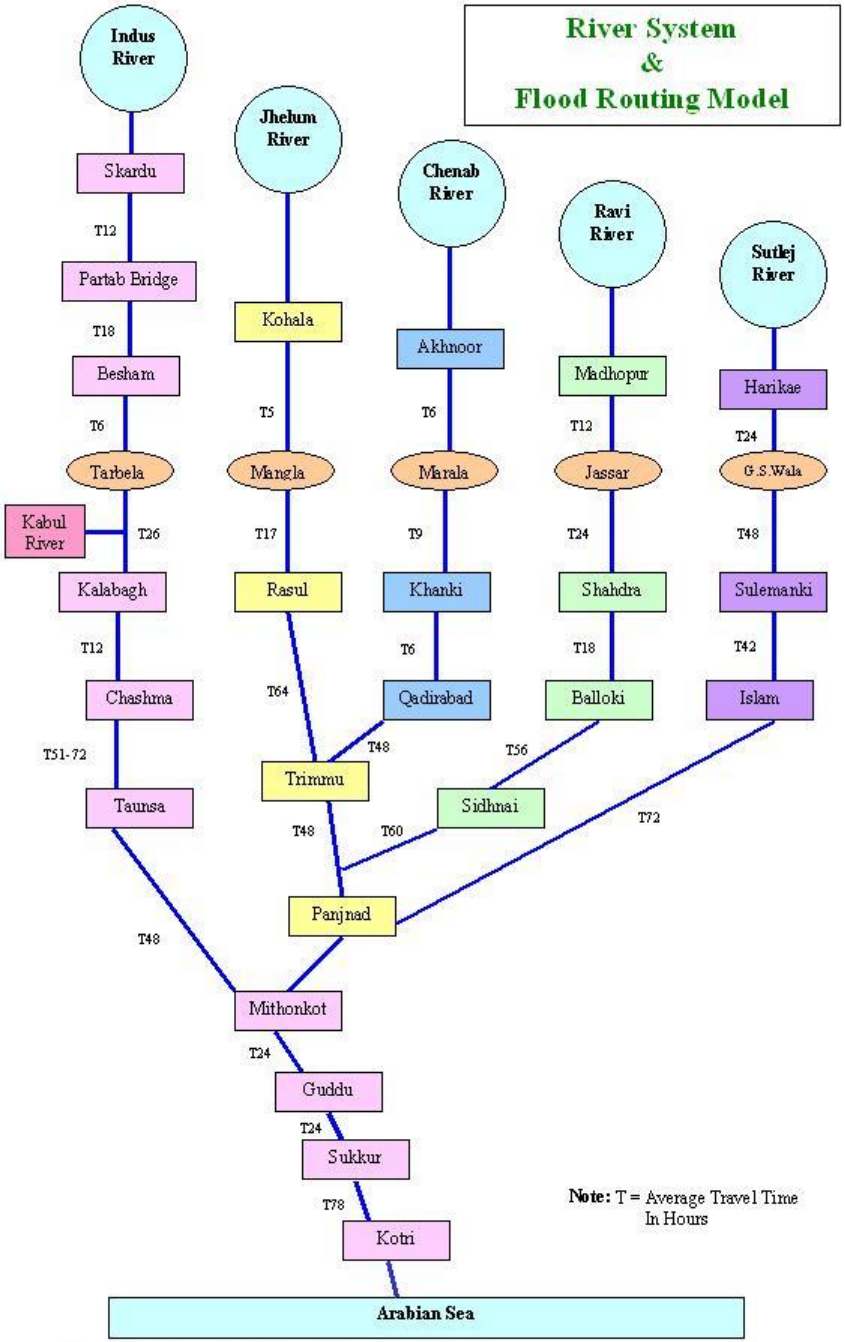
Pakistan Meteorological Department Lahore

Scale : 1 Cm = 50 Kms. or 1 : 5,000,000.





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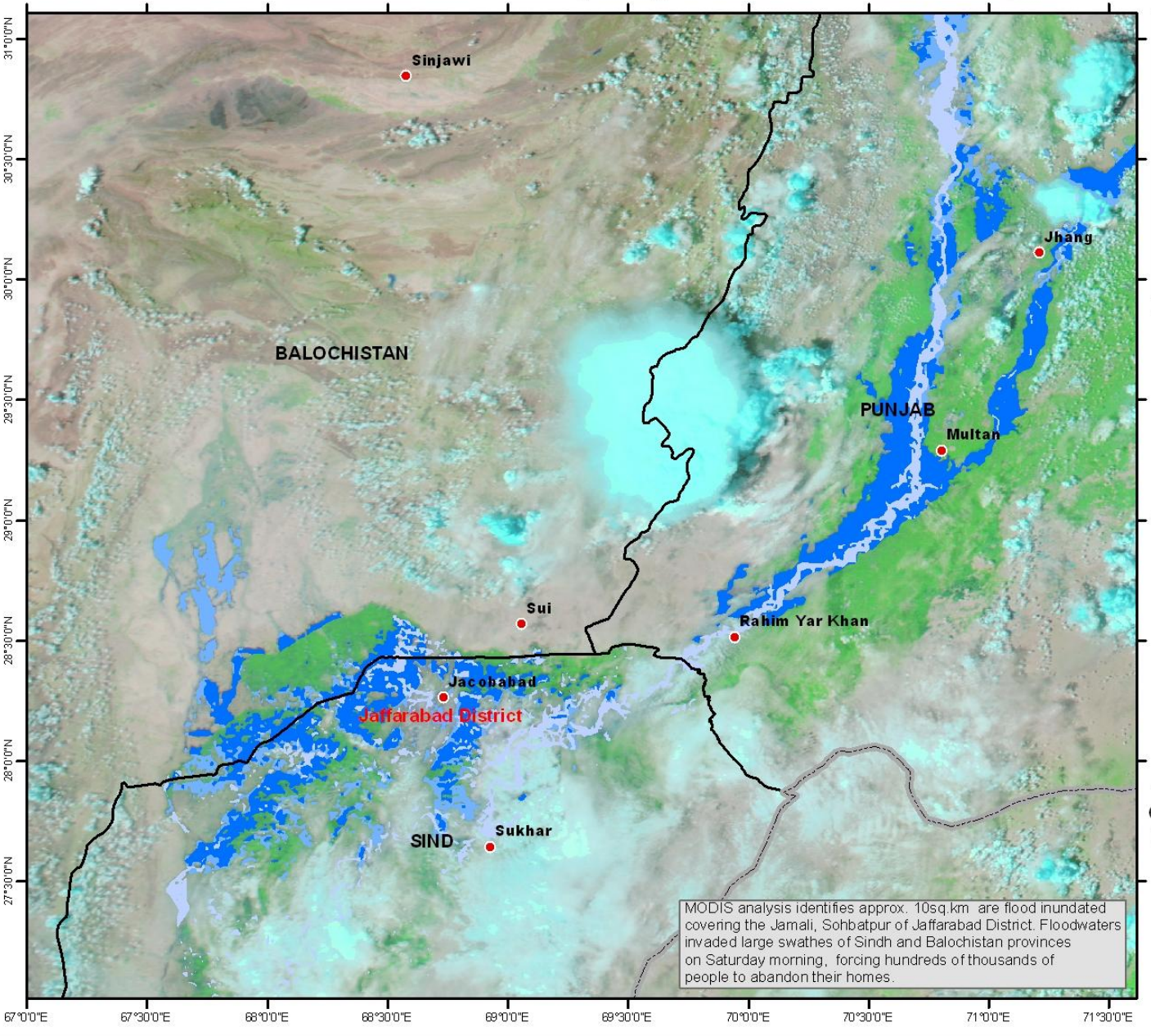
Source: Flood Forecasting Division, Pakistan Meteorological Department

Flood Inundated Areas of Balochistan, Punjab and Sindh Provinces, Pakistan (August 14,2010)



Map showing flood inundated areas of parts of Balochistan, Punjab and Sindh provinces observed on August 14, 2010 using Aqua MODIS Satellite data. Pre-flood water extent is mapped using Aqua MODIS Satellite data of September 17, 2009.

Jacobabad city seems to be under high flood compare to the previous day (Aug 13, 2010)

Legend

MODIS Flood Class

- High Flood Inundated Areas
- Moderate Flood Inundated Areas
- Pre-Flood Water Extent
- Major city
- Province Boundary
- International Boundary

0 500 1,000 2,000 Kms

Map Prepared by

ICIMOD

SERVIR - HIMALAYA

Supported by

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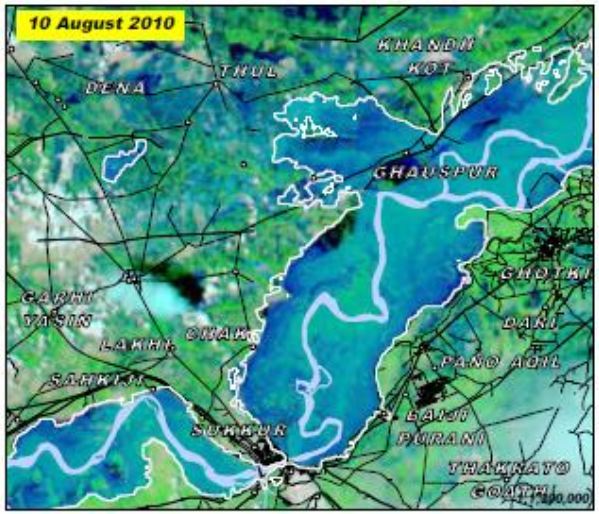
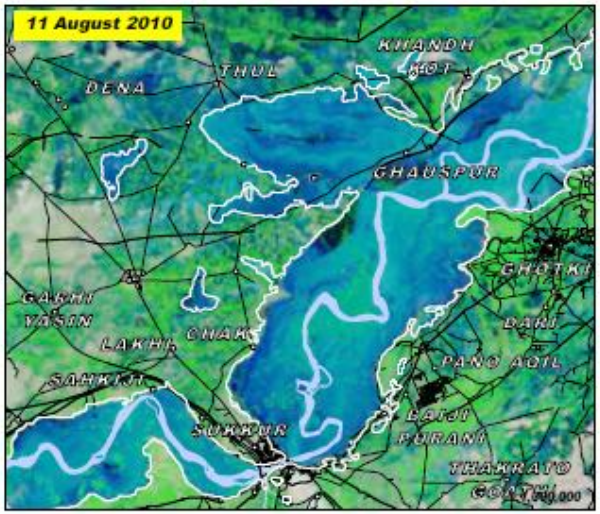
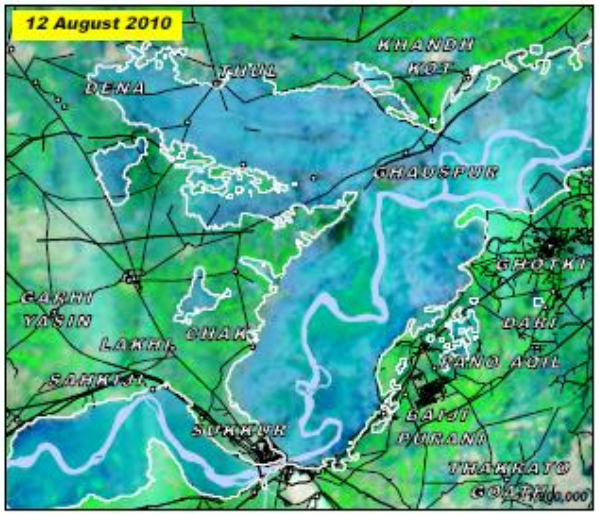
UPDATE 1: FLOOD WATERS NEAR SUKKUR BARRAGE, SINDH PROVINCE, PAKISTAN

Flood Analysis Based on Satellite Data Recorded on 8-12 August 2010

Disaster coverage by the International Charter 'Space and Major Disasters'. For more information on the Charter, which is about assisting the disaster relief organizations with multi-satellite data and information, visit www.disasterscharter.org







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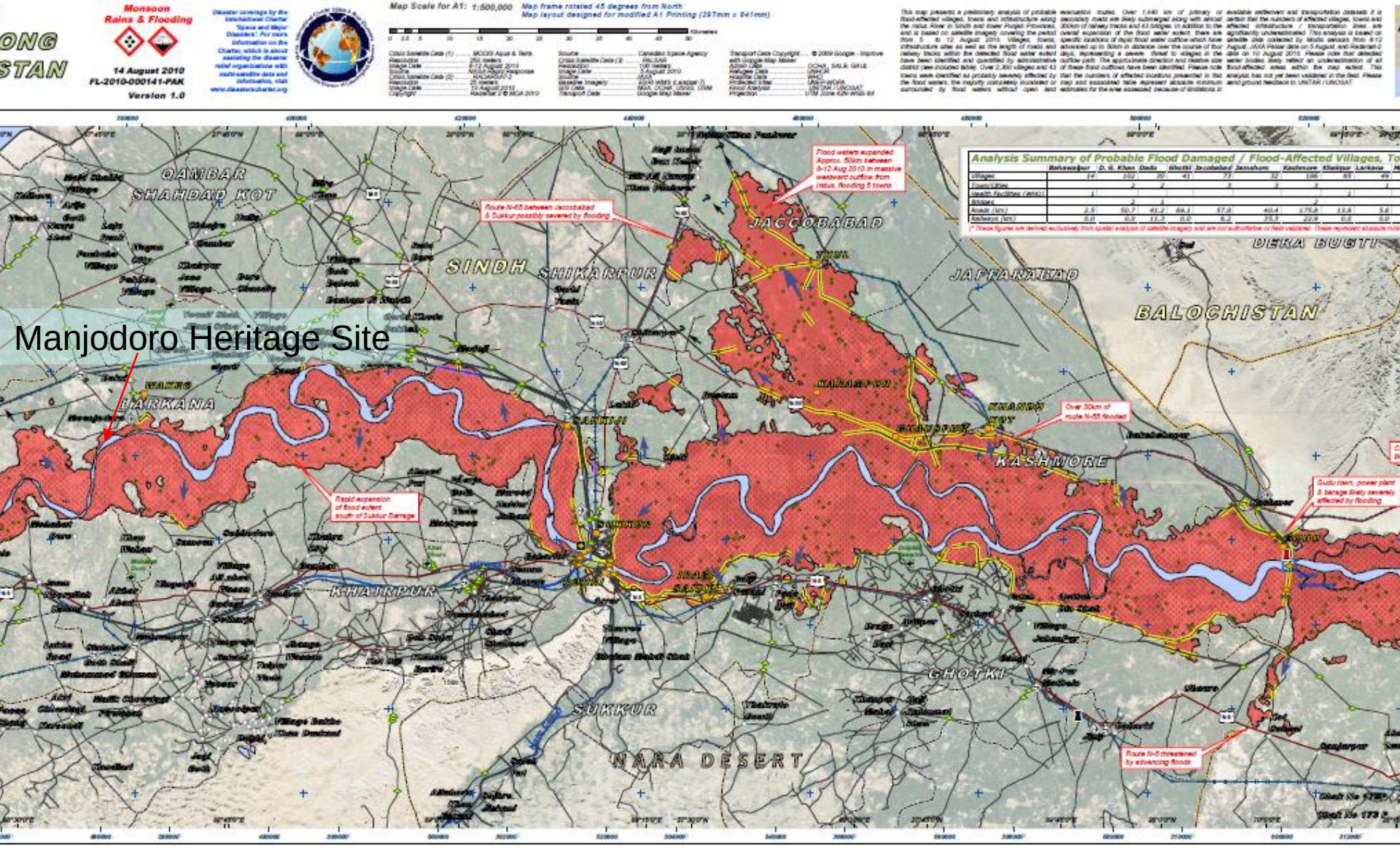
Flood Situation 14 August



UNESCO Missions to Pakistan

To define areas of cooperation with Pakistani authorities to reinforce the country's capacity in:

- integrated flood and watershed management
- groundwater resources for emergency situations
- landslides and ground instability especially for relocation of affected population.

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Time Frame

- Short term (within 1 year)
- Medium term (2 to 3 years)
- Long term (3 to 5 years)

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Integrated flood and watershed management

Short term actions

– Identify areas of improvements of hydrological models for flood forecasting – augment local capacity

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Integrated flood and watershed management

Medium to long term actions

- Real time flood inundation modeling linked with Flood Early Warning System (FEWS)
- Develop risk and hazard maps
- Enhance flash flood forecasting for pilot areas
- Mapping and modeling snow and ice cover

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Integrated flood and watershed management

Medium to long term actions

- Diagnostic analysis of causes of floods
- Evolutionary analysis of river morphology
- Urban planning for flood resilient communities
- Facilitate transboundary data sharing using WMO and UNESCO networks such as Flow Regimes from International Experimental and Network Data (FRIEND) and International Flood Initiative (IFI)
- Enhance radar coverage of the country to be able to forecast flash floods
- Use of remote sensed precipitation data for flood forecasting

Groundwater resources for emergency situations

Short term actions

- Groundwater vulnerability assessment and mapping with special regard to groundwater emergency resources in pilot areas in Mardan and Peshawar Valleys as well as in hydrogeology suitable sites in Baluchistan, Punjab (e.g. Kasur) and Sindh

Groundwater resources for emergency situations

Long term actions

- Assessment of groundwater recharge of aquifers safe to flood disasters
- Assessment of impact of floods on groundwater quality and groundwater related ecosystems
- Groundwater monitoring networks linked with Pakistan meteorological and hydrological networks
- Evaluation of high content of fluoride and arsenic in water in Peshawar area (fluoride) and Kasur District (arsenic)

Landslides and ground instability

Short term actions

- Capacity building in integrated hydrogeology modelling
- Update Policy Guidelines for dealing with geohazards triggered by land slides

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Landslides and ground instability

Long term actions

- Improve institutional linkages and knowledge
- Analyse snow avalanche mechnisms
- Launch an integrated ecogeohydrology network using UNESCO networks
- Understanding the hydro-meteorological processes of landslides

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Education and Capacity Building

Short term actions

Specialized training for politicians, policy makers and higher level managers in hydrological and related geohazard risk management to deal with uncertainty

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Education and Capacity Building

Medium to long term actions

- Specialized education and training of flood forecasting specialists at the tertiary level
- Training of middle level technician and managers of water departments – update curricula of existing institutes in Pakistan
- Review and strengthen community and school education in managing geohazards

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Education and Capacity Building

Medium to long term actions

- Map capacity of existing institutes in water education
- Revitalize the UNESCO Centre of Excellence in water management considering hydrological extremes and related geohazards in Pakistan

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Management Options

- More storage dams are a must to manage floods from Kabul River
- Proactive scenario modelling on 6 hour basis is a must to decide on controlled flooding and downstream flooding in the Sindh province
- Introduce hydrograph delays using the link canals between Chenab, Ravi and Sutlej. This extra water can be use for artificial aquifer recharge through controlled flooding