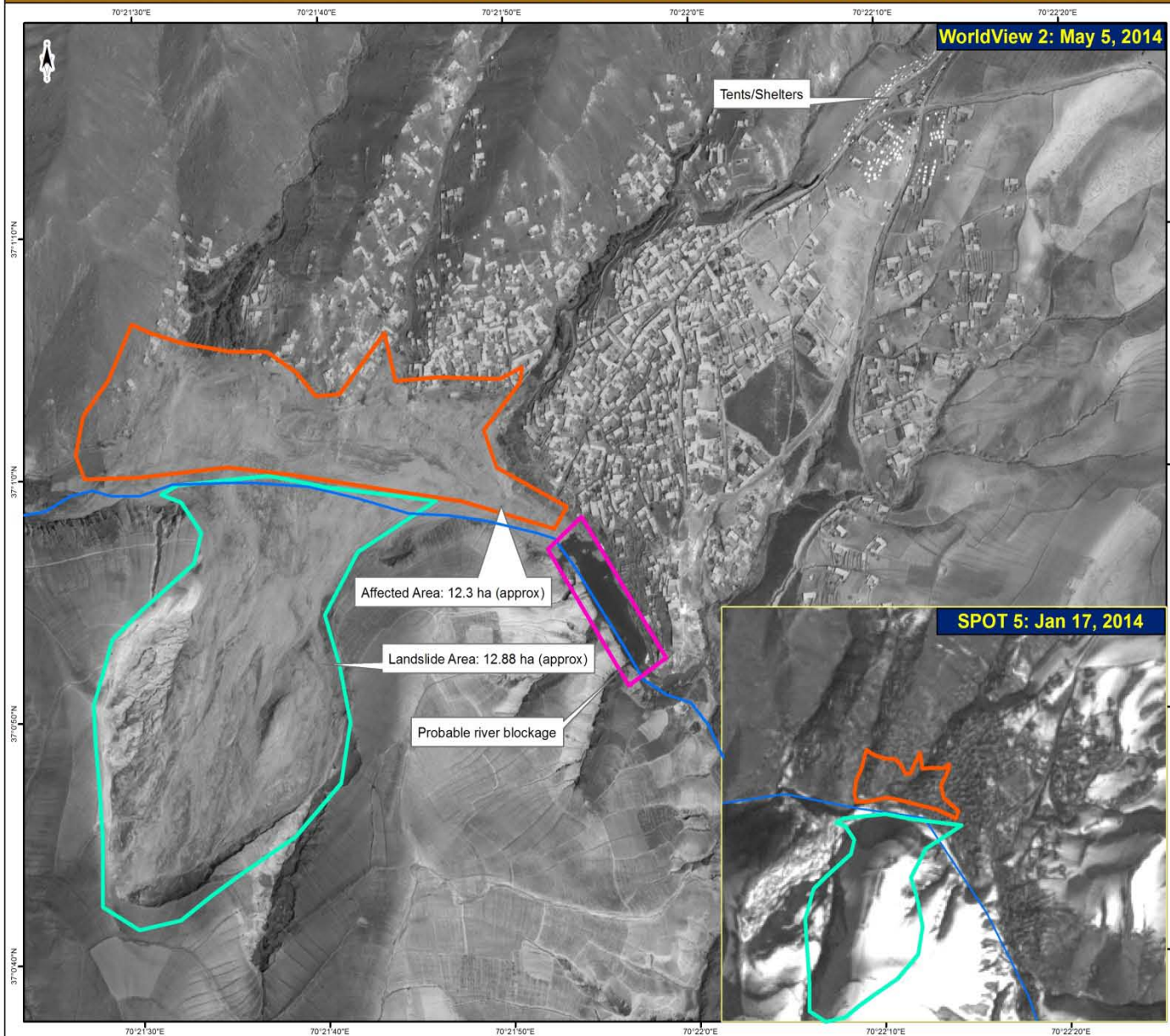# Proposal for Establishment
of
WG on Earthquake& Landslides

Background

At the forum of JPTM 2013, Representative of SUPARCO, PAKISATN emphasized for establishment of new Working Group (WG) on Earthquake & Landslides.

➢ **In the Recommendations,** the Secretariat tasked SUPARCO to propose recommendations for effective utilization of space based information for Earthquake & Landslide utilizing existing capacities within the Sentinel Asia network.

AFGHANISTAN LANDSLIDE
AB BAREK, PROVINCE BADAKHSHAN - MAY 02, 2014

WorldView 2: May 5, 2014

Tents/Shelters

Affected Area: 12.3 ha (approx)

Landslide Area: 12.88 ha (approx)

Probable river blockage

SPOT 5: Jan 17, 2014

Badakhshan

Uzbekistan · Tajikistan · Kyrgyzstan · China

Turkmenistan

Iran

Afghanistan

Disputed Territory

Pakistan

India

Source: FOCUS-Afghanistan

Legend

— River
- - - International Boundary
⌁ Affected Area
⌁ Landslide

A massive landslide occurred on May 02, 2014 at Ab Barek town in Badakhshan Province (northeastern Afghanistan). A section of mountain collapsed following torrential rains. Cyan polygon shows the landmass which has moved towards the north-east. Over 2000 people are missing, leaving many homeless. About 300 homes are buried. Tents/shelters along roadside could be seen in the upper right corner. The landslide has also choked the river, which might result in a landslide-induced dam, posing threat to the settlements downstream. SPOT 5 (5m pan of Jan 17, 2014) and WV2 (0.5m pan) image of May 05, 2014 (courtesy USGS) is used in this analysis. This map has been produced on May 07, 2014.
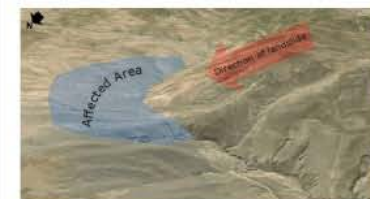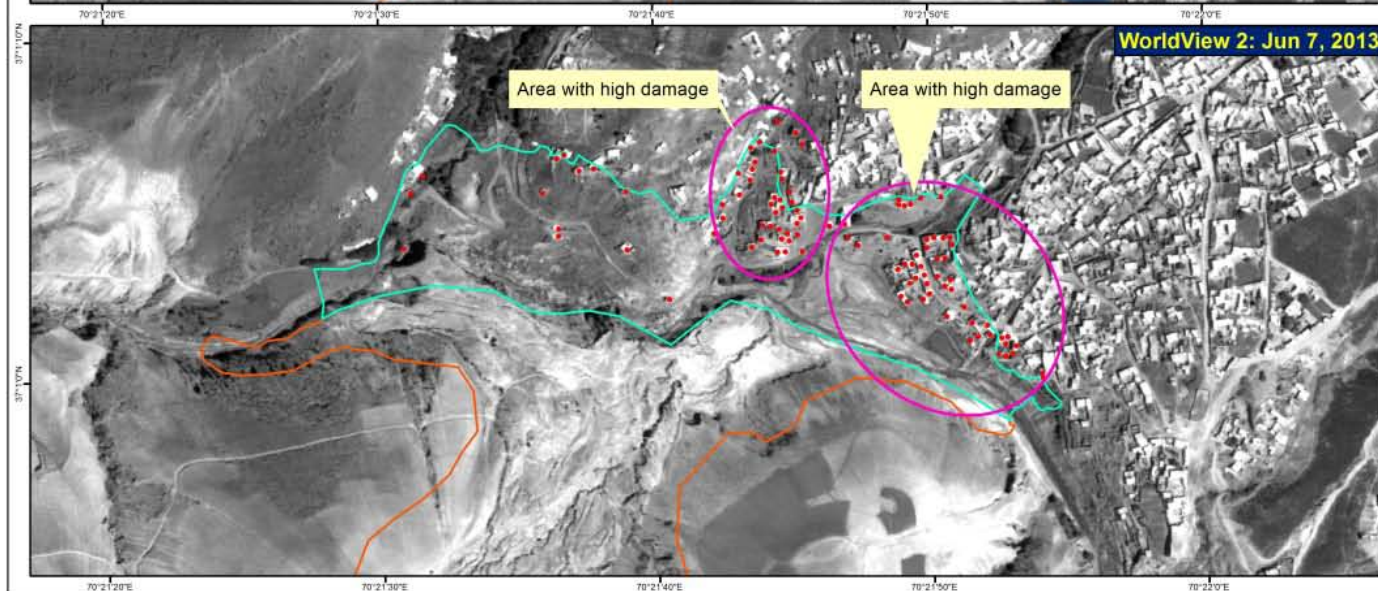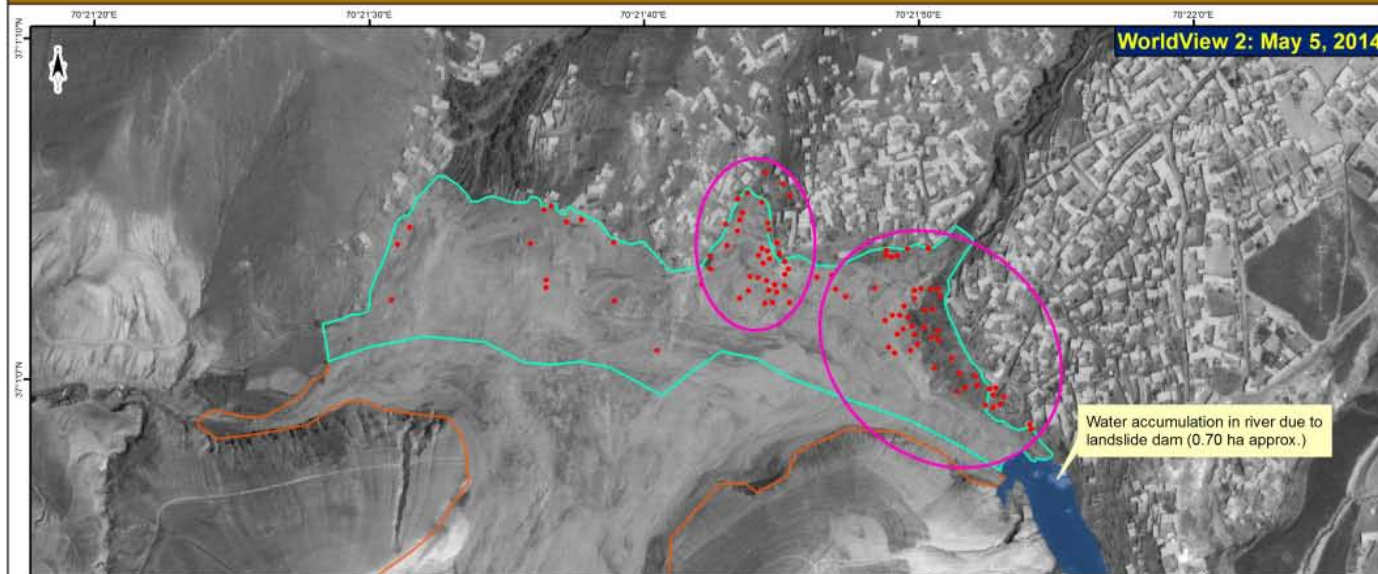
SUPARCO is host to the UN-SPIDER Regional Support Office (RSO) in Pakistan

Projection: UTM Zone 42 N
Datum: WGS 84

1:5,000

0 50 100 200 300

Meters

NDMA · SUPARCO · FAO · USGS science for a changing world

AFGHANISTAN LANDSLIDE
AB BAREK, PROVINCE BADAKHSHAN - MAY 02, 2014

WorldView 2: May 5, 2014

Water accumulation in river due to landslide dam (0.70 ha approx.)

WorldView 2: Jun 7, 2013

Area with high damage

Area with high damage

Badakhshan

Legend

● Damaged Structures (103)

🔵 River Blockage

〰 Mud mass

〰 Buried area (7.37 ha approx.)

- - - International Boundary

This map shows the areas affected by the landslide which occured on May 2, 2014. Statistics are based only on the comparative analysis of WorldView 2 images of June 7, 2013 and May 5, 2014 (courtesy USGS). Affected area of settlements has been delineated using visual interpretation. The damaged structures include both completely and partially damaged housing. Partially damaged structures are observed towards the edges of the buried area. The landslide has also blocked the river, which might result in a landslide-induced dam, posing a threat to the settlements downstream. This, however, depends on the local rainfall in the days to come. This map has been produced on May 08, 2014.

SUPARCO is host to the UN-SPIDER Regional Support Office (RSO) in Pakistan
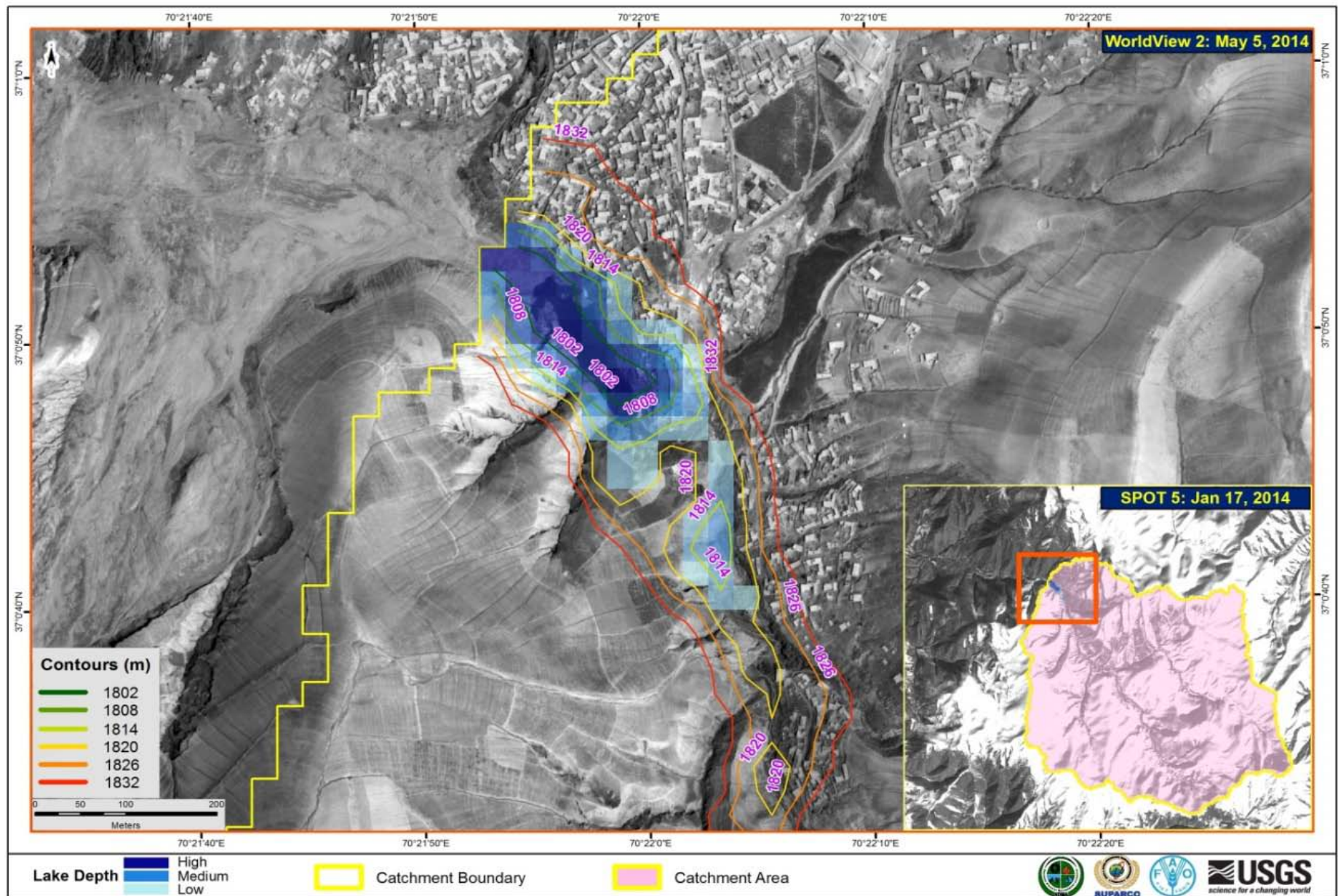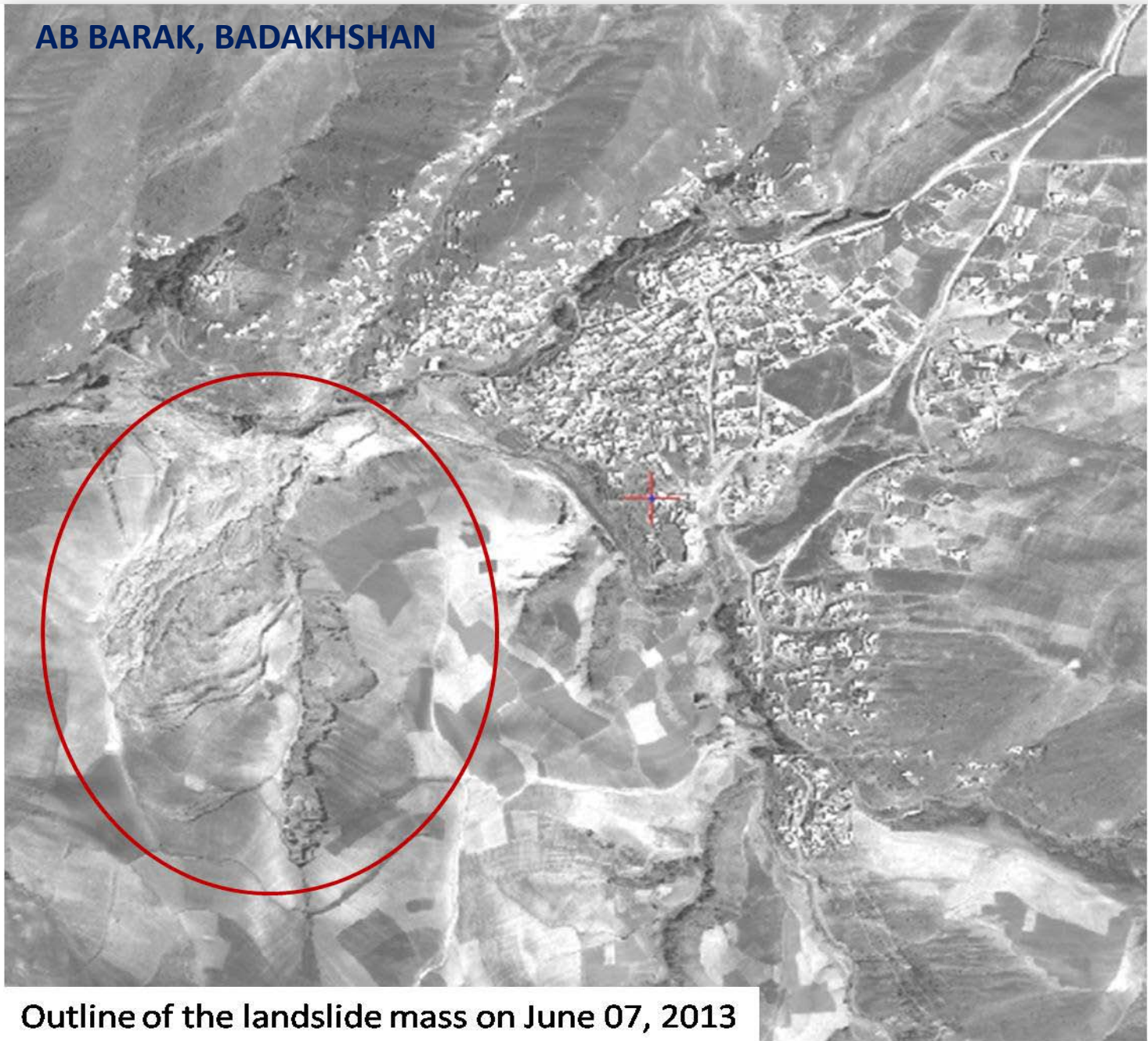
Projection: UTM Zone 42 N
Datum: WGS 84

1:4,000

0   50   100   200   300
Meters

SUPARCO

USGS
science for a changing world
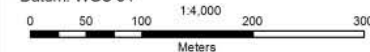
Figure 2 Preliminary Landslide Risk Assessment
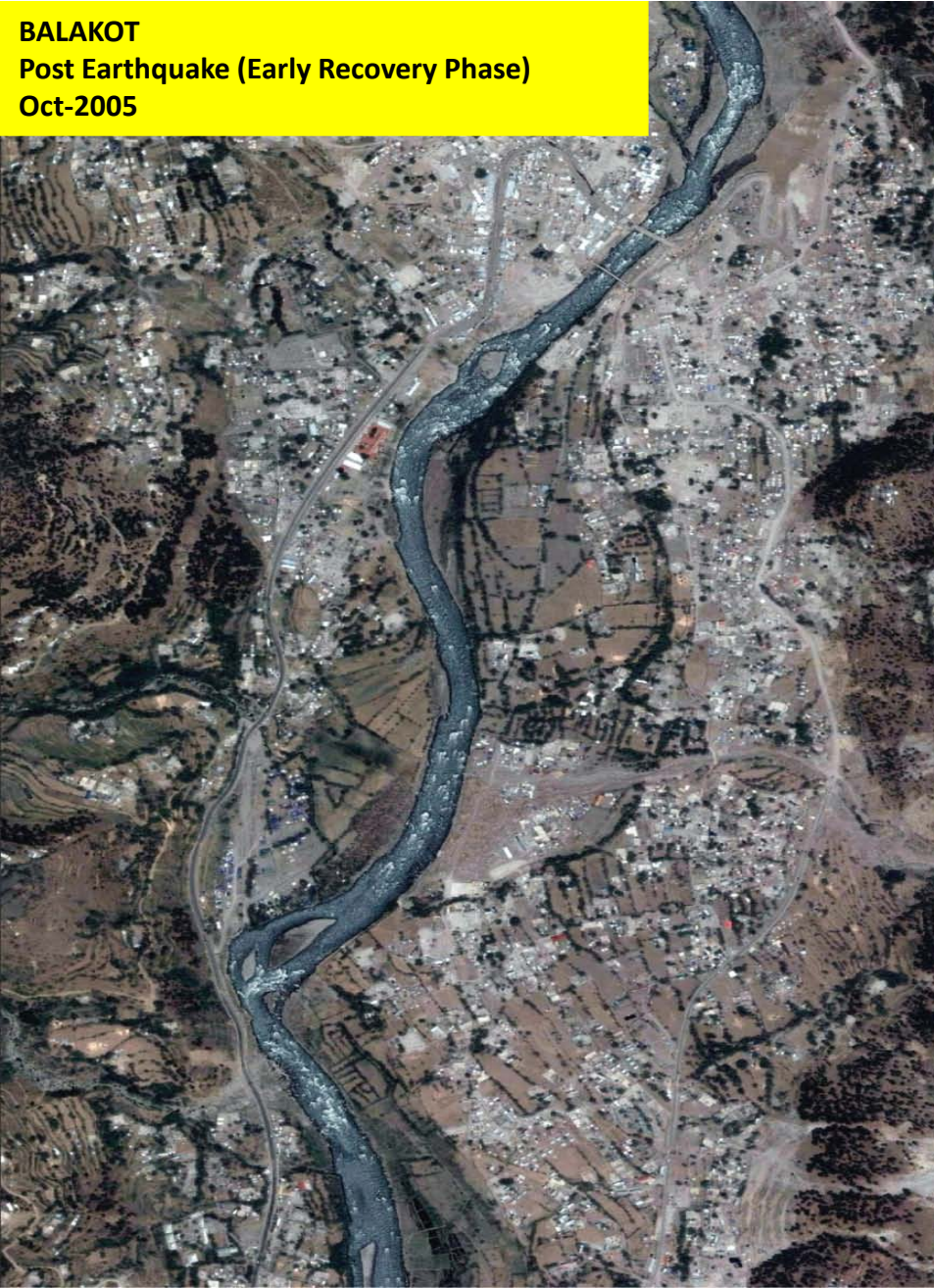
AB BARAK, BADAKHSHAN

Outline of the landslide mass on June 07, 2013

Reconstruction & Rehabilitation Monitoring

BALAKOT
Post Earthquake (Early Recovery Phase)
Oct-2005

BALAKOT
Post Earthquake (Reconstruction Phase)
April-2010

NATURAL DISASTERS
HUNZA LANDSLIDE

ATABAD

Hunza River
Right Bank

Landslide

NATURAL DISASTERS

HUNZA LANDSLIDE

Landslide Smoke

Natural Disasters

Hunza Landslide

Left Bank
River Hunza

Karakoram
Highway

Accumulated water at
Up stream of Hunza River

Image of 2 February

Water accumulation between 12 January and 2 February

Image of 12 January

Hunza **LANDSLIDE**

Natural Disasters

HUNZA LANDSLIDE – WATER ACCUMULATION

WG Context

Earthquake is a potentially damaging phenomenon (hazard), which itself is not considered a disaster when it occurs in an inhabited area. It is called disaster when it occurs in populated area, and brings damage; its impact is rapid and instantaneous. Earthquake result in the largest amount of the disaster losses, which is about 35% of total losses of the world due to disasters. (Munich Re., 1999)

The area affected by earthquakes are generally large, but are restricted to well known regions (plate boundaries). The following factor play an important role in earthquake disaster: distant from active fault, geological structure, soil types, depth of focus, topography, and construction type of buildings. In some cases, secondary hazards from earthquakes also complicate the situation

Flooding/Tsunami
Landslides in mountainous areas
Fire eg. from gas main rupture

WG Context

The most important data for seismic hazard zonation is driven from seismic networks. In the phase of disaster prevention Satellite Remote Sensing can play a role in mapping of lineaments and faults, the study of tectonic setting of an area, and neo-tectonic studies. Visible and infra-red imagery with spatial resolutions of 5-20 meters is generally used.

Satellite Laser Ranging (SLR) and Very Long Base Baseline Interferometry (VLBI) have been used for the monitoring of crust movement near active faults. In the measurement of fault displacements, Global Navigation Satellite Systems (GNSS) can play an effective role. SAR infeterometry (InSAR) is very important remote sensing which can use for mapping of earthquake deformation fields (Massonet et al., 1994, 1996). It allows for a better understanding of fault mechanism and strain. The method can reveal the behavior of the landslide that could not be observed with discrete GPS measurements.
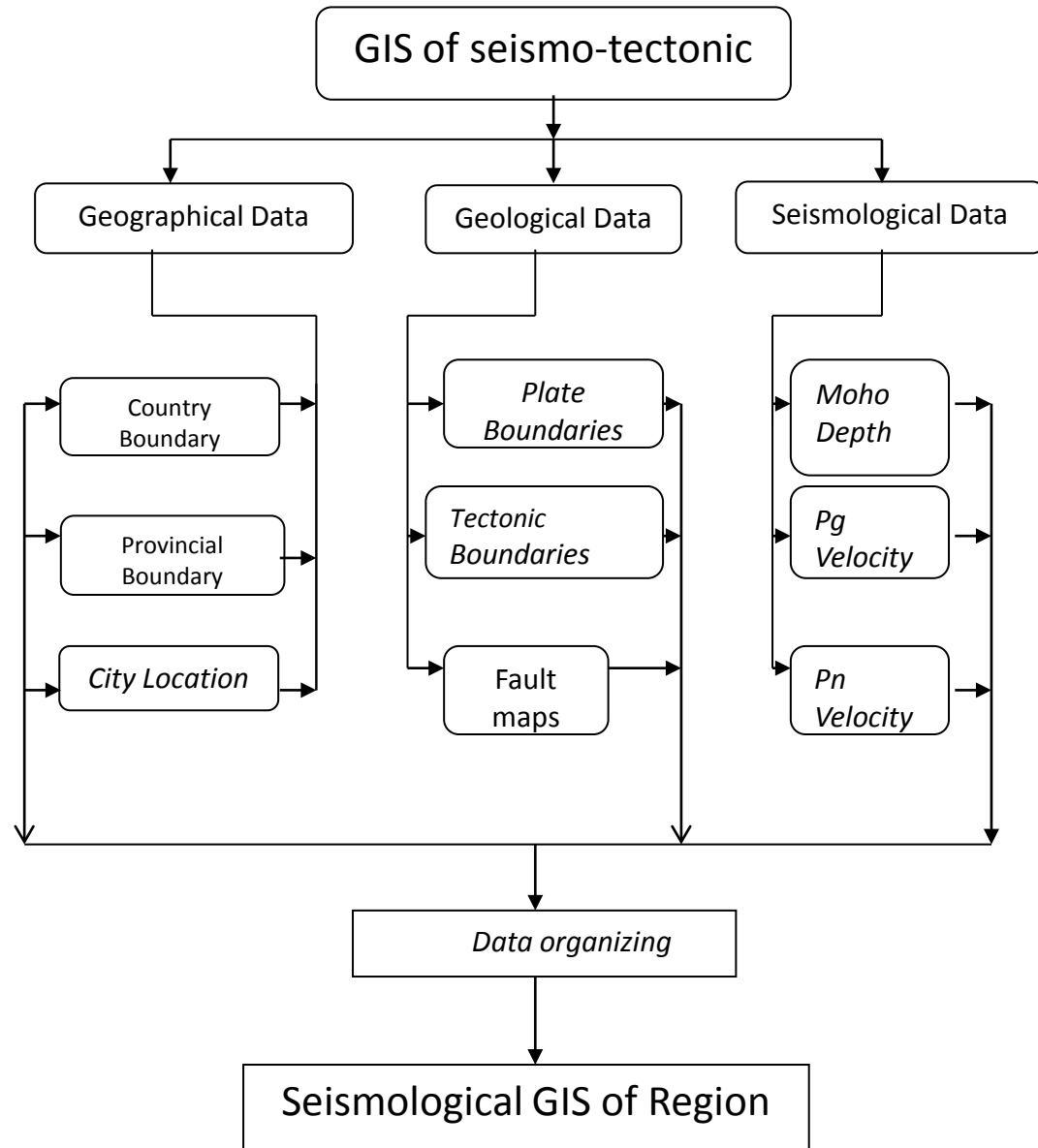
WG Context

There are no generally accepted operational methods for predicting earthquakes. Although there is some mentioning of observable precursors for earthquake in literature, such as variations in electric field or thermal anomalies.

However, in the early recovery and rescue/relief phase, Satellite Remote Sensing & GIS can be effectively utilized for rapid damage assessment and for effective monitoring during reconstruction & rehabilitation phase.

WG Context

- Develop an understanding of basic earthquake processes from the source, via path, to the site
- Study seismic principles such as waves and other concepts in terms of Hazard
- Know about ground motion, site effects
- Know seismic hazard integration in to loss models
- Know about probabilistic and deterministic models
- Apply hazard assessment to a real situation

GIS of seismo-tectonic

Geographical Data | Geological Data | Seismological Data

Country Boundary

Provincial Boundary

City Location

Plate Boundaries

Tectonic Boundaries

Fault maps

Moho Depth

Pg Velocity

Pn Velocity

Data organizing

Seismological GIS of Region

Interferometry Analysis

Radar Interferometry

- Interferometry is the method of using two SAR images, taken with a time delay and/or cross-track parallax, to infer height or motion information of the Earth's surface.

- With a selected time delay and zero parallax, pure motion is measured.

- With zero time delay and a selected cross-track parallax, pure height is measured.

- Between most satellite image pairs, both time delay and parallax exist; therefore motion and height information must be separated.

- With airborne SAR, the time delay or the parallax between images is nearly zero, so near-ideal height or motion measurements can be achieved.
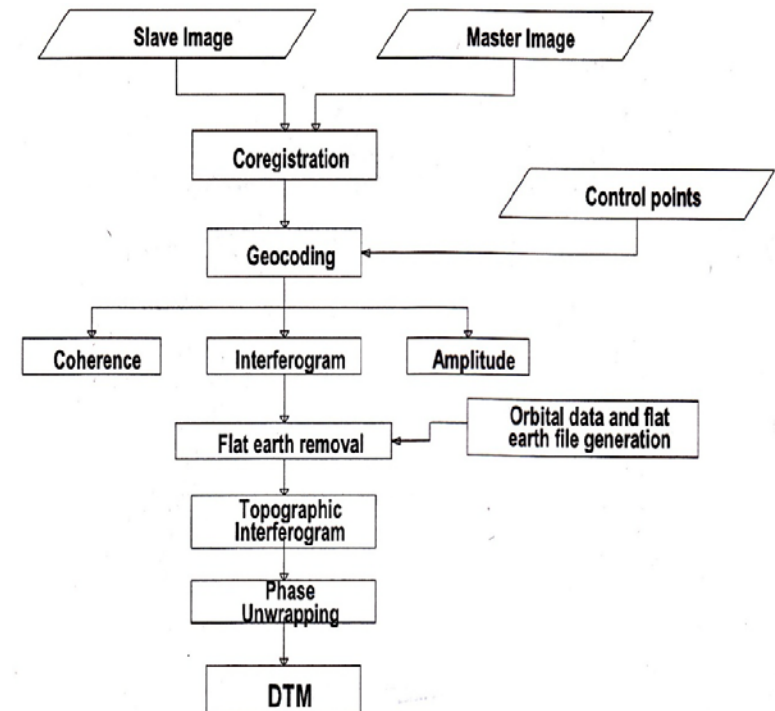
Priority Actions

1. Establishment of Technical Working Group (TWG)

2. Sharing of Recommend practises of Space Based utilization on Sentinel Asia platform

3. Rapid Analysis Support Services during natural disasters through DAN

These priority actions would help facilitate in;

- Characterisation of EQ/Landslide hazards, vulnerability and risk in the member states

- Understanding decision making in complex and changing risk context

- Reducing risk and losses through knowledge-based actions

Technical Working Group

To this end the member states may, as a first step, formulate Core Technical Working Group devoted to the development of a regional risk picture on "sharing of existing information of Earthquake/Landslide risk assessments in member countries". The development of the regional risk picture should be followed by relevant activities devoted to the other topics that need to be addressed in order to develop a regional capacity in this disaster domain

This Working Group would provide strategic guidance to ensure the consistency in methodologies employed for EQ/Landslide hazard risk assessments, support in identification of data sources and uniformity in data formats, guidance on incorporating existing studies. Two expert Groups are proposed

➢ Geophysical/Geological Hazards
   (Earthquake, Mass movement, volcanic activity)

➢ Hydrological Hazards
   (Floods, Avalanches, Landslides)

Recommendations

The WG on EQ and Landslide may be formulated to;

• Explore capacity building opportunities on the use of Optical as well as SAR Data for EQ /landslide Hazard Risk Assessment

• Identify available Data sources, softwares, research material for Mapping of elements at risk (Vulnerable areas) in member states

• Establish Linkages with other counterpart organizations/ academic Institutes to keep abreast with latest research

Conclusion

- **Geo information**-A powerful spatial approach to aid Disaster Management

- Pakistan would be pleased to share its knowledge and experience with member countries