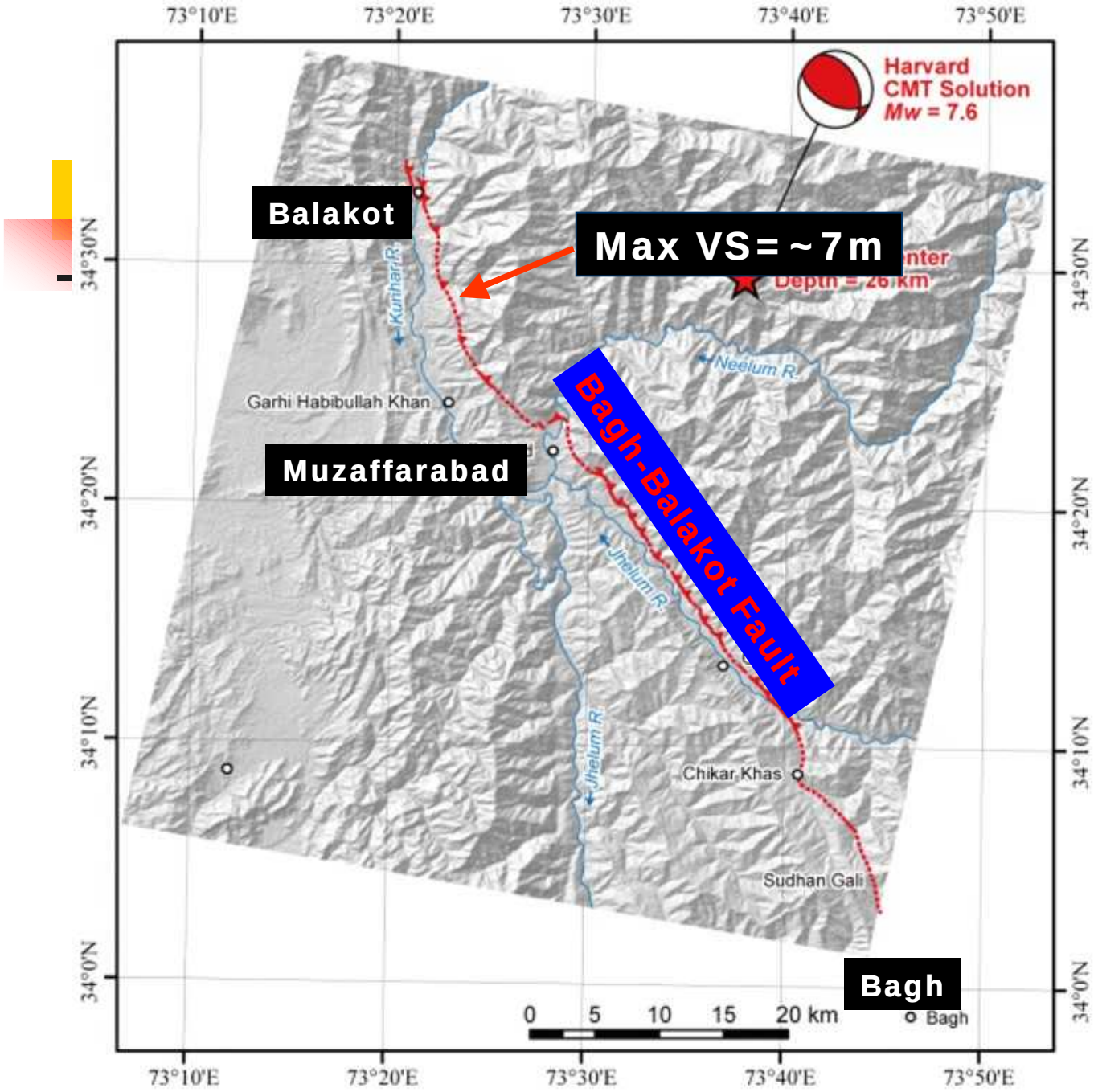
パキスタンにおける防災知識の伝承と普及活動報告

小長井一男



The UNITED STATES GEOLOGICAL SURVEY (USGS) reported its epicentre at 34°29′35″N, 73°37′44″E, about 19 km (11.8 miles) northeast of Muzaffarabad

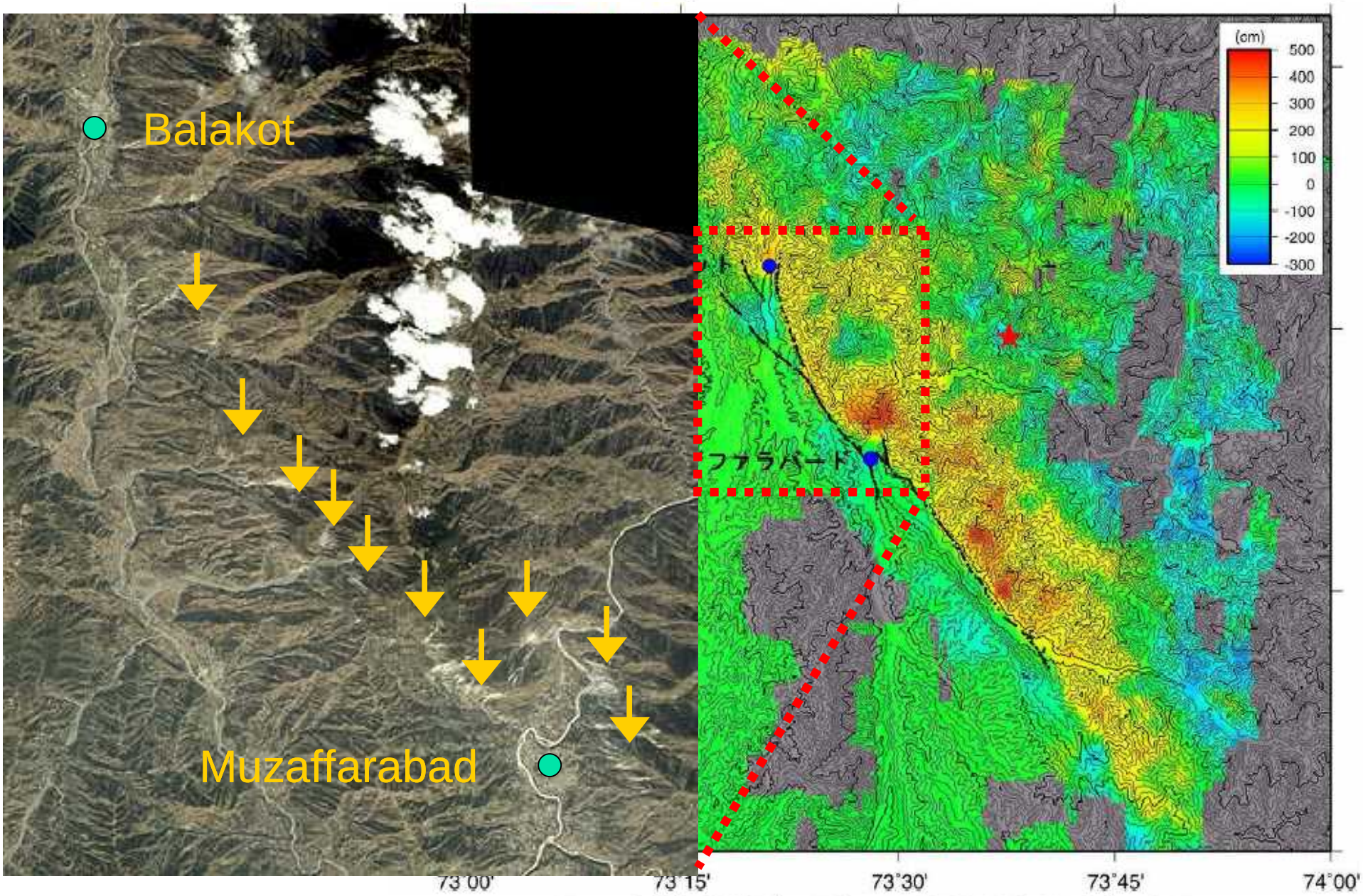


図５　地殻変動と標高、既知の活断層位置を重ね合わせた図

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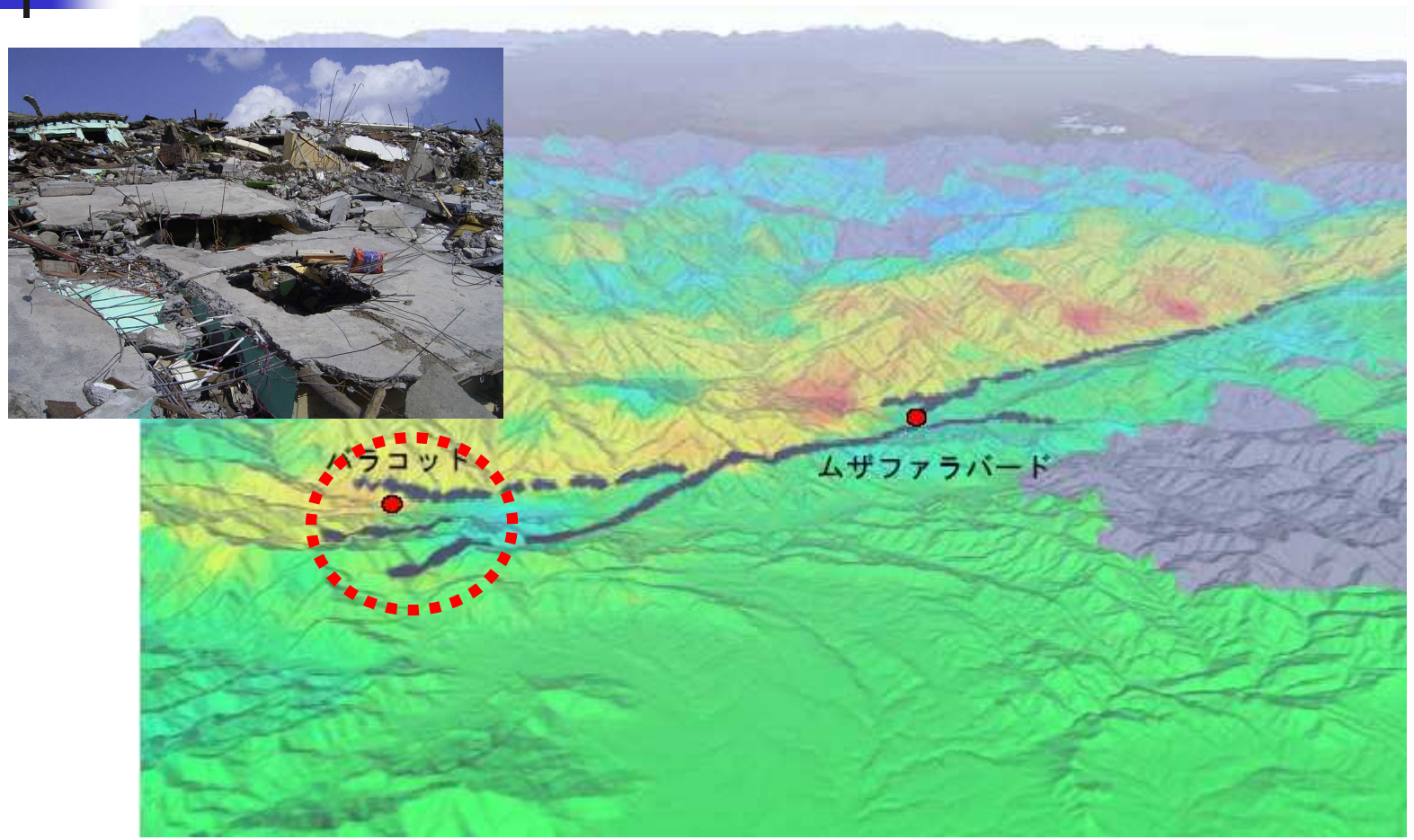
Bird’s eye view of the affected area



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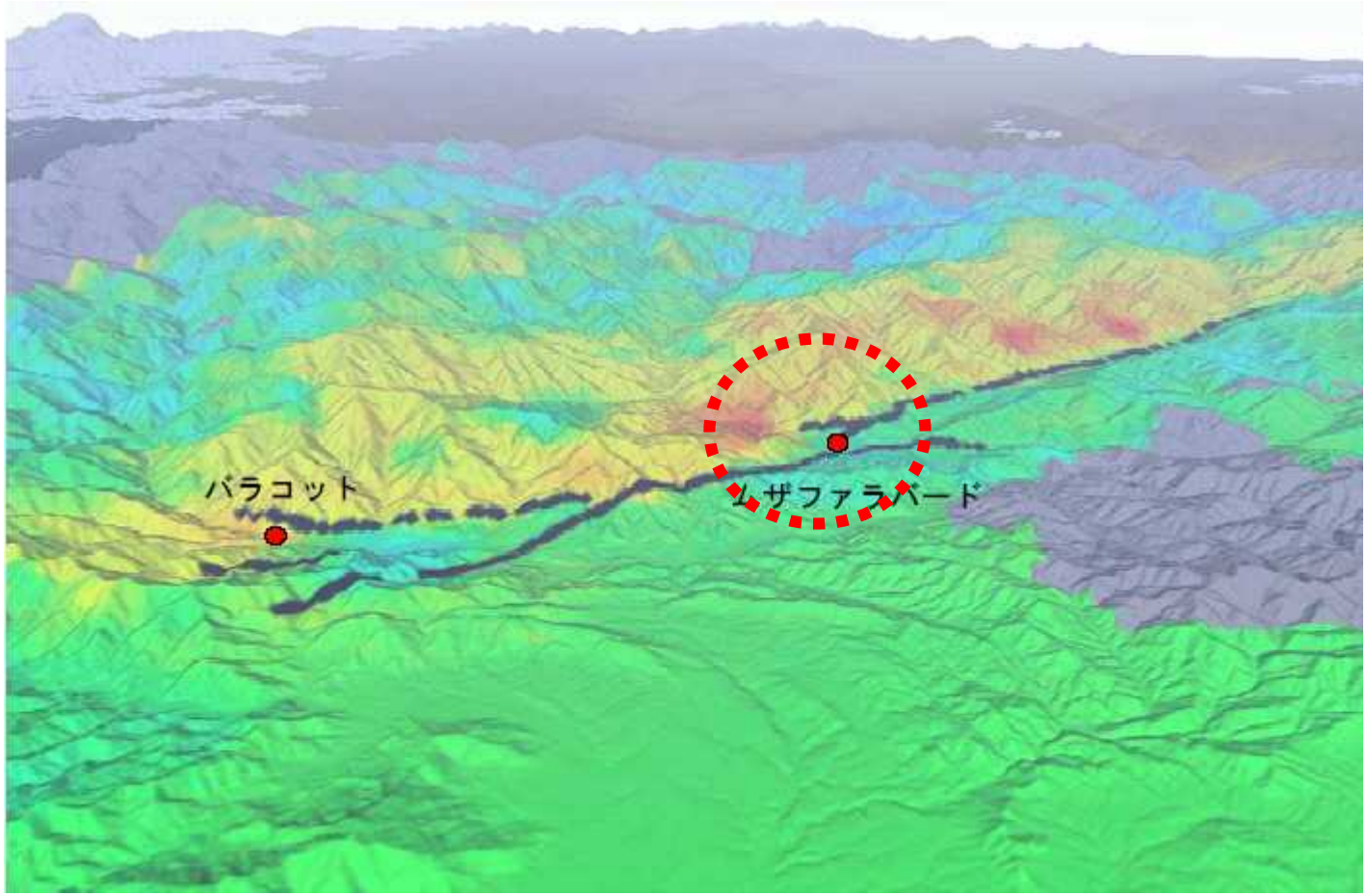
Geomorphology can tell where an active fault is!

Photo by Aamir Rashid

Bird’s eye view of the affected area



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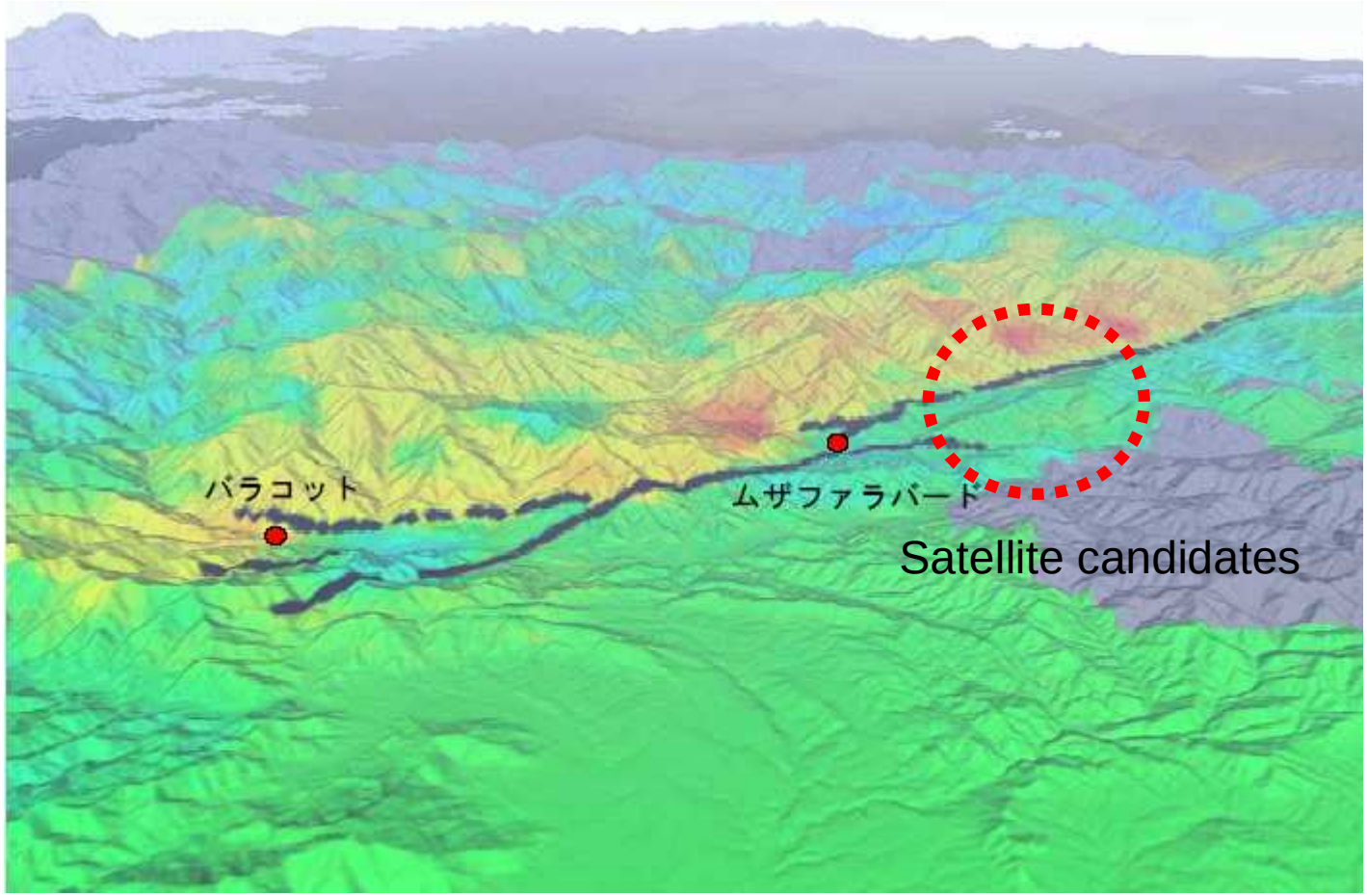
Debris sources behind the city

Even in Muzaffarabad

Bird’s eye view of the affected area



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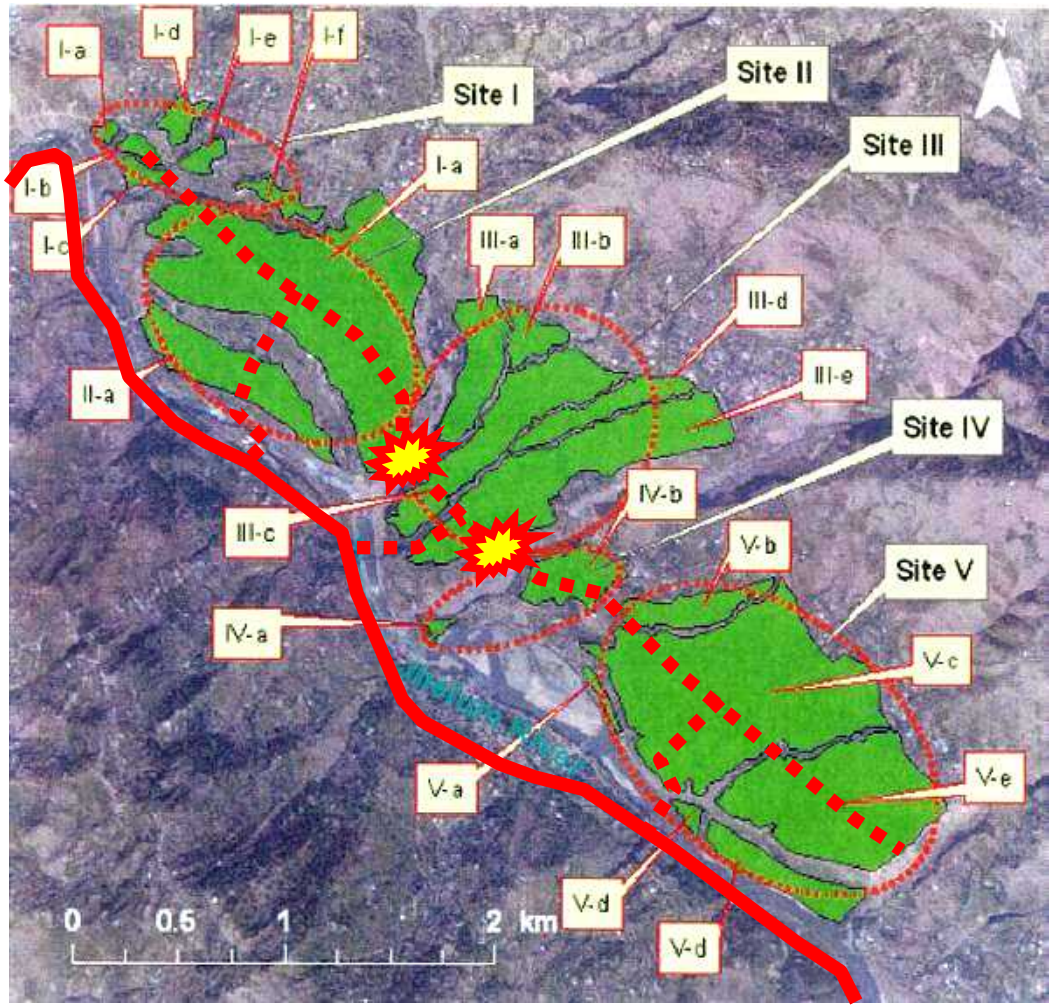
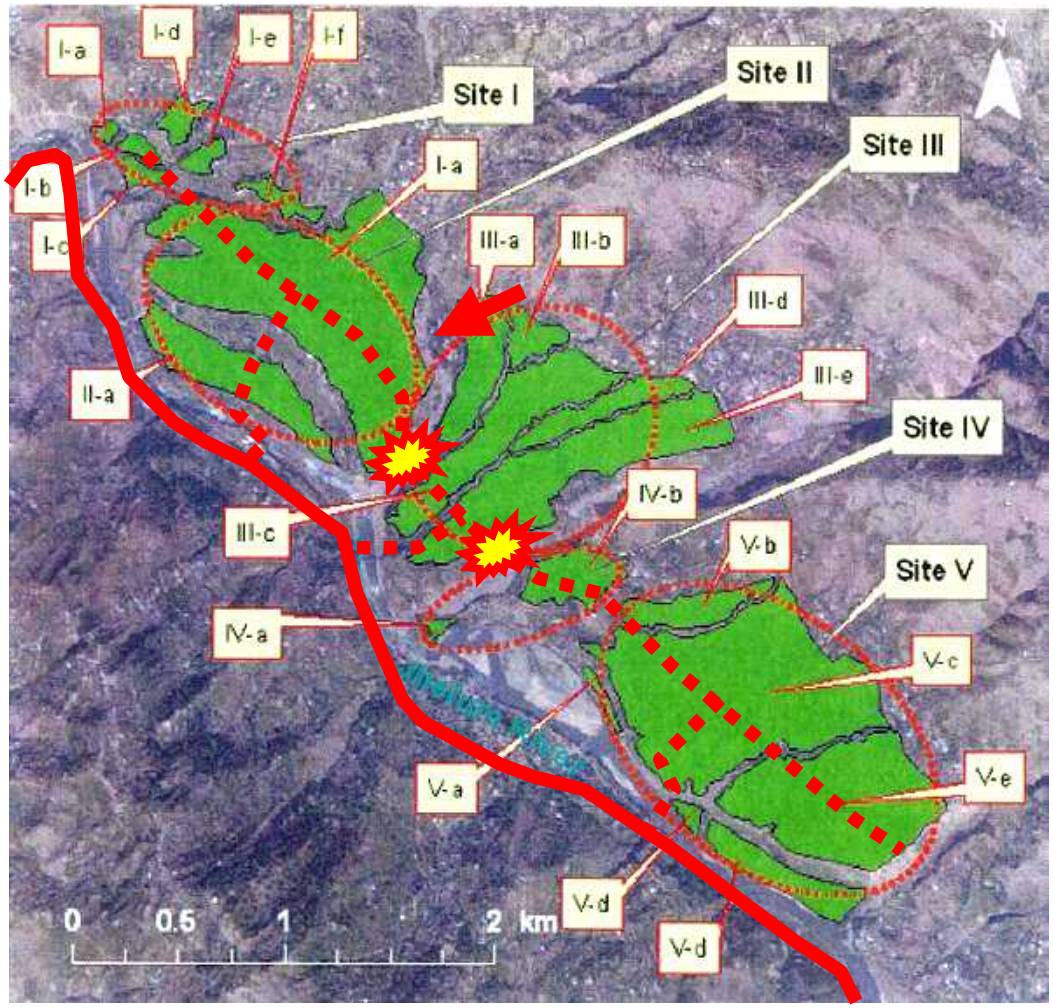
Feasible Plan of developing satellite cities



Long-lasting issues

- Conservation of land starts immediately after a massive earthquake and can last for a long time.

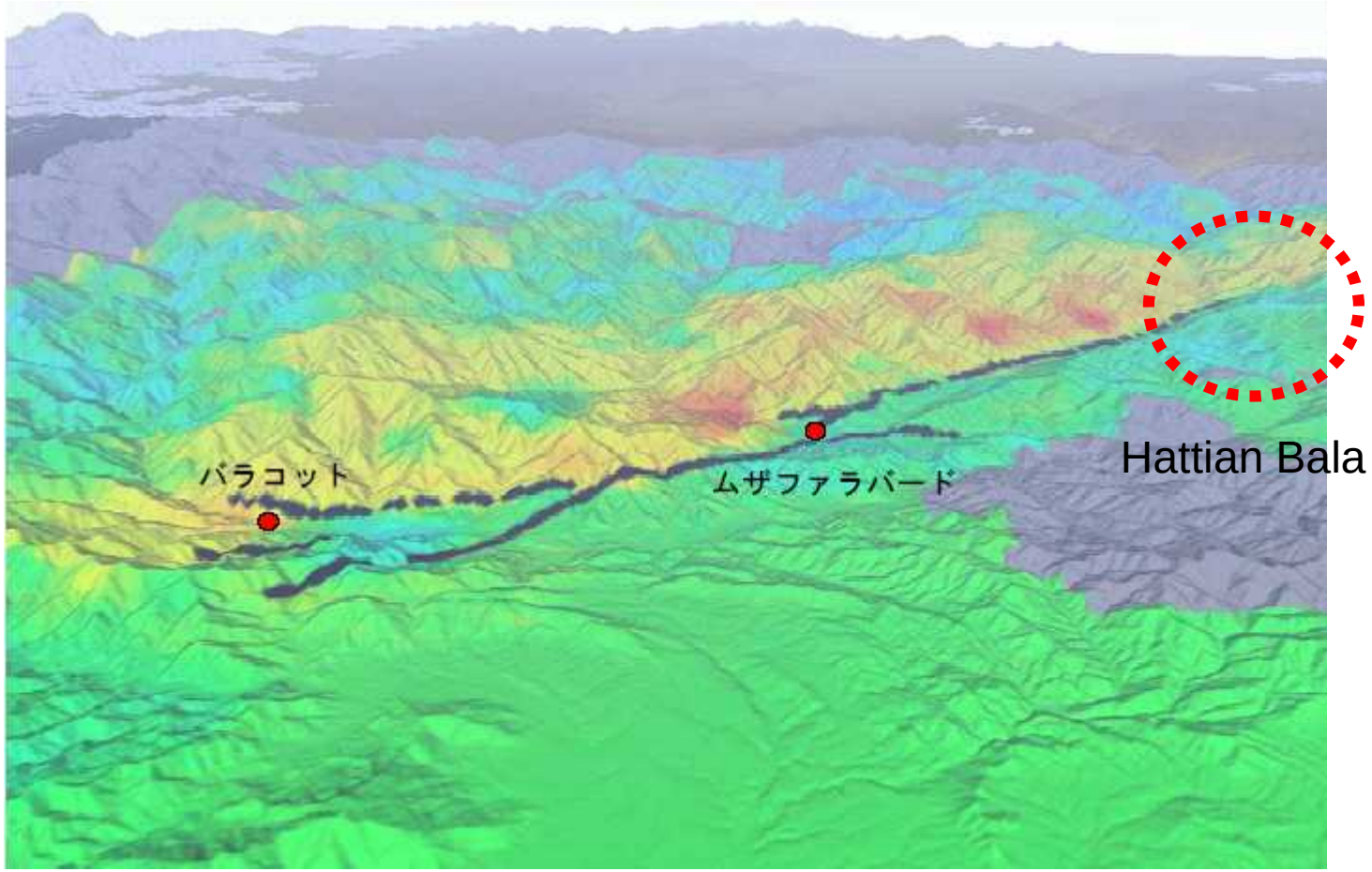
Feasible Plan of developing satellite cities



Remaining front of debris flow

- (N34º20’ 37.8”, E73º30’ 57.6”)

Bird’s eye view of the affected area



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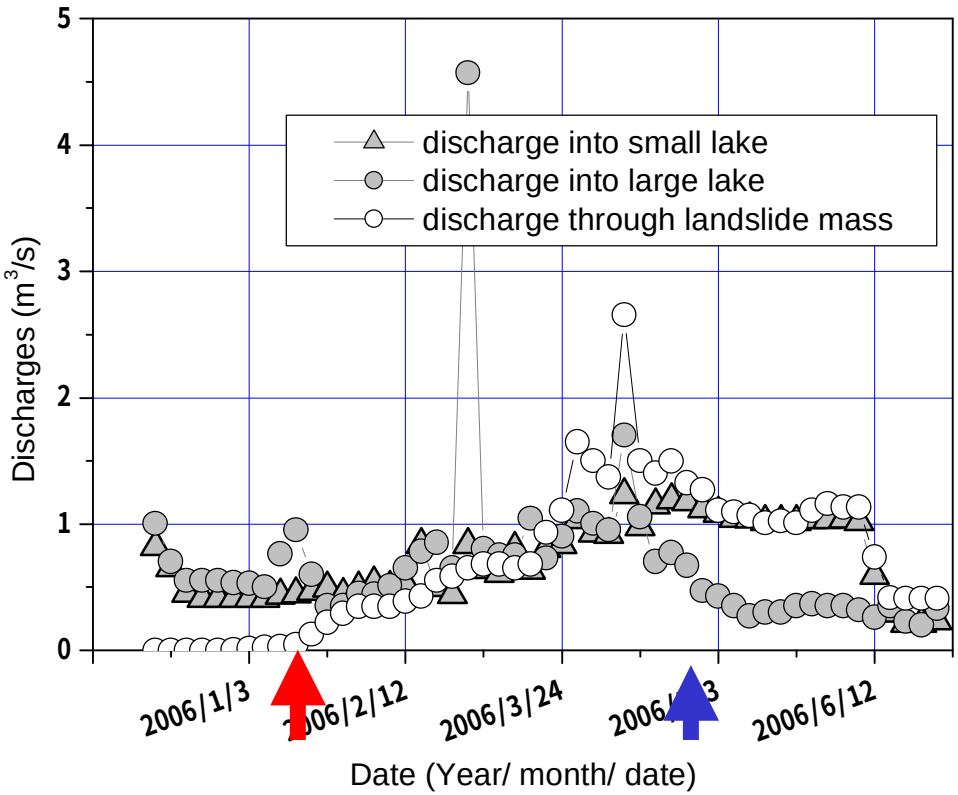
Hattian Bala rock-avalanche deposit

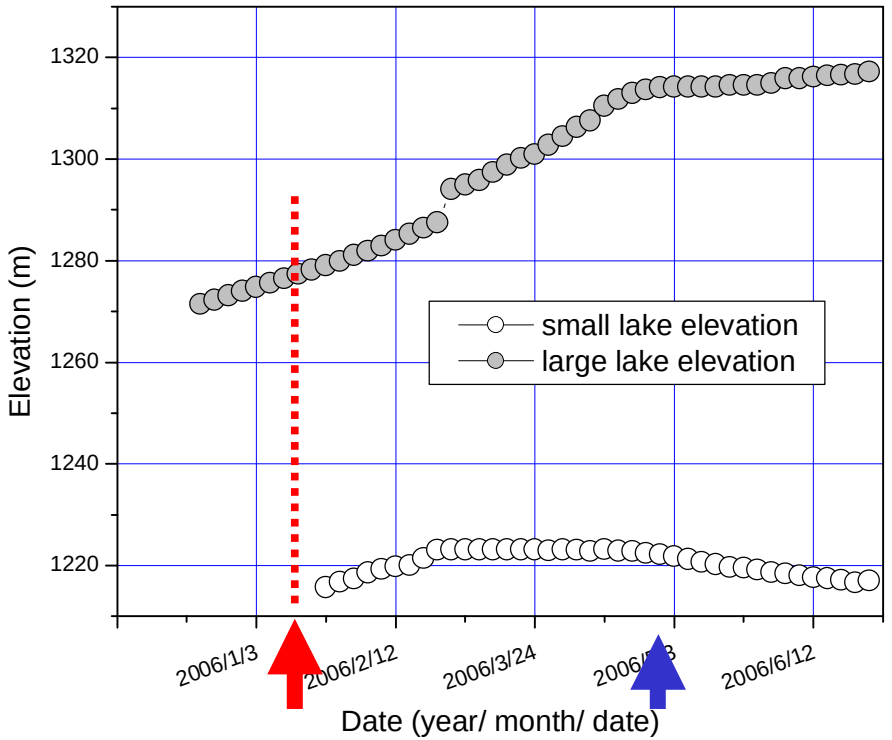
Photo by Prof. Mizra

Hattian landslide mass

Nov. 15, 2006

WPDA report says…

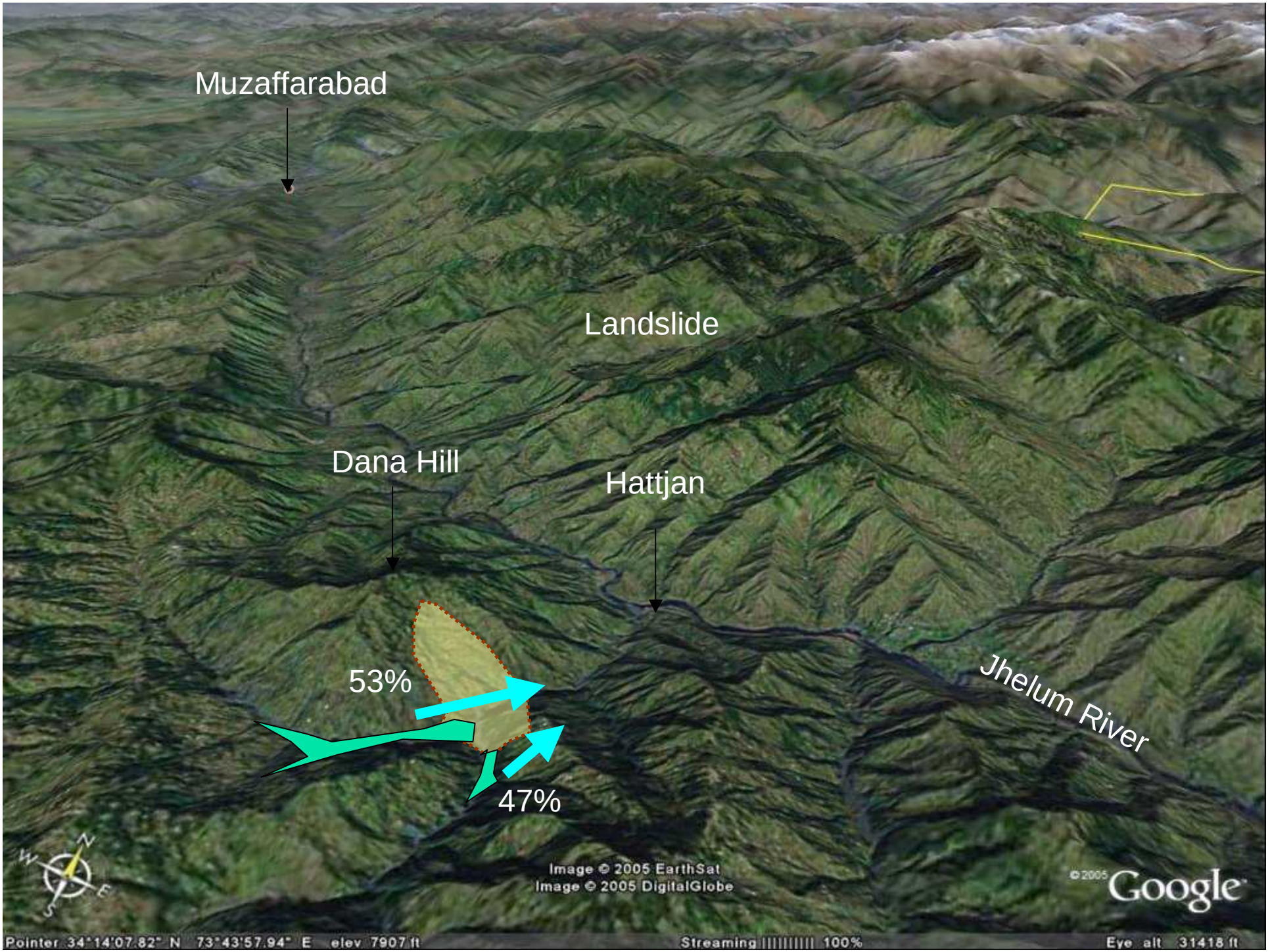




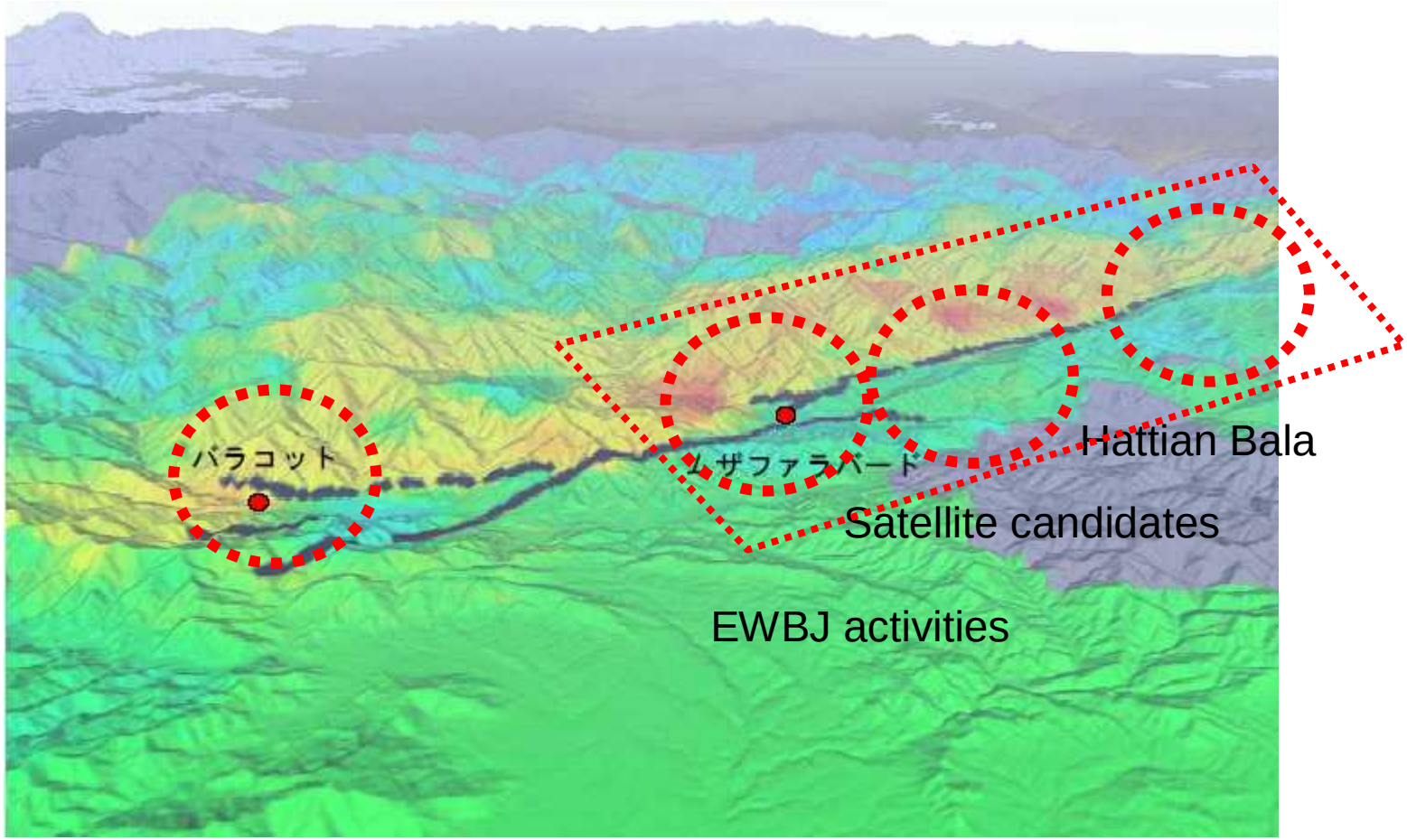
- Permeability is changing??

$\delta^{18}O$ Ratios indicate…

Location	$\delta^{18}O$ ratio (average)
Large lake	-4.88
Spillway of large lake	-5.09
Small lake	-5.95
Spillway of small lake	-6.39
Water from toe	-5.70


Muzaffarabad
Landslide
Dana Hill
Hattjan
53%
47%
Jhelum River
Image © 2005 EarthSat
Image © 2005 DigitalGlobe
©2005 Google
Pointer 34°14'07.82" N 73°43'57.94" E elev 7907 ft
Streaming 100%
Eye alt 31418 ft

Bird’s eye view of the affected area



国土地理院ウェブサイトより

EWB-Jの支援内容

2006.11.12-16,
2007.8.16-26

2007.8.19-20、22
2007.10.25

Muzaffarabad

Satellite town candidates

2006.11.15,
2007.8.20-21

Hattian-Balla Landslide

4km

+防災教育
2007.10.25

各機関への報告 (2007.11.17)

Quick Report of the JSCE Mission for Geotechnical Survey along Jehlum and Kunhar Valleys (Ver. 1.1)

PREFACE

A massive earthquake of M 7.6 occurred in North Eastern Frontier Area of Pakistan (Epicenter: 34.493°N, 73.629E), about 90 km NNE of Islamabad at 8:28 local time, Oct. 8, 2005. This Earthquake resulted in a wide-spread devastation. As of Nov. 8, the Pakistan government officials said at least 73,236 people had been killed, making this devastation worst that this country had ever experienced since 1900.

Japan Society of Civil Engineers (JSCE) together with Architectural Institution of Japan (AIJ) and "Engineers without Borders" (EWBJ) has been exchanging expertise opinions among Japan and Pakistan organizations for better rehabilitations since they dispatched the first advance body for a quick reconnaissance. Reflecting these discussions, JSCE decided to dispatch the 5th team to the affected area on the following missions:

1. Estimating permeability of a huge landslide mass of Hattian for a better stabilization of the soil mass, and
2. Measuring ground micro-tremors in Muzaffarabad for estimating soil profiles to understand damage distributions and thus to reflect the findings in the ongoing rehabilitation projects.

This report outlines the findings obtained through the quick four-days survey of the 5th team and proposals to mitigate earthquake-inflicted losses. Some descriptions in this report are not fully analyzed and evidenced yet, and therefore, some comments are not yet the conclusions reached after thorough discussions among the members. However, providing both Japan and Pakistan experts and persons in charge with a rough-an-ready overview will be important for taking measures for better rehabilitations and precautions against possible secondary disasters.

All the members of the 5th team are much indebted and thankful to Mr. Tahir Sharif, Director, Earthquake Reconstruction and Rehabilitation Authority,(ERRA), Government of Pakistan, Mr. Arshid Mehmood Abbasi and Mr. Zahid Amin, Chief Officer and Administrator of Municipal Corporation Muzaffarabad, Azad Kashmir, Pakistan, experts from Tobishima Co, who have taken all the trouble of providing every convenience for the team. The members are also grateful to many experts from Japan International Cooperation Agency (JICA), National Highway Authority, Pakistan (NHA), for their valuable suggestions and numerous discussions during the survey. They wish to further collaborate with Pakistan experts for possible countermeasures, e.g., reconstruction of damaged structures, retrofitting of existing structures and reducing earthquake hazards.

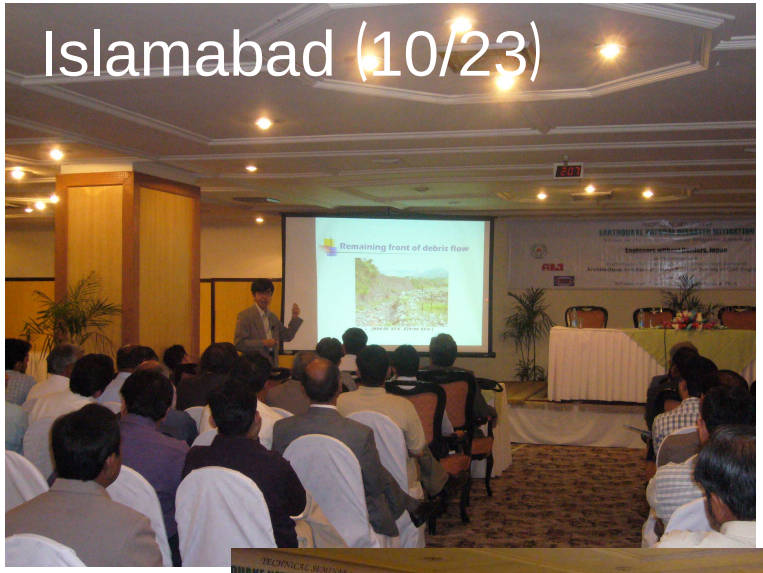
STABILITY OF HATTIAN LANDSLIDE MASS

Estimation of overall permeability

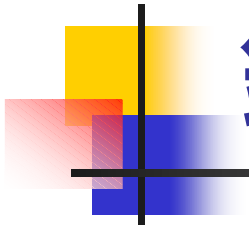
Far up in the Jehlum mountains, a huge landslide mass stopped water of a branch of the Jehlum river creating a natural dam and killing some thousands people living on the mountain side the slid down. About one year has passed since the earthquake triggered this landslide, and the water level is yet 40 m below the lowest point of the debris mass. But, the reservoir can surely be filled to its full capacity of about 62 million m^3. Well planned and thorough investigations of the landslide mass is a must, and if necessary the landslide mass should be stabilized for projects currently going on downstream side. The team measured some key dimensions of the landslide mass, elevations of waters stopped behind the soil mass, and discharge of water leaking through the debris for estimating overall permeability of the landslide mass.

技術セミナーの実施（10/23・24）

Islamabad（10/23）

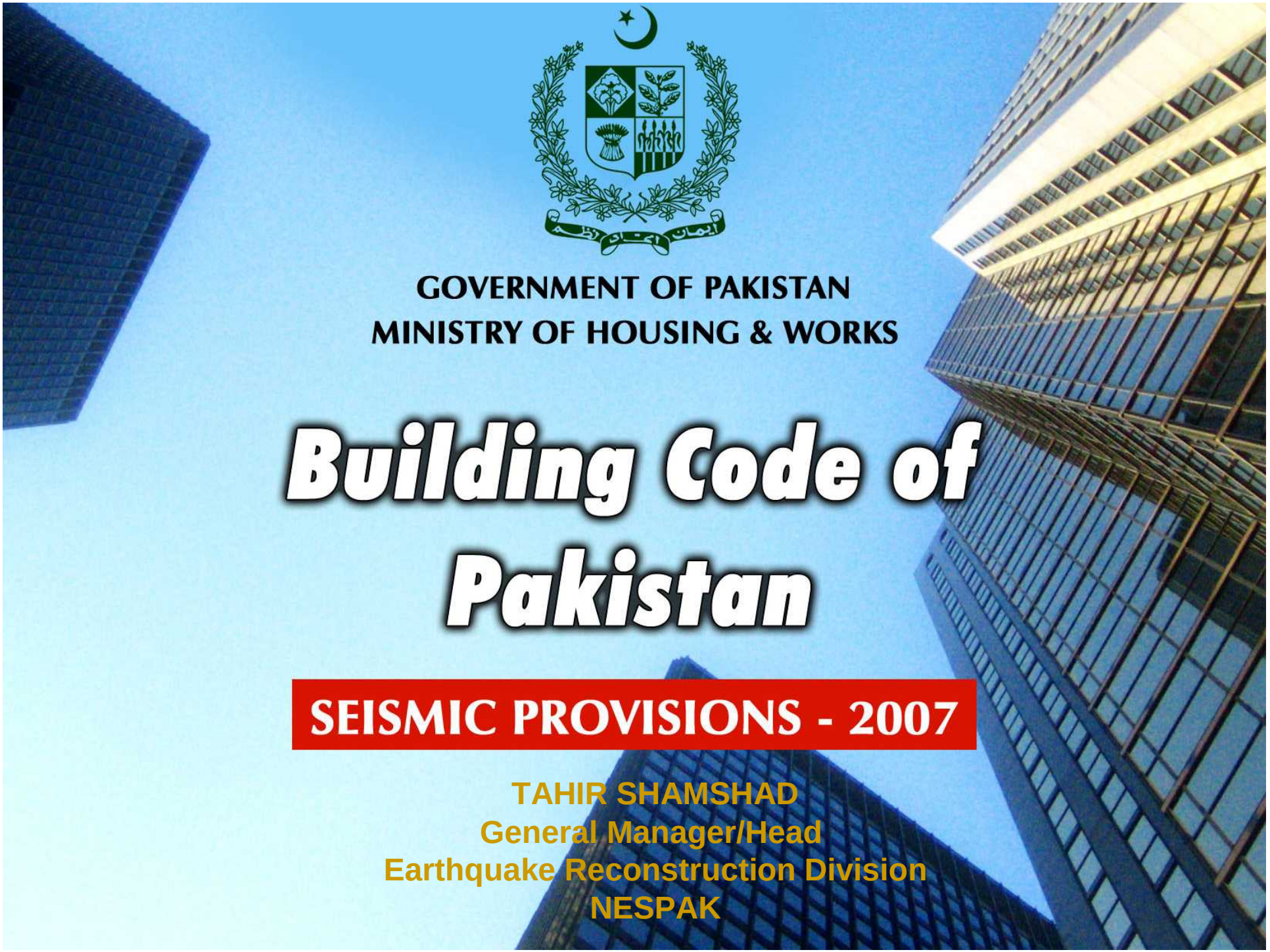


Muzaffarabad（10/24）



鉄砲玉がない！

- Shamshad氏の講演で使われたスライド


GOVERNMENT OF PAKISTAN
MINISTRY OF HOUSING & WORKS
Building Code of Pakistan
SEISMIC PROVISIONS - 2007
TAHIR SHAMSHAD
General Manager/Head
Earthquake Reconstruction Division
NESPAK

HISTORY OF BUILDING CODES IN PAKISTAN

- **1947 TO SEVENTIES**
  BRITISH CODES PREVAILED

- **LATE SEVENTIES TO DATE**
  AMERICAN CODES TOOK OVER GRADUALLY. AT PRESENT THESE ARE TAUGHT IN UNIVERSITIES AND PRACTISED BY ENGINEERS.

- **1986**
  A BUILDING CODE OF PAKISTAN WAS DEVELOPED; BUT NOT ENFORCED

REVISION AND UP-DATING OF 1986 CODE

- **OCTOBER 2005 EARTHQUAKE MADE OBVIOUS THE POOR DESIGN AND CONSTRUCTION PRACTICES IN PAKISTAN**

- **2005 (AFTER EARTHQUAKE)**
  WORK STARTED ON UPGRADING THE CODE, WITH PRIORITY GIVEN TO SEISMIC PROVISIONS.

- **NEED FOR UPGRADATION OF THE BUILDING CODE WAS REALIZED**

- **TASK ASSIGNED TO NESPAK IN NOVEMBER 2005**

SCOPE OF WORK

WORK DIVIDED INTO TWO STAGES

STAGE-I — RECOMMENDATIONS OF PRELIMINARY SEISMIC DESIGN PARAMETERS AND CRITERIA FOR SEISMIC DESIGN OF BUILDINGS IN ISLAMABAD – RAWALPINDI AREA

STAGE-II — SEISMIC HAZARD EVALUATION AND SEISMIC PROVISIONS FOR BUILDINGS, COVERING WHOLE COUNTRY

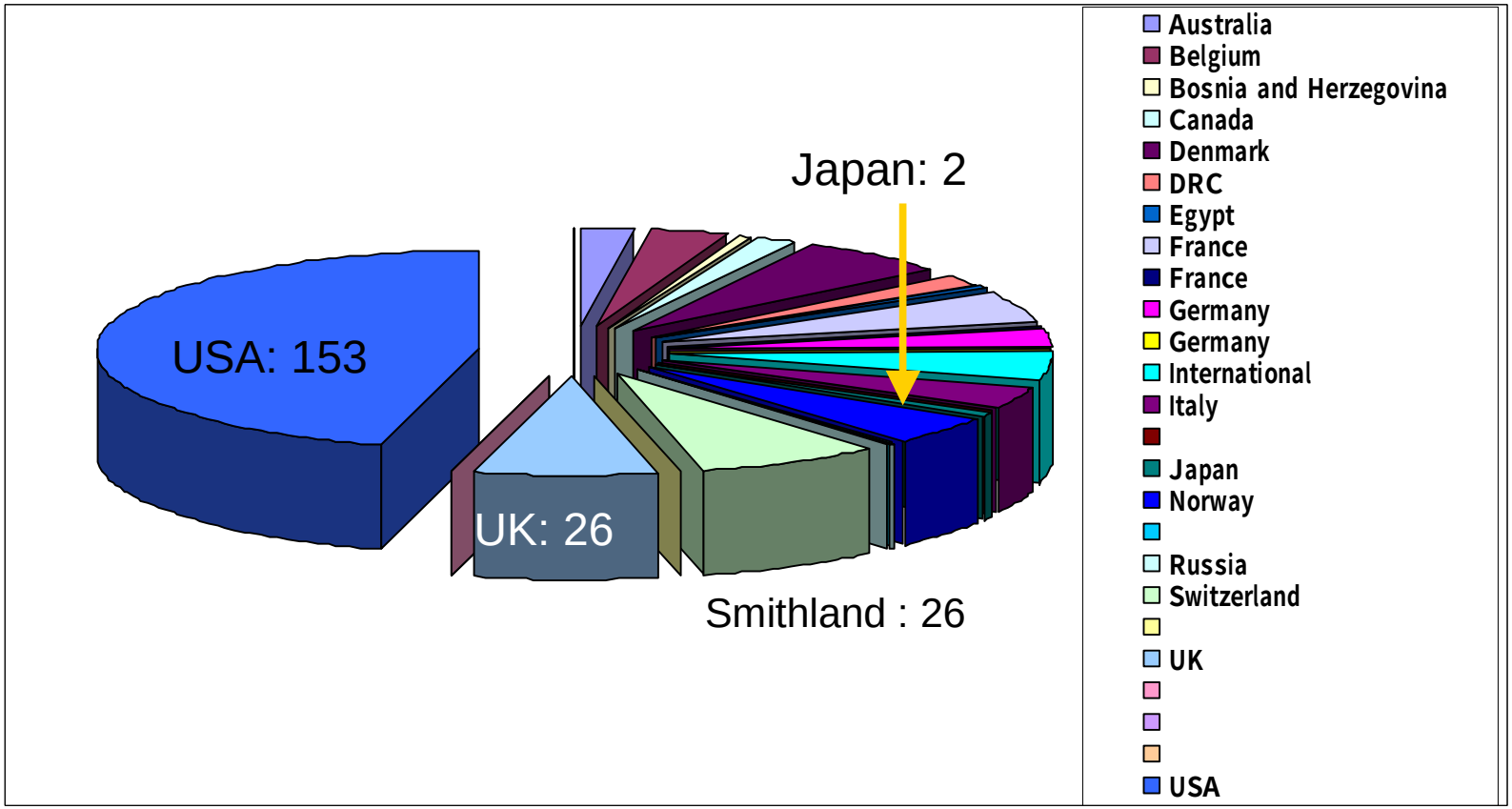
STEPS IN CODE DEVELOPEMNT

- SEISMIC HAZARD EVALUATION
- REVIEW OF CODES WORLDWIDE
- ASSESSMENT OF PREVALENT CONSTRUCTION METHODS IN PAKISTAN
- SELECTION OF APPROPRIATE BASE DOCUMENTS
- FORMULATION OF CODE PROVISIONS FOR PAKISTAN
- REVIEW BY NATIONAL AND INTERNATIONAL EXPERTS

REFERENCE DOCUMENTS

- UBC-97: UNIFORM BUILDING CODE
- ACI-2005: AMERICAN CONCRETE INSTITUTE: BUILDING DESIGN REQUIREMENTS
- AISC-2005: AMERICAN INSTITUTE OF STEEL CONSTRUCTION, PROVISIONS FOR STRUCTURAL STEEL BUILDINGS
- ASCE-2005: AMERICAN SOCIETY OF CIVIL ENGINEERS: MINIMUM DESIGN LOADS FOR BUILDINGS

NGO Projects in 1999 sponsored by UNHCR



Where is Japan?

Donors for UNHCR, 1999