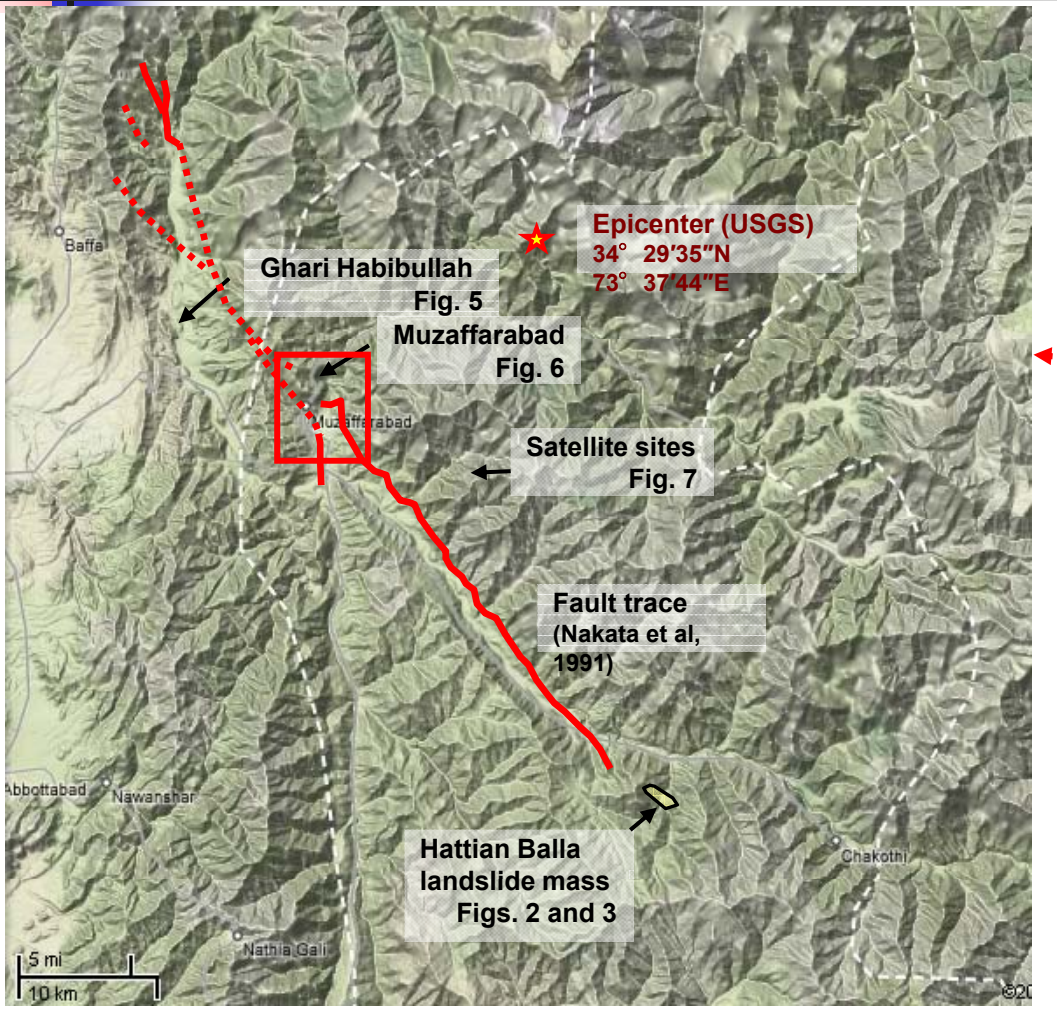
パキスタンにおける災害復興事業について

小長井一男

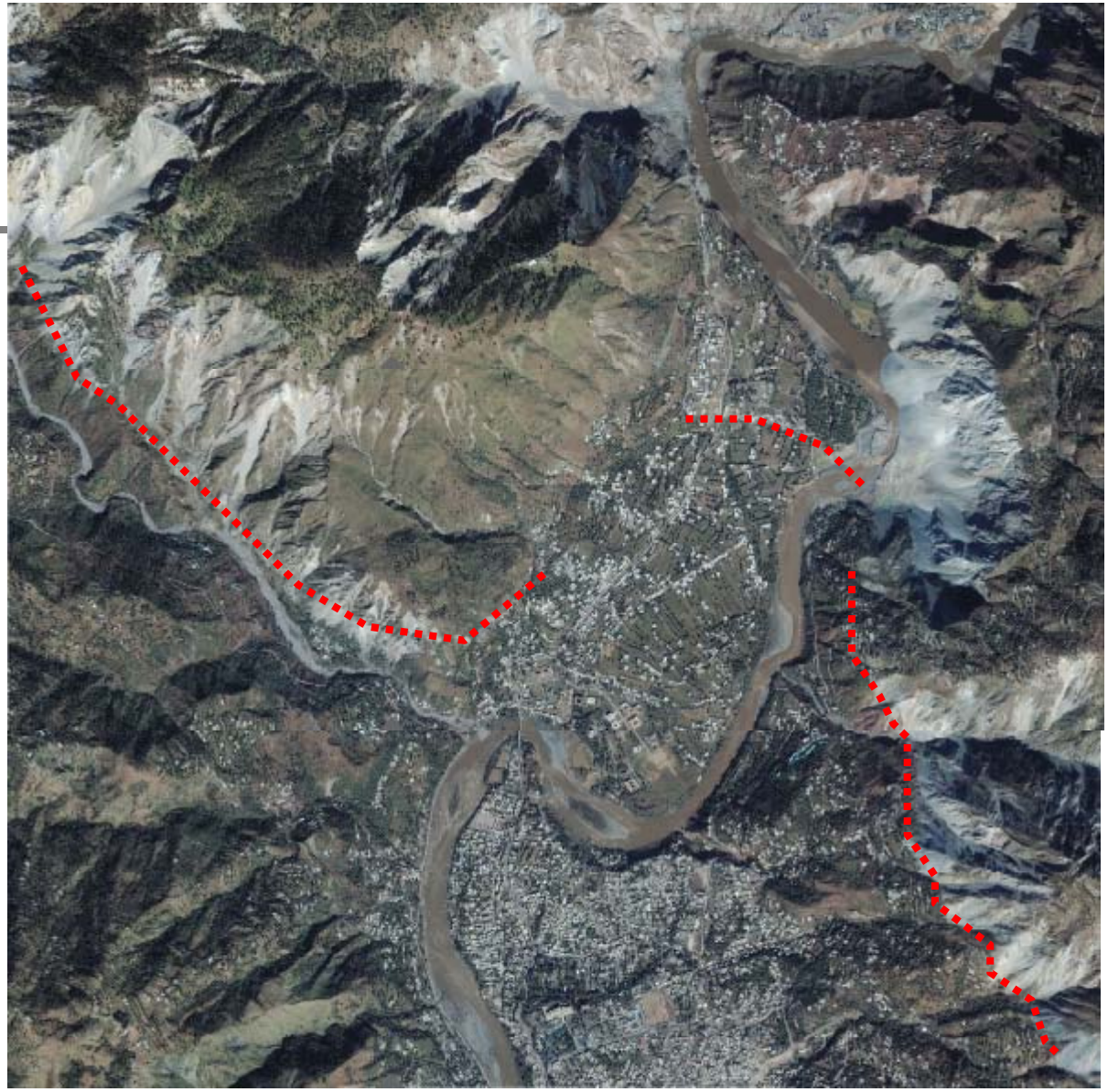
地震後12回・・・

Mr. Zahid Ameen

2005年カシミール地震



Muzaffarabad



IKONOS

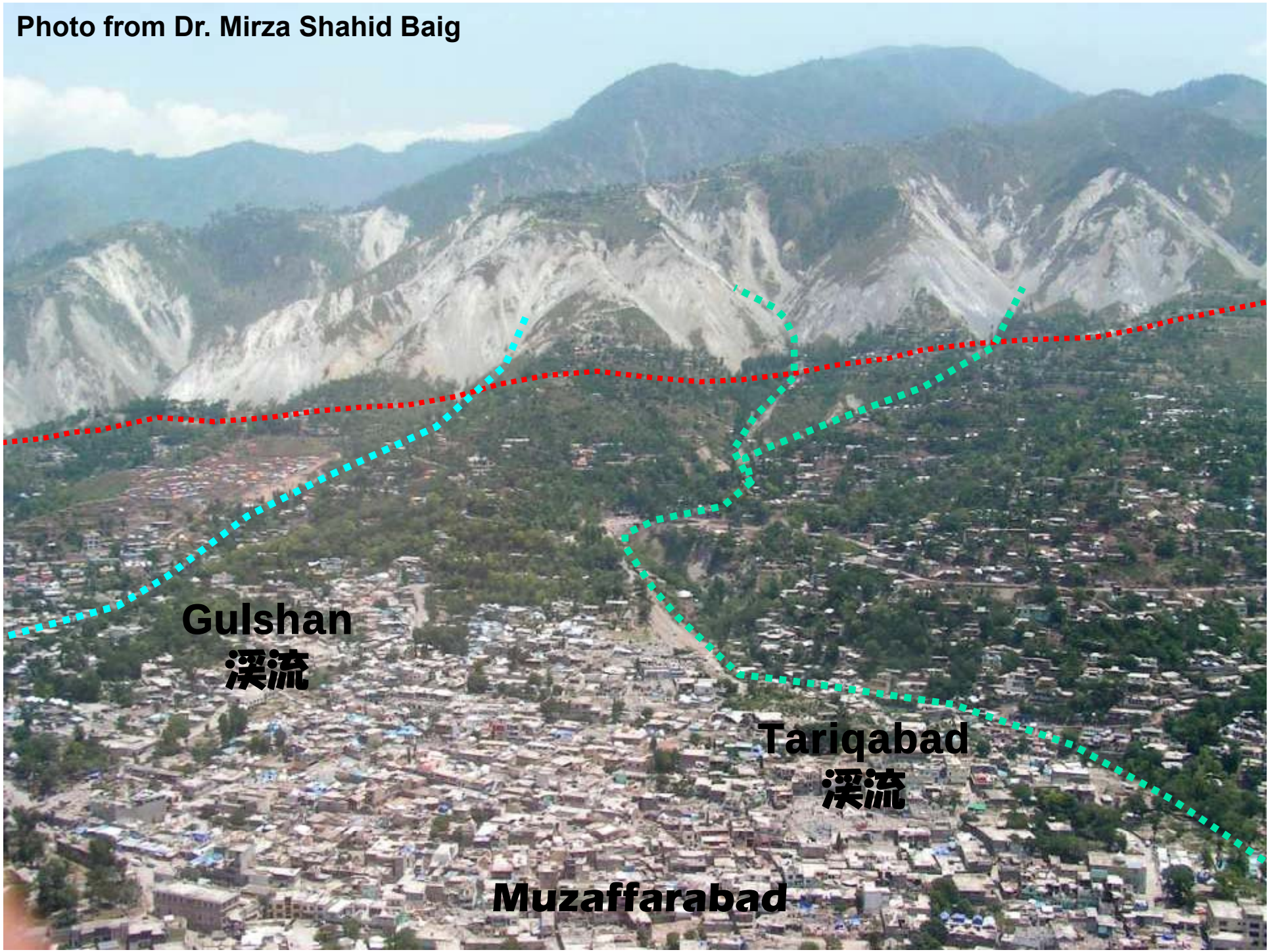


Photo from Dr. Mirza Shahid Baig
Gulshan
渓流
Tariqabad
渓流
Muzaffarabad

Gulshan 溪流

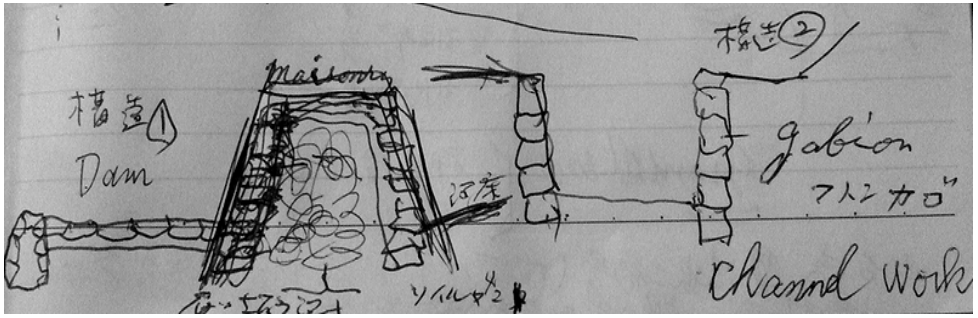
19/08/2007

25/06/2008

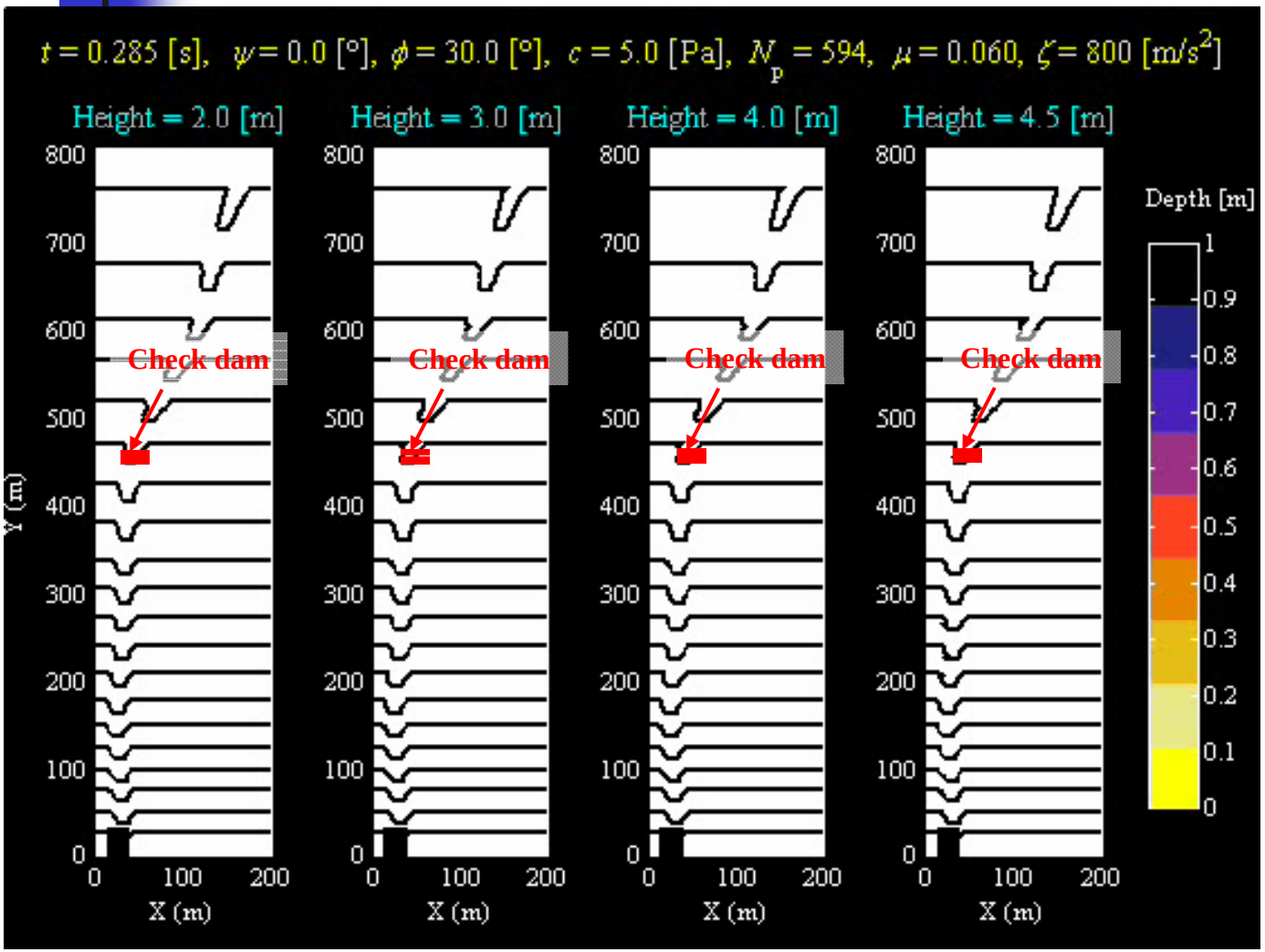
29/11/2008

砂防ダムの可能性に言及

地すべり砂防技術センター
近藤浩一専務理事



砂防ダムの効果を数値解析で

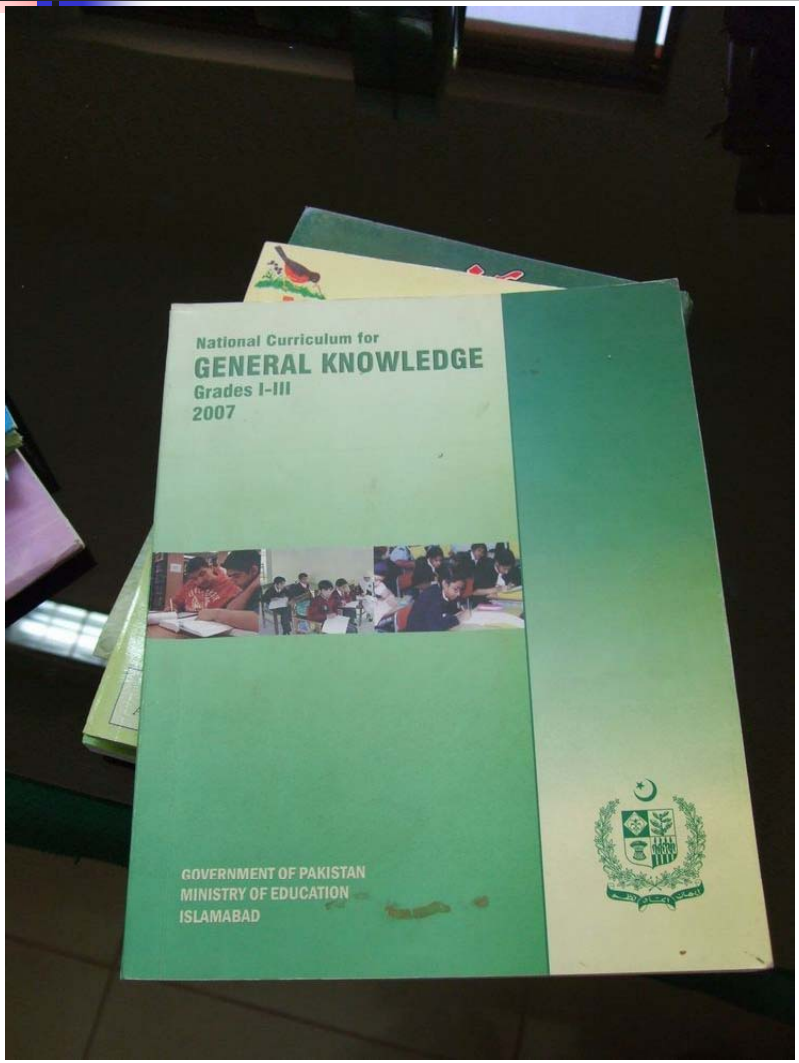


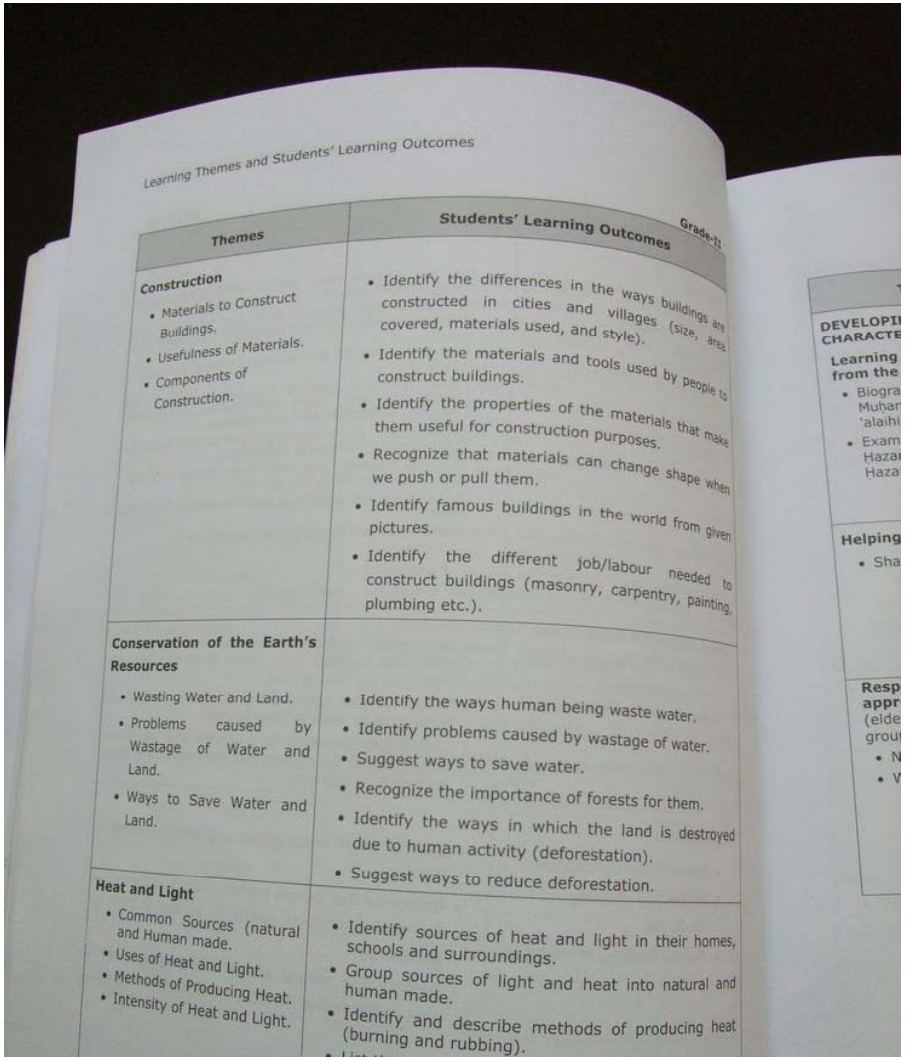
Zaheer Abbas KAZMI , Konagai Lab.

防災教育（2008/11/27）

防災教育（2008/11/27）

JICA教科書からAJKの教科書へ



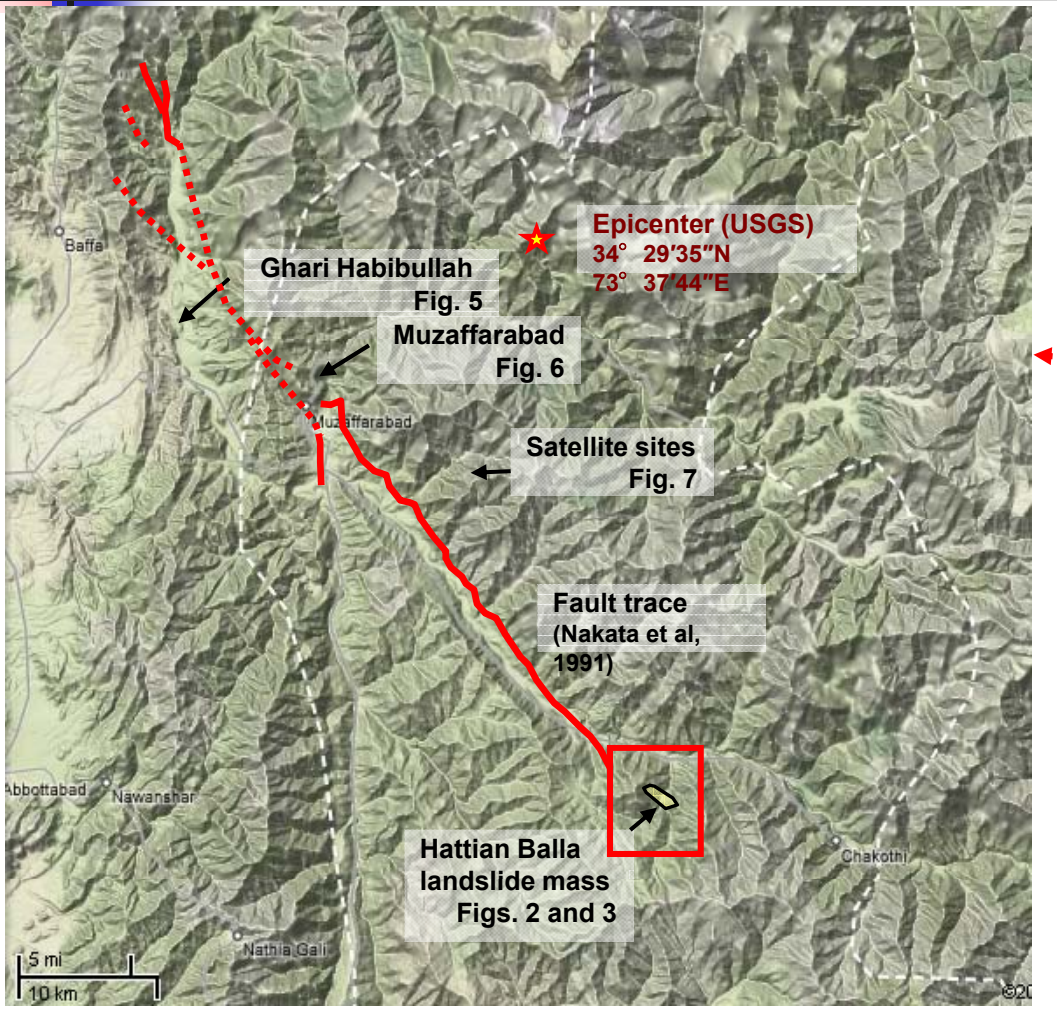


Learning Themes and Students' Learning Outcomes

Grade-II

Themes	Students' Learning Outcomes
Construction • Materials to Construct Buildings. • Usefulness of Materials. • Components of Construction.	• Identify the differences in the ways buildings are constructed in cities and villages (size, area covered, materials used, and style). • Identify the materials and tools used by people to construct buildings. • Identify the properties of the materials that make them useful for construction purposes. • Recognize that materials can change shape when we push or pull them. • Identify famous buildings in the world from given pictures. • Identify the different job/labour needed to construct buildings (masonry, carpentry, painting, plumbing etc.).
Conservation of the Earth's Resources • Wasting Water and Land. • Problems caused by Wastage of Water and Land. • Ways to Save Water and Land.	• Identify the ways human being waste water. • Identify problems caused by wastage of water. • Suggest ways to save water. • Recognize the importance of forests for them. • Identify the ways in which the land is destroyed due to human activity (deforestation). • Suggest ways to reduce deforestation.
Heat and Light • Common Sources (natural and Human made. • Uses of Heat and Light. • Methods of Producing Heat. • Intensity of Heat and Light.	• Identify sources of heat and light in their homes, schools and surroundings. • Group sources of light and heat into natural and human made. • Identify and describe methods of producing heat (burning and rubbing).

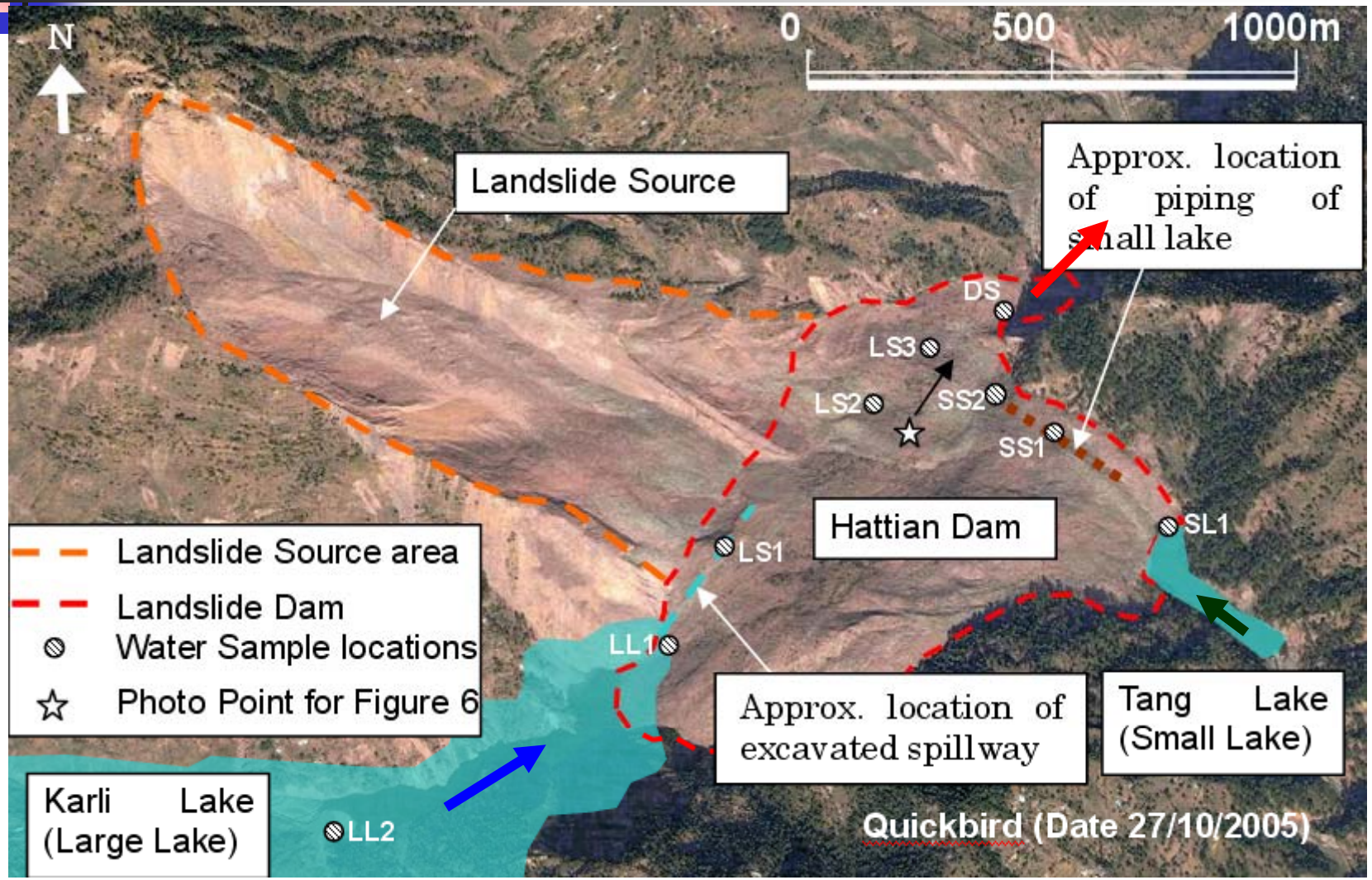
変形し続けた土砂ダム


Epicenter (USGS)
34° 29′35″N
73° 37′44″E
Ghari Habibullah
Fig. 5
Muzaffarabad
Fig. 6
Satellite sites
Fig. 7
Fault trace
(Nakata et al,
1991)
Hattian Balla
landslide mass
Figs. 2 and 3
Baffa
Abbottabad
Nawanshar
Nathia Gali
Chakothi
5 mi
10 km

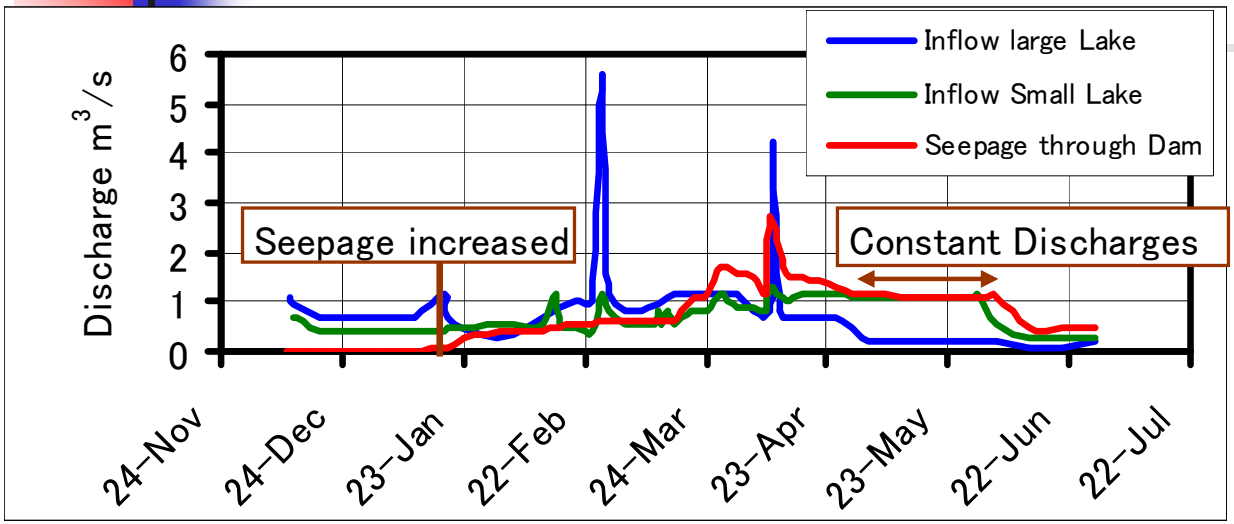

Balakot–Bagh
Fault
ghanistan
Pakistan

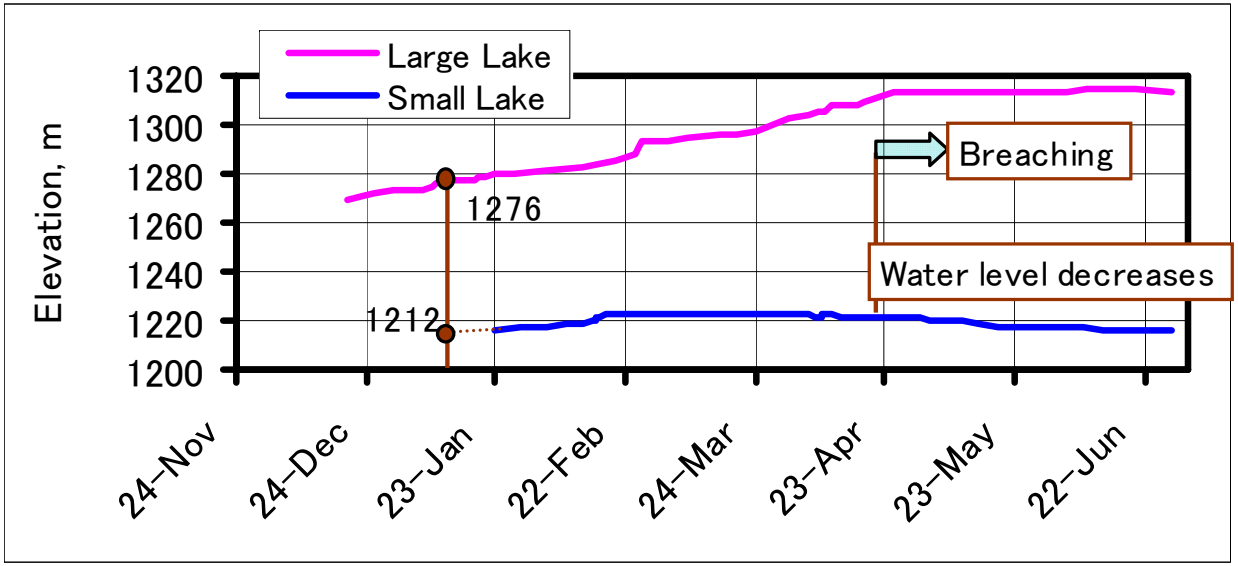
変形し続けた土砂ダム

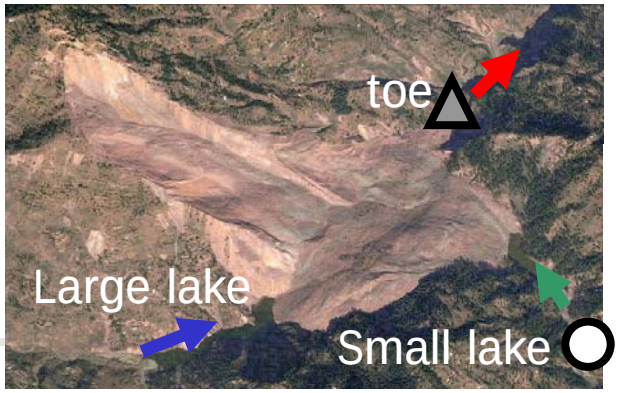
流入・流出量の計測
(WAPDA report)



浅い部分はガサガサ？







- Water of the small lake began to seep through the landslide mass after the water level of about 1212m was reached.
- Either piping or erosion may have been formed after April 21st 2006.

小さい湖からの伏流水に沿って

徐々に侵食が進む

15th Nov. 2006

28th June. 2008

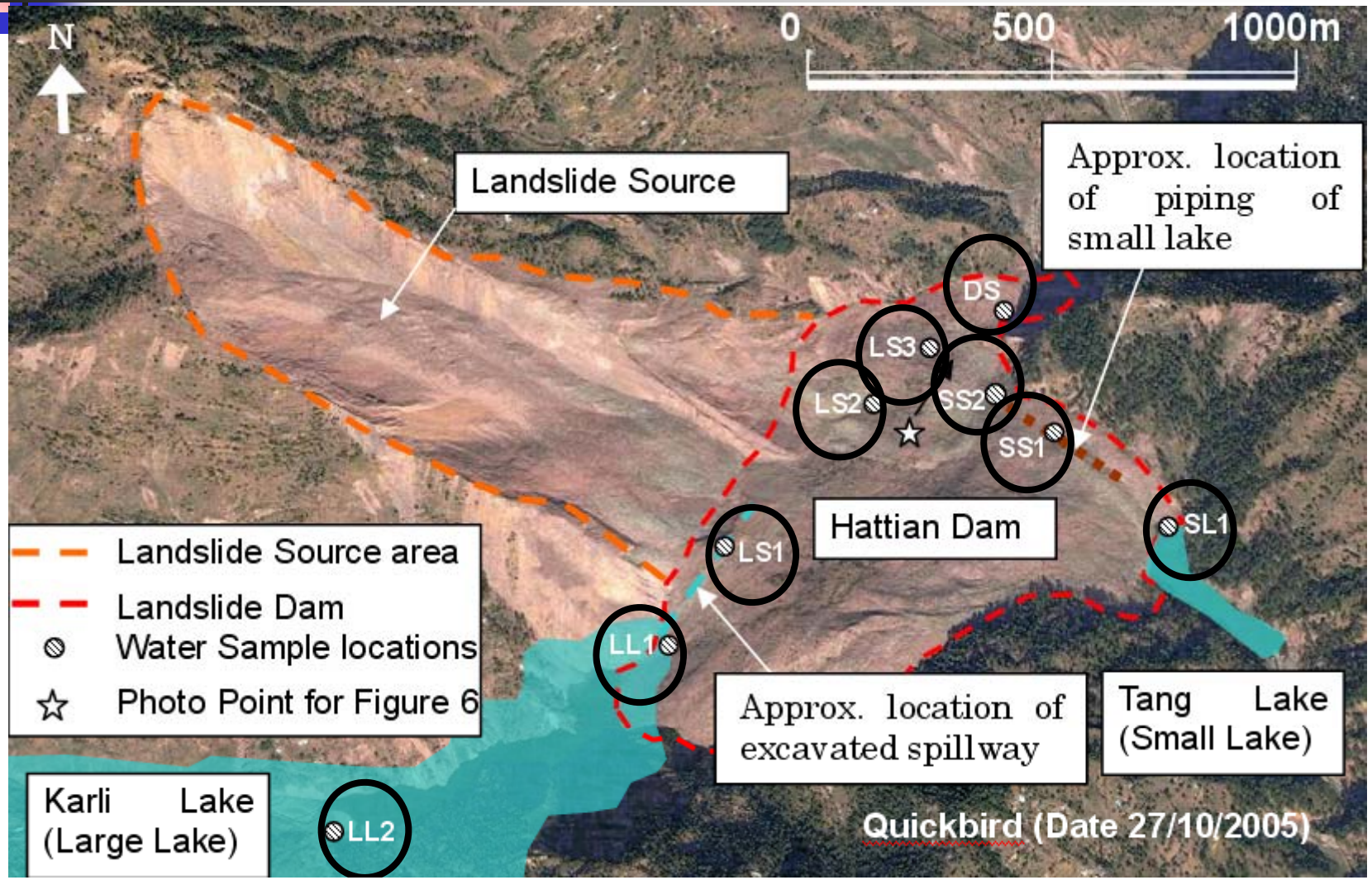
スレーキング

it is not known exactly when, but ...

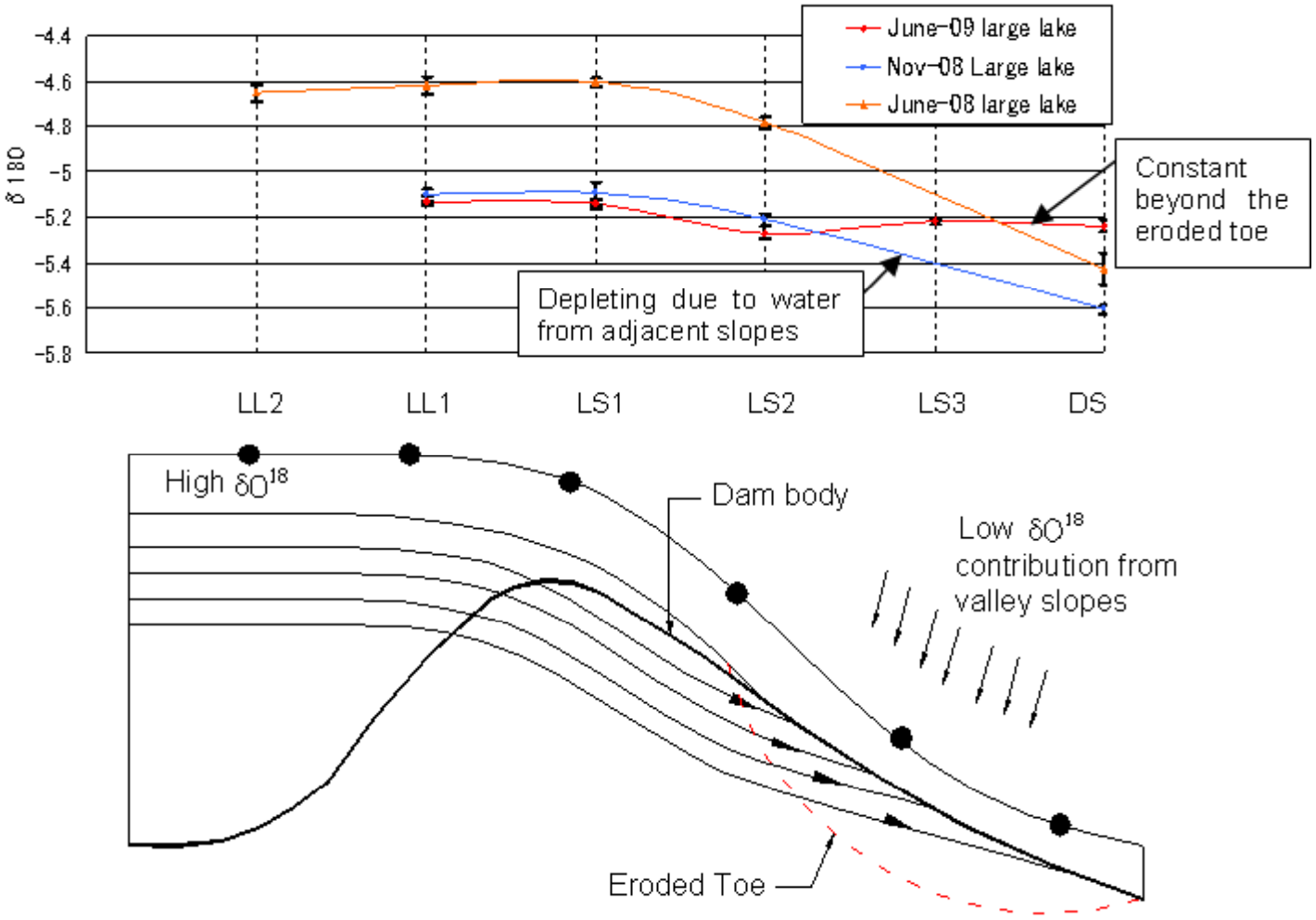
そして突然現れた侵食崖

- The Debris mass have has been going through further gradual changes. These changes have been accelerated since the water from the larger lake began spilling over the debris mass.
- It is not known exactly when, but a significant backward erosion scar progressed about 300m up through the toe slope during November 2008 till June 2009.
- but there had been no marked change observed between June 2009 and November 2009

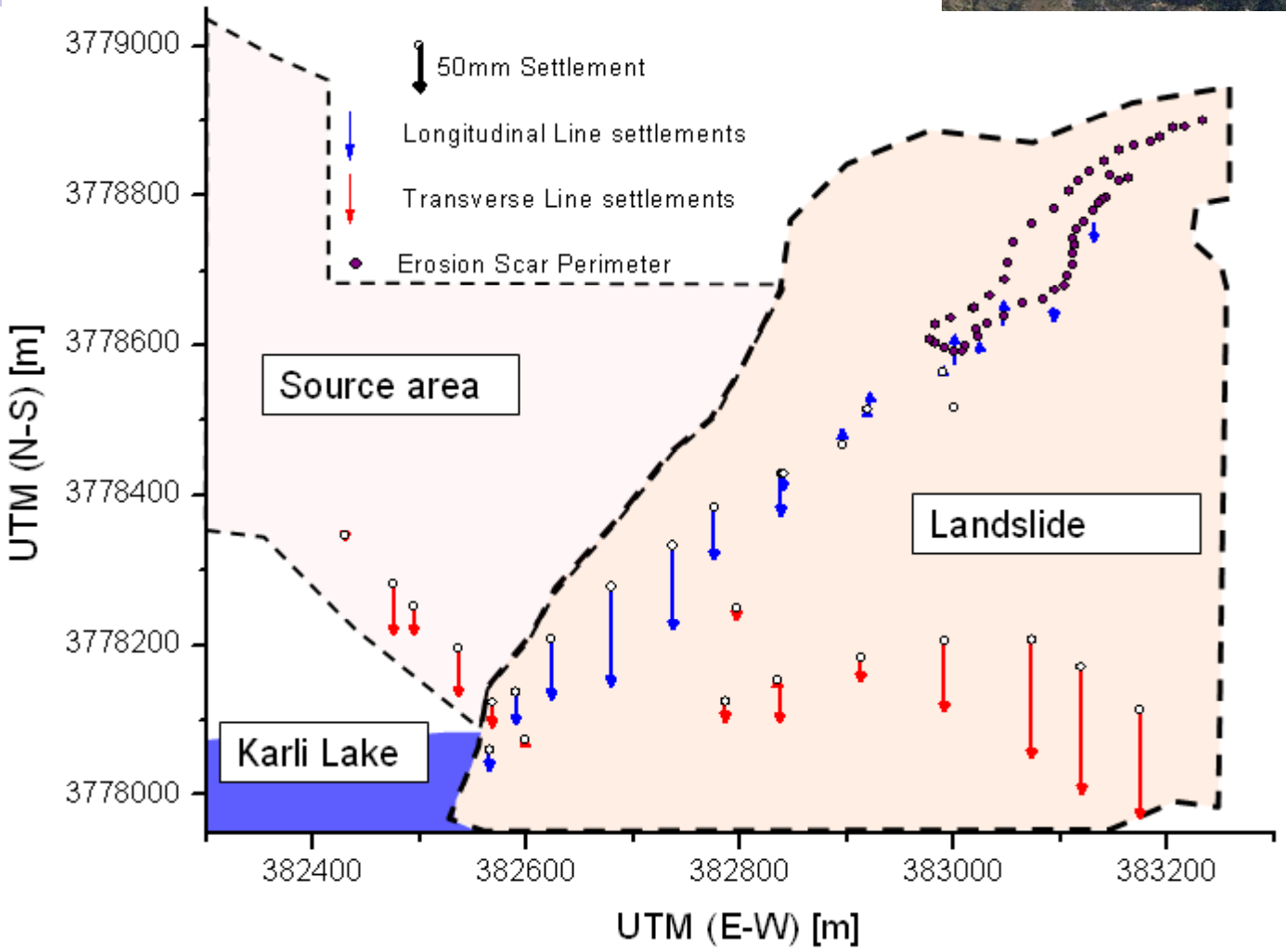
重水$\delta^{18}O$ の比率計測



$\delta^{18}O$ 比が侵食の進んだ場所で変化



沈下の兆候

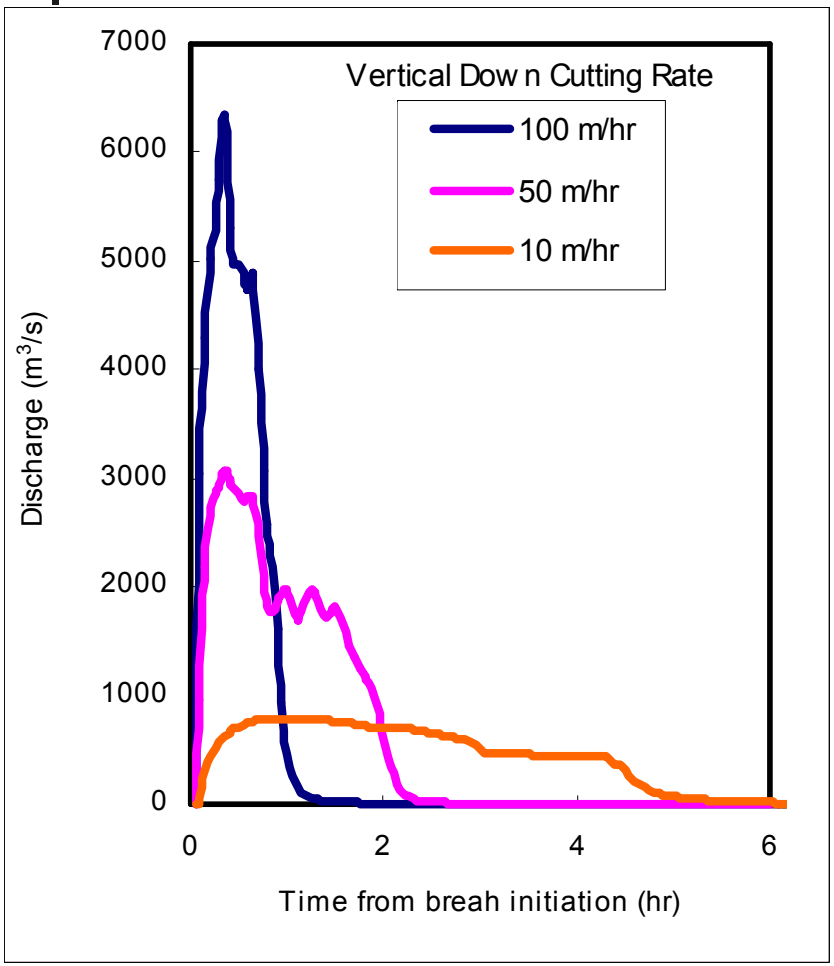

50mm Settlement
Longitudinal Line settlements
Transverse Line settlements
Erosion Scar Perimeter
Source area
Landslide
Karli Lake
3779000
3778800
3778600
3778400
3778200
3778000
UTM (N-S) [m]
382400
382600
382800
383000
383200
UTM (E-W) [m]

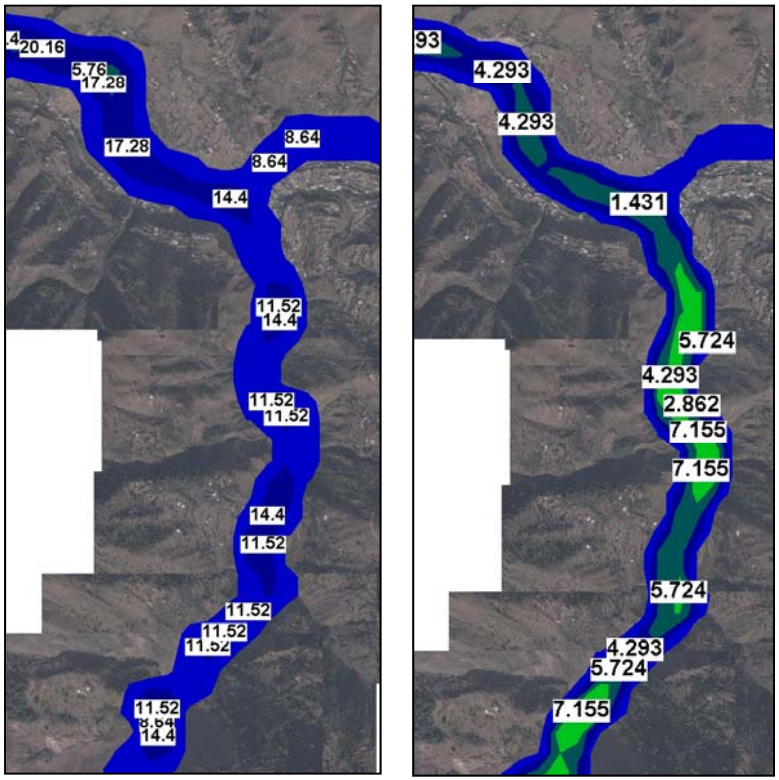
そして唐突に…
2010年2月9日、決壊

Courtesy of Prof. Jean F. Schneider

- On February 9, 2010, a natural landslide dam at Hattian Ballah of Pakistan, which was formed in the Oct 8, 2005 Kashmir earthquake, failed due to incessant rains.

事前に洪水予測までしていたのに！

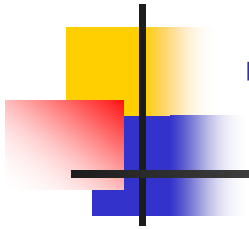




予測結果を整理した論文の最後に・・・

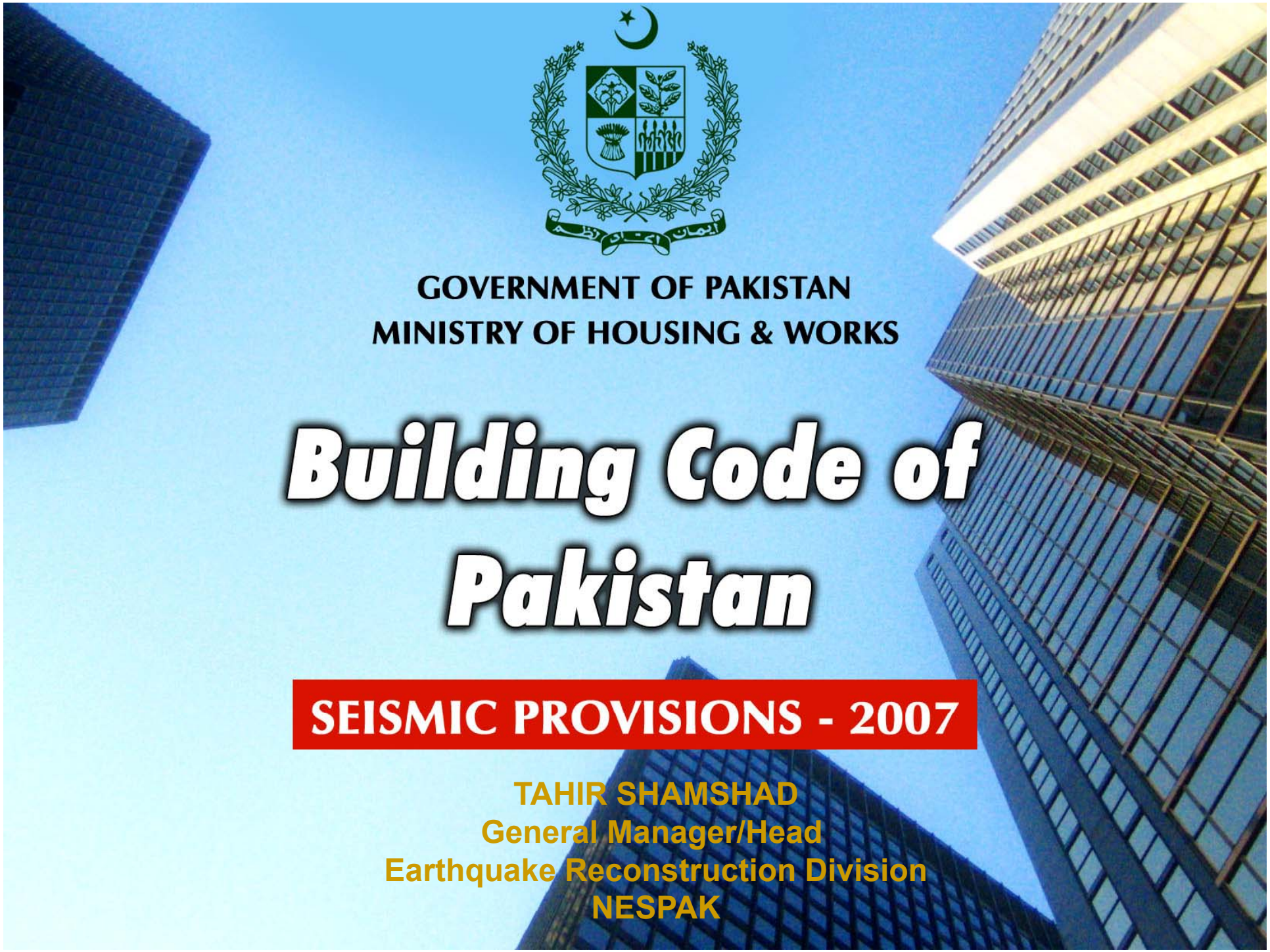
When the authors would finish this paper, they heard that the debris dam breached on Feb. 9th, 2010 destroying two dozens of houses and killing a boy. We regret that it was only at a later day that we knew some changes that we observed at Hattian Bala debris mass may have been early signs of this tragic event. The authors therefore got to devote much of their energies to cope with the threat for the people along Jehlum River in a rational manner, where threat probably remains in a serious situation even now.

右端:Ahsan Sattar, Konagai Laboratory, one of winners of the Furuichi Prize



まだまだ鉄砲玉がない！

- 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