ADRC Peer Review Project 2011

Asian Disaster Reduction Center

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Overview of the Mission to Tajikistan

<u>Counterpart in Tajikistan:</u> 

Information Management and Analytical Center (IMAC), Committee for Emergency Situations (CoES)

Person in charge: Mr. Alisho Shomakhmadov, Head

<u>Mission Date:</u>

13-15 February 2012

<u>Theme of Review:</u>

Risk Assessment and Hazard Mapping for Landslide Disasters

(HFA Priority Action 2: Identify, assess and monitor disaster risks and enhance early warning)

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Organizations & Officials Visited (1)

1. **Focus Humanitarian Assistance (NGO)**
   - Mr. Zafarbek Kuvvatbekov, Regional Coordinator, GBAO Operation
   - Mr. Farrukh Lalani, Senior Program Officer
   - Ms. Imomberdi Berdov, Program Officer
   - Mr. Laylo Sabzalieva, Executive Assistant
2. **Khuroson District Office & Affected Area**
   - Mr. Jabbor Samadov, Chairman of the Khuroson District
   - Mr. Saidkhodja Karimov, Deputy to the Chairman of the Khuroson District
   - Mr. Manuchehr Kholikov, Head of the Emergency Situations and Civil Defense, Headquarter in the Khuroson District
   - Mr. Djamshed Asadulloev, Head of the Ayni djamoat of the Khuroson District
3. **Institute of Geology, Earthquake Engineering, and Seismology, Academy of Science of Tajikistan**
   - Dr. Yunus Mamadjanov, Director
   - Dr. Ja'far Niyazov, Senior Researcher

Organizations & Officials Visited (2)

4. **Main Department of Geology, under the Government of Republic of Tajikistan**
   - Dr. Azim Ibrohim, Head
   - Mr. Mahmadaliev Abdusalom, Deputy Head
   - Mr. Akhmedov Akmal, Chief of the hydrology division

5. **Committee of Emergency Situations (CoES)**
   - Mr. Khairiddin Abdurahimov, Head

6. **Information Management and Analytical Center (IMAC) of CoES**
   - Mr. Alisho Shomakhmadov, Head
   - Other staff members

7. **Research Center of the State Committee for Land Use and Geodesy**
   - Mr. Saidov Mirzo, Director

Brief Introduction of Tajikistan

Geographical Info:

✓Location: borders with China, Kyrgyz, Uzbekistan and Afghanistan

✓Area: 143,100 km^2
(93 % of the land is mountainous)

✓Height: highest elevation: 7,495 m
lowest elevation: 300 m

Population:

✓6.8 million
(urban population: 24%)

Climate:

✓Continental and Subtropical with some Semi-Arid areas

✓Rainfall: Highest in Central Asia,
ranging from 500-600mm to 1,500mm in the mountains

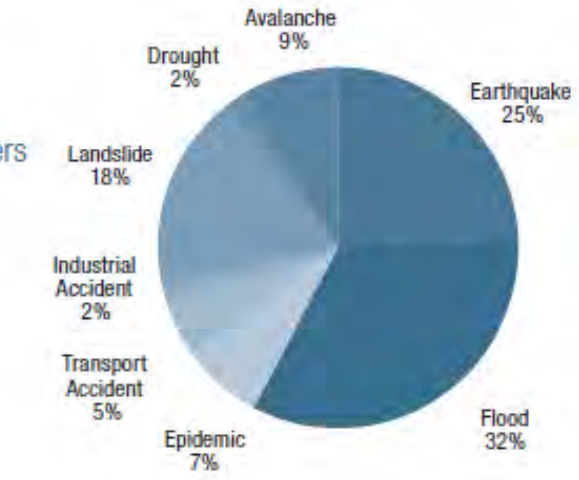
Map Source: Courtesy of the University of Texas Libraries, The University of Texas at Austin.

Disasters in Tajikistan

Main Natural Disasters:

Earthquake, Flood, Debris flow (landslide), Drought, Avalanche, Wind damage, and Epidemics

Figure 23: Percentage distribution of reported disasters Tajikistan (1988-2007)



Source: "Central Asia and Caucasus Disaster Risk Management Initiative"

Landslides in Tajikistan:

- The most active zones: between 700m and 2,000m above mean sea level
- About 50,000 sites have been identified as landslide sites
- Considerable numbers of human-induced landslides
- Major and recent disasters
  - ✓ Earthquake induced landslide: Feb 1911, Pamir mountains -> formed 75km long Lake "Sarez"
  - ✓ May 1992 landslide: Killed 243 people, Cost of damage US$24,100,000
  - ✓ April-May 2009 landslide (Khroson district): 444 families resettled
  - ✓ June 2011 landslide (Sughd region): Affected 800 people, Damaged 23 houses

Disaster Risk Mgmt System in Tajikistan

Legal System:

Government Decree No.400 "On the establishment of the Committee for Emergency Situations and Civil Defense“
(17 August 1994)

Plans & Programme:

National Strategy for Disaster Risk Management 2010-2015 (March 2010)

National Program for Realization of the National Strategy for DRM 2010-2015 (March 2010): Planned Activities includes establishment of crisis management center & national platform, elaboration of disaster preparedness and response plan, integrated emergency monitoring & information system, and
Improvement of legislative base for DRR

Organizations:

Committee for Emergency Situations: Roles for main coordination

Rapid Emergency Assessment and Coordination Team (REACT): Multi-stakeholder partnership

Finding in each organization

1. Focus Humanitarian Assistance (NGO)-(1)

- Overview
  - International crisis response and disaster risk reduction agency
  - Part of Aga Khan Development Network
  - Closely related to International Agencies
  - Covers Central and South Asia, Europe, and North America
- Efforts: Enhancing preparedness in communities as well as emergency response such as supply of foods, fuels, tents, etc. Impressing capacity building activities for enhancing preparedness against various types of hazards at vulnerable local communities.
- Advantage: Activities are conduced on resident side and staffs can understand the community's needs and have good relationships with residents. Their standpoint are close to the residents. Easy to collect their needs and residents past experience.
- Weakness: NGOs usually have less technical knowledge and less experience regarding hazard zoning and prevention works. Technical skills and knowledge of specific hazards strongly depends on the (mostly local) experts they employ.

1. Focus Humanitarian Assistance (NGO)-(2)

- Discussion: focused on (1) examination of multi-hazard scenarios like extreme rain, strong quakes, and their combination, and corresponding multiple plans of evacuation. Each hazard is supposed to be induced by single cause. (2) Quality of potential landslide hazard zoning methodology was discussed on a sample hazard map. They employed local geologist but apparently “landslides” and debris / mud flows zonation is not enough.
- Recommendations
  - Raising awareness activities are recommended, on (1) mechanisms of landslides, (2) potential landslide scenarios of the community based on multiple scenarios considering possible causes as rain, snowmelt, quake, anthropogenic cause like water leakage. The information should be simple, straight-forward.
  - Considering multiple evacuation plan and periodical (annual) evacuation drill are recommended.
  - Periodical monitoring is required. However, monitoring rainfall system is not established in this country. Monitoring and prediction of weather (rain) in mountainous regions is still difficult even employing rain satellites. JICA has been promoting community level rain monitoring using pet-bottle made rain gauges at elementary schools and municipal govts.

1. Focus Humanitarian Assistance (NGO)-(3)

- Recommendations (cont.)
  - Periodical watching of potential upslope landslide sites. Only the residents can do it. When unusual change showing increasing landslide activities found, they should call local or national authorities for further technical assistance or reliable risk evaluation.
  - Hazard maps working jointly with plural, not only professional geologists, considering extreme weather condition and eq. is recommended, because landslide zoning depends on individual geologist.
  - Collaboration with overseas experts using Google Earth/Map through internet could be possible now. This idea can mobilize wide international expertise and can realize reliable hazard mapping.

2. Khuroson District Office & Affected Area –(1)

- Overview
  - The Uyali area was affected by the debris flow in April 2009.
  - The area was covered by glaciers in one day and most soil are derived from ice (till material). Gravel deposits are found within the deposits but the amounts are not plenty. At the time of investigation snow covered most areas and made a muddy ground. Absence of coarse materials such as gravel, it is susceptible to initiate the flow type landslides in the Uyali area. 2009 debris flow is also occurred with this ground condition.
- Efforts: The municipal govt of Huroson (Khroson) has prepared hazard map with help of national govt. Response manual of emergency situation is also prepared.
- Advantages: Effective governance of the nation works well under emergency situation especially in maintain social security and order. Appropriate coordination of civil and military department is expected. According to the Professor of National University, the April 2009 Uyali debris flow was induced by overflow of irrigation water and penetration into loess layer. Then drop of the torrent flow level was found 3 days prior to the disaster and they started evacuation 2 days before, on the community's own decision. Although more than 300 houses were destroyed, however, no one was killed. This is a remarkable practice. They are aware of the risk of landslides due to such anthropogenic causes..

2. Khuroson District Office & Affected Area –(2)

- Weakness: During our field trip to landslide sites in Uyali, we could not meet any representative of local community. Under emergency situation of natural / anthropogenic disaster, self-organized activities for saving lives as well as properties are required. We could not evaluate their preparedness, experience and capacity this time.
- Discussions: Not only anthropogenic causes, but also extreme natural conditions such as unusual heavy rain affected by global climate change, and large scale earthquake or their combined conditions should be considered for enhancing the preparedness
- Recommendations
  - Landslides due to anthropogenic causes like leakage from irrigation channel are most frequent and typical signs are known to some extent. Global climate change is taking place, intense rainfall are expected in the future.
  - Communities constructed recently at the exit of channels are at SERIOUS risk of future debris / mud flows. Even though no or almost no water flow is observed in the channel, under extreme weather condition, debris flow can take place and hit the location. In Japan and other developed countries, many residents are killed in such location. Capacity building activities are urgent. New construction of those houses should be prohibited.
  - Their evacuation from large-scale debris flow at the April 2009 disaster was good practice and should be disseminated through the nation. Education on possible signs (opening cracks, subsidence, muddy water, unusual sounds, etc.) are recommended.

2. Khuroson District Office & Affected Area –(3)

- Recommendations (cont.)
  - Their evacuation from large-scale debris flow at the April 2009 disaster was good practice and should be disseminated through the nation. Education on possible signs (opening cracks, subsidence, muddy water, unusual sounds, etc.) are recommended.
  - Education on the mechanism of typical rapid landslides such as softening , erosion, subsidence, liquefaction of loess soils are also recommended. Most importan lesson learnt from the 2011 M9 Tohoku EQ and gigantic tsunami disaster in Japan was that those who fully understand the mechanism of hazards and unavoidable possibility of unexpected magnitude of hazards, only escape and save lives.

3. Institute of Geology, Earthquake Engineering, and Seismology, Academy of Science of Tajikistan - (1)

- Overview
  - Merged into one institution a year ago
- Efforts: Established one year ago by combining two institutes. They have been keeping monitoring of earthquakes and geodetic deformation covering the territory. Long-time records are compiled.
- Advantages: It is the highest academic entity and maintains good relationships with scientists in developed countries. Young ambitious scientists are growing. Started collaboration with EU and US scientists and mobilizing several advanced digital seismometers and GPS receivers in recent years. Precision of seismicity mapping has been raised greatly. Joint geophysical exploration of the ground microtremors for evaluating strong ground motion characteristics under upcoming large-scale earthquakes along the major active fault zones. They have hydro-geological laboratory devoted for landslide dynamics studies. They published a variety of books, research reports, and scientific papers
- Weakness: Most of the distributed seismometers are of old manual type and not connected to Dushanbe in real-time. Their number is still not enough for covering the seismically active territory. Also most data are paper based and difficult to be shared.
- Discussions: No trench survey of active faults had been conducted, although it costs not so much and provides return period of large eq., and information of past liquefaction, landslides, etc.

3. Institute of Geology, Earthquake Engineering, and Seismology, Academy of Science of Tajikistan - (2)

- Recommendation
  - Joint Neotectonics studies with Dept of Geology of the National University especially promoting trench cut survey of major active faults are highly recommended. Its cost are digging and carbon dating only. It provides the activities of specific active fault and rough estimates of the period of next earthquakes as well as past disaster history such as liquefaction, landslides, debris flows, etc.
  - Earthquake risk maps are to be published by the institute. While, detail geomorphological examination of the fault zone topography, can reveal the distribution of past or ancient large-scale earthquake-induced landslides and landslide dams like Usoy dam and Sarez lake. Joint studies with sedimentology and Quaternary geology community on the evolution of ancient landslide dam reservoirs will be highly evaluated.
  - International joint research collaborating with A. Strom (Moscow) and his colleagues in ICL (International Consortium on Landslides) as well as cooperation with academic institutions in Kyrgyzstan, Uzbekistan are recommended.

3. Institute of Geology, Earthquake Engineering, and Seismology, Academy of Science of Tajikistan - (3): Department of Geology

- Efforts: educating students who wish to be geologists. It has 4 chairs, about 20 staffs and 400 students including both undergraduates and post-graduates.
- Advantages: They are updating the most fundamental geological setting and history of their territory. They can mobilize big man power for promoting fundamental research on engineering geology especially on landslide studies. Traditionally maintaining strong tie with Moscow State University and Russian academic institutions. They have been engaged in creating geology maps as well as landslide distribution maps.
- Weakness: Practically, they can not give PhD degree due to complicated dissertation system. Most of excellent students intend to enter graduate course of European universities. Emigration of young excellent scholars to foreign countries.
- Discussions: Could not visit their campus this time, however, interviewed professors during our field visit. Could not obtain enough information about situation of landslide science studies, and collaboration with civil engineering such as geotechnical engg groups of the university.

3. Institute of Geology, Earthquake Engineering, and Seismology, Academy of Science of Tajikistan - (4): Department of Geology

- Recommendation
  - To enhance geologic hazard research capability. It's an cutting edge, inter-disciplinary and integrated science area and it needs collaboration with geology, geophysics, hydrology, geotechnical engineering, as well as risk management science and resilience studies. Typical landslide mechanism such as large scale earthquake induced landslide like Usoy slide, small to medium scale mud slides/flows in loess induced by water leakage from structures, heavy rainfall and combined with quakes.
  - To educate and encourage students who can establish geologic consultants in Tajik in the near future, looking for developing independent market of consulting works. At least the works for evaluating and making order of existing risks in the territory can not be done only by national officers and it needs professional consultants.
  - To collaborate international landslide researchers community to exchange information and knowledge. To join ICL or presenting posters at EGU, AGU, GSA, ISL, IGC, etc.

4. Main Department of Geology, under the Government of Republic of Tajikistan – (1)

- Overview
  - Control tower for geologic information in Tajikistan
- Efforts: Creating every geology-related national scale maps including geological hazard map and landslide distribution map. Controlling on development and preservation of natural resources.
- Advantages: Strong governance of collecting geological information including witness of geological hazards. They have excellent experts on landslides and large accumulation of past landslide records including interesting resident witness such as strange unusual roar sounds from underground as sign of a rapid landslide. They have published a 300 landslides distribution map. It dispatch experts to international academic meetings to collect advanced scientific and engineering information.
- Weakness: They can use less research capability to disaster risk reduction related activities.
- Discussions: Discussed about the possibility to develop nation-wide landslide topography distribution map. Most serious restriction is limitation of budget and human resources.

4. Main Department of Geology, under the Government of Republic of Tajikistan – (2)

- Recommendations
  - To create nation-wide landslide topography distribution map with regards to engineering geology characteristics, and seismicity. Extracting typical head scarps and deposits are not difficult. Using NASA's SRTM (90 m resolution) data and/or Japanese ASTER (30 m) global topography data, both of which are free of charge, could help them very much for interpretation. Free effective GIS software is available at ITC, Netherlands. They may provide training course with certain support. Contact to Prof. van Westin, the eminent landslide and GIS expert (thru Sasha is ok).
  - To evaluate and select societal high-priority landslide site and collect information of their activities by interview of local residents and field visit. Then, appoint local appropriate person in the community to keep paying attention to any change possibly affecting the slope stability. Be careful not to load too much responsibility on the person.
  - To call for any information from communities showing precursor signs of past landslides as a contest or something. Then, dissemination materials of collected typical signs should be distributed. NGOs may help awareness raising activities with the materials..
  - Cooperation with international association such as IAEG (International Association of Engineering Geology), ICL (International Consortium on Landslides), etc.

5. Information Management and Analytical Center (IMAC) of Committee of Emergency Situations (CoES) – (1)

- Overview

  They are formed by Presidential Decree in 2003
- Efforts: New presidential decree in 2009 provided independence from other governmental section. Then, data collection section is separated to avoid information overflow. Options of strategic decision is prepared by this info analysis section.
- Advantages: Effective information collection and analysis system under emergency situation is established. It has GIS technology and employs GIS technicians and ABCD hazard experts. With help from ADRC, they have started pilot study on landslide topography distribution map.
- Weakness: Info analysis section has only 11 officers. When extra-large scale emergency situation arises, additional staffs should be prepared who can join and work effectively. No alternative communication line under emergency situation. When large scale disaster takes place, they have high responsibility to collect precise disaster situation and report to the decision makers in the first 10 – 100 hours.
- Discussions: Their pilot landslide distribution map are well evaluated. It is apparently successful. Using Google Earth and detail topographic data, they can estimate mobility of past landslides.

5. Information Management and Analytical Center (IMAC) of Committee of Emergency Situations (CoES) – (2)

- Recommendations
  - Constructing alternative communication lines / tools for collecting situation information are urgent employing satellite phones, military radio communication lines,
  - Back-up and online-cooperating system employing “cloud” techniques for complied collected data are required. Both the alternative communication system and any info system designed for use in emergency should be used also in daily operation. Otherwise, does not work in emergency situation.
  - BCP of central / local offices for 10 / 100 / 1,000 / 10,000 hours should be considered separately. Keywords for the IT system and resilient societies are (1) Self-organized, networked, cooperating, and (2) 4R (robustness, rapidity, redundancy, resourcefulness). Especially, those should be applied to structure of information network between central govt and local offices.
  - Nation-wide landslide topography distribution map should be jointly prepared with Dept of Geology and National University and built on GIS.
  - To extract landslide hazard vulnerable communities such as adjacent to ancient landslide scars and recent anthropogenic ground water supply to loess.
  - Education is most important for enhancing vulnerable community’s capacity against landslides, including (1) awareness of potential slides, (2) initiation mechanism, and (3) possible signs of landslides.

Field Visit

Field trip Route from Dushanbe to Uyali on Feb 12

Google Earth imagery of Uyali, Tajikistan

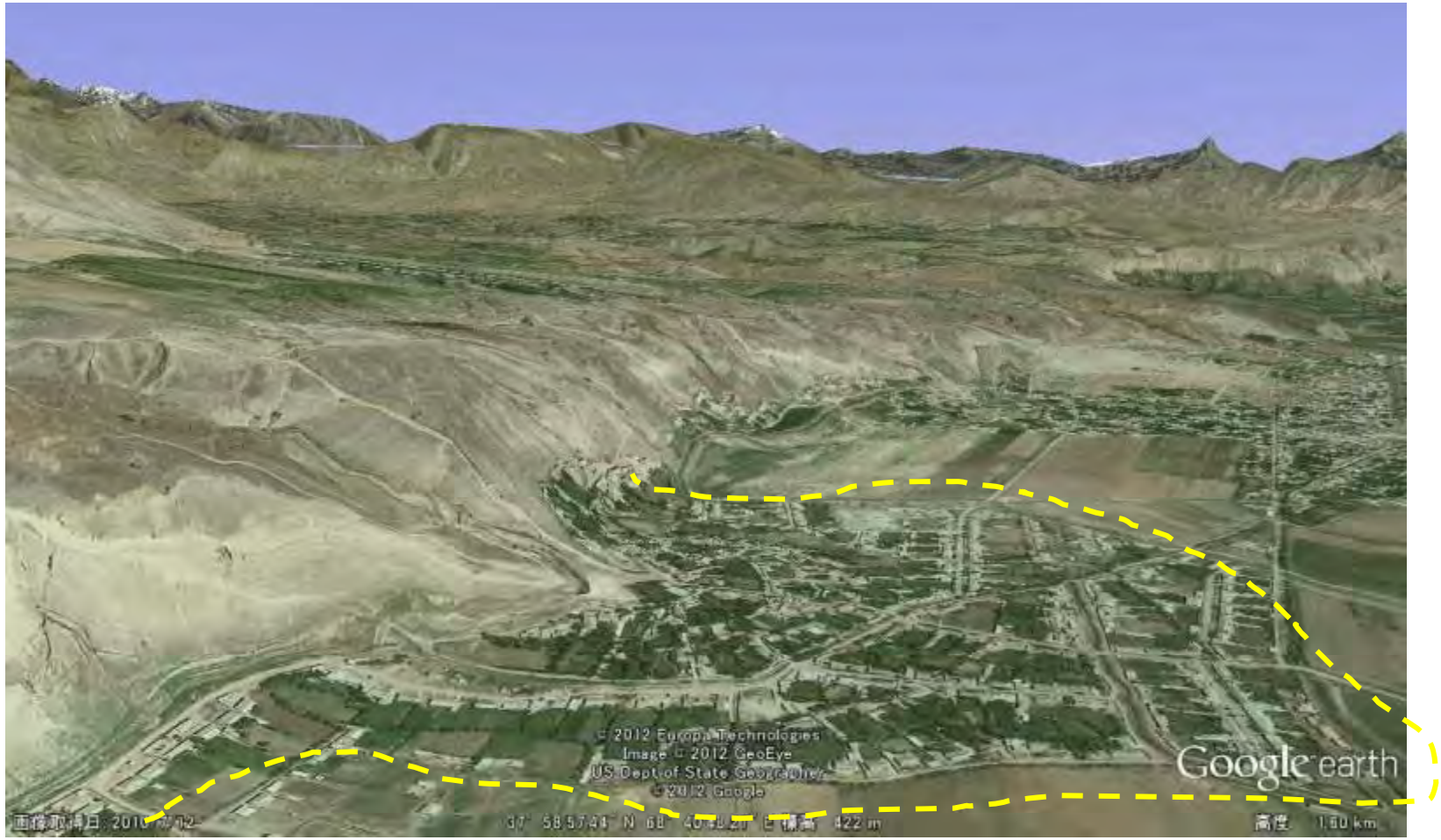
(old landslide scars ? Those scars could be retrogressed to upward. Much debris remain in the channel bottom. They could be mobilized under extreme condition.)

Possible sources of upcoming debris slide – debris flows
Strongly winded meander. Graven on banks show detachment of the deposits, which could be mobilized in the future. Potential landslide scarps are visible on hillside slope.

Sediment reach distance appears on topography

(Village 18-Partsyezd, Ayni, Huroson district)

(This new settlement is constructed recently on mud flow fan. Many houses are located in front of the exit of the channel. They are seriously threatened by future floods / mud flows)

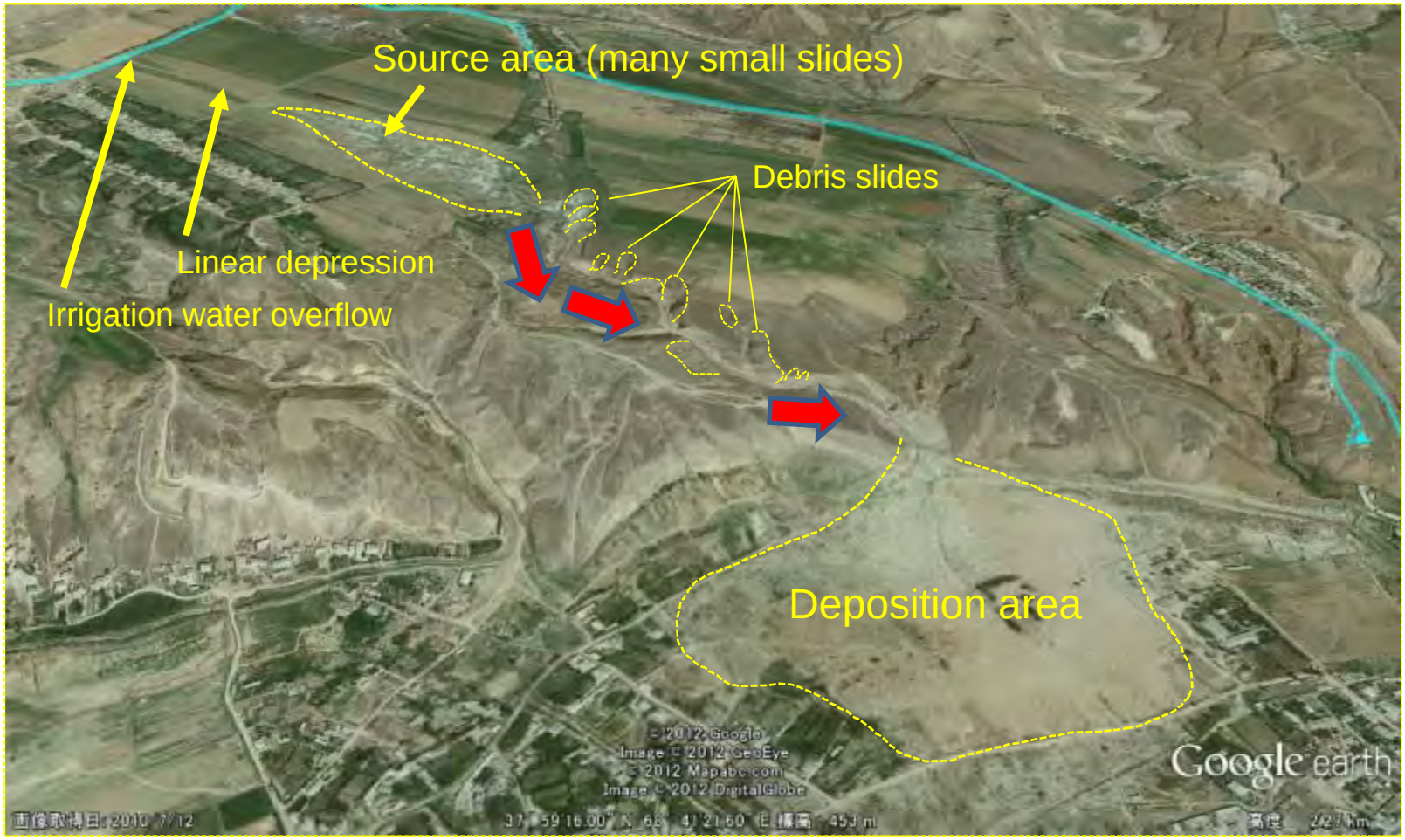


Sediment reach distance appears on topography

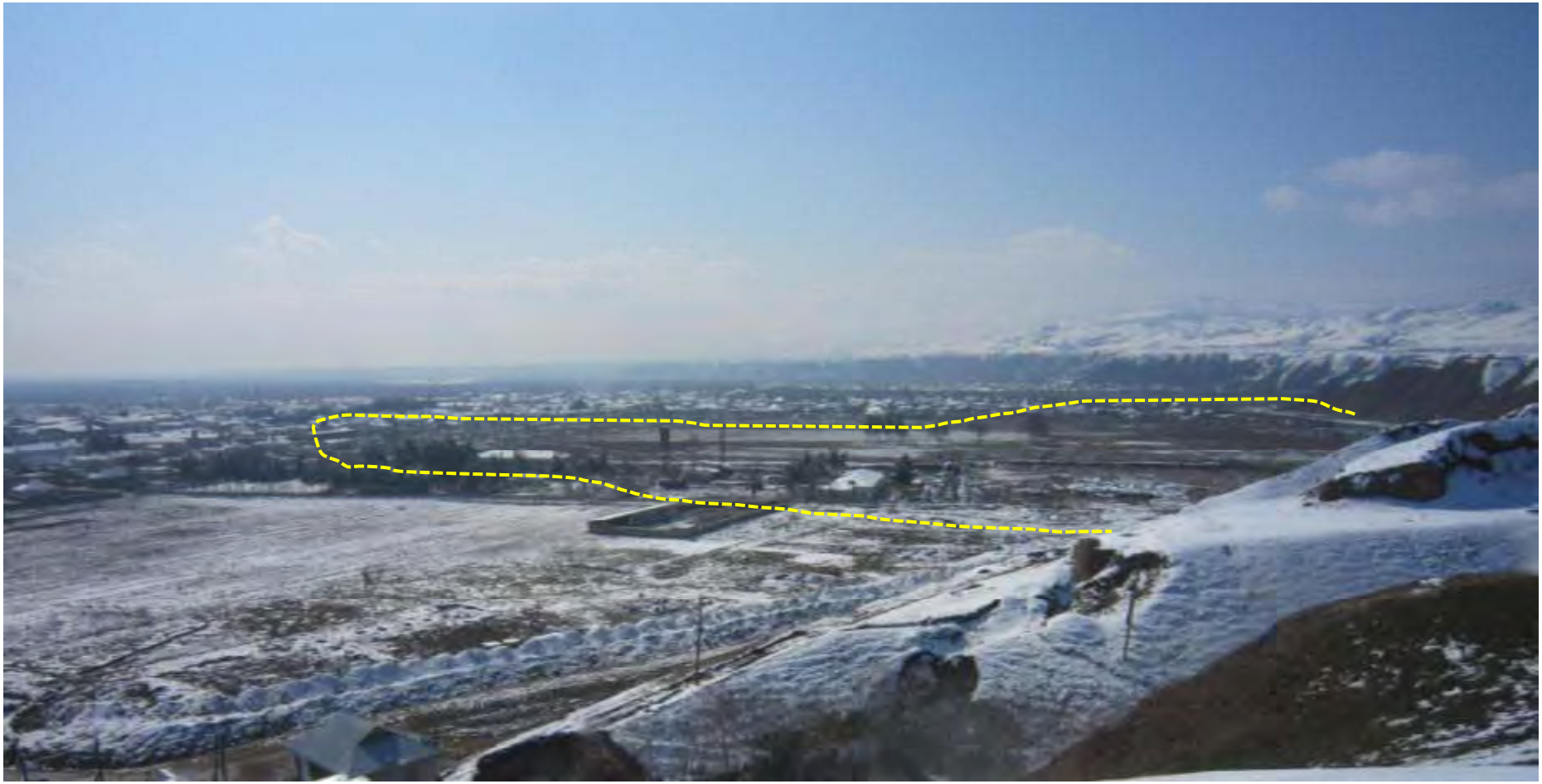
(Examination of micro-topography provides accumulation of past sediment transportation indicating the reach of mud flows as well as landslides)

29 April 2009 Uyali debris flow disaster site

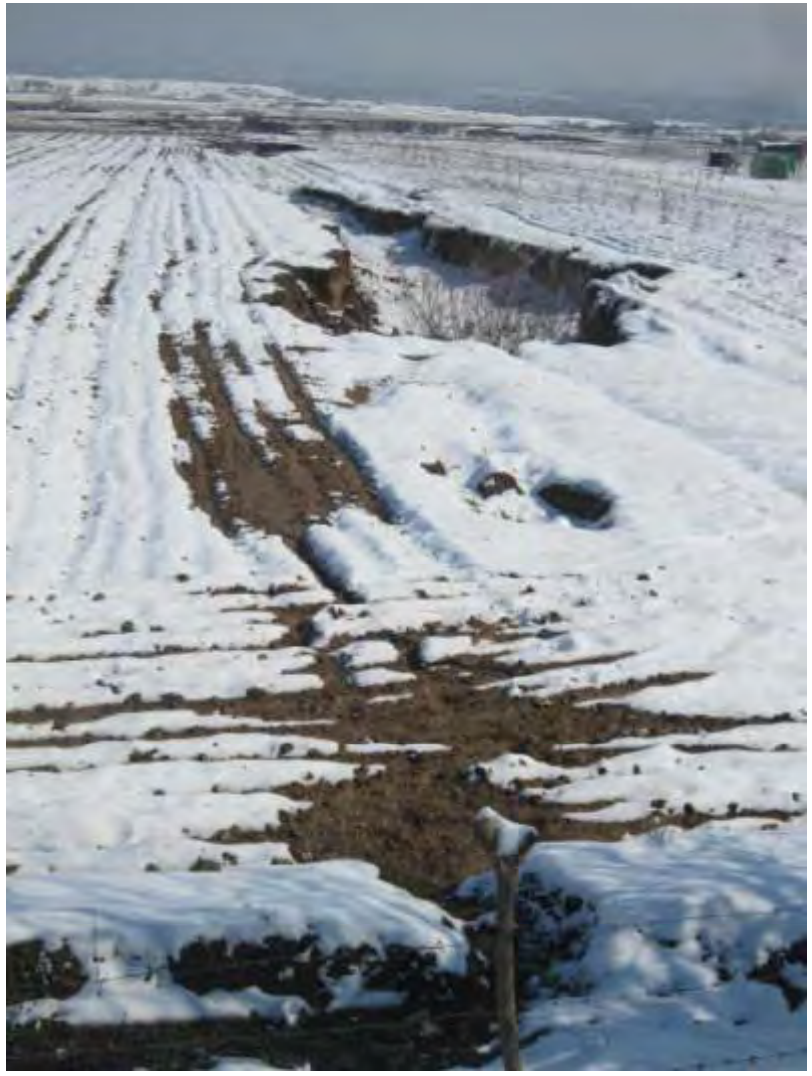
(The source area, running channel, and deposition area of the April 2009 debris flow is visible on Google Earch, free version. Even remnant of houses are recognized. The source area contains a lot of small slide scars and high possibility to cause mud flows again)



Deposition area of the April 2009 Uyali debris flow



Linear subsidence in the upslope of 2009 Uyali debris flow due to irrigation channel overflow



Retrogressing of 60 m deep subsidence and landslides due to irrigation water leakage at east of 2009 Uyali debris flow

Retrogressing of 60 m deep subsidence and landslides due to irrigation water leakage at east of 2009 Uyali debris flow
(Damaged steel drainage pipe)

Retrogressing of 60 m deep subsidence and landslides due to irrigation water leakage at east of 2009 Uyali debris flow
(View from top)

Irrigation channel which affects the Uyali area by repeated overflow

Retrogressing of 60 m deep subsidence and landslides due to irrigation water leakage at east of 2009 Uyali debris flow

(Malfunctioned water gate of irrigation channel filled with mud)

Usoy landslide dam induced by 1911 eq.

(Elevation difference of lake water and dam body is 100 – 200 m. More than 10 seepage points are visible at the bottom of the dam)

Seepages and associated small slides of the downstream side of the Usoy landslide dam

Summary of Findings

(Summary)

Advantages

Based on Observation and Analysis

- There are NGOs that are able to conduct DRR activities in close cooperation with the residents and with consideration for the real needs of them
- In areas devastated by landslides, residents evacuated smoothly based on the information provided by a resident who noticed the sign of risks and there were no human casualties. Mutual tie among local residents seems very strong.
- The research institutions have developed motivated young researchers and also have good networks with researchers in developed countries.
- Geological Survey Institute and Earthquake Engineering and Seismology Institute has recently integrated. Collaborative research can be expected in the future.
- Approximately 400 undergraduate and graduate students are enrolled in the geology department of the National University. The department has strong relationship with Moscow State University and Russian Academy of Sciences.
- Main Geology Department under the Government of Tajikistan has accumulated useful geological information including witness information on geological hazard and information of past landslides in the past.
- Under the Committee for Emergency Situation, Information Management and Analysis Center was established in 2007 with the independent command chain based on common understanding of the importance of system for aggregating disaster-related information.

(Summary)

Points to Be Considered for Further Improvement
Based on Observation and Analysis

- There is no landslide risk management system in association with the observation of rainfall.
- Disaster early warning mechanism for transmission of information to residents is still weak.
- The many of hazard maps have been created during the Soviet era, and have not been updated the information.
- Capacities of landslide zoning of the local engineers who participate in the disaster mitigation activities are insufficient.
- The lack of latest observation equipments due to the limitation of budget. Preparation of the equipments is relied heavily on support from abroad.
- Students cannot receive PhD in the Department of Geology in the National University. Therefore they go to universities in Europe for continuing the research activities, and resulted in loss of specialist personnel.
- Due to budget shortfall, disaster prevention activities are not appropriately conducted based on the risk information gained.
- Number of the staff members in the Information Management and Analysis Center of CoES is only 11 yet. They need more staffs to effectively gather and analyze information.

(Summary)

Findings and Recommendations of Reviewer

- More effective activities by strengthening collaboration among relevant agencies and stakeholders
  - Cooperation of research institutions in the activities of NGO
  - Promotion of cooperation among government agencies, research institutes, organizations that directly involved community activities including NGOs
- Create easy-to-understand materials for residents
  - Create easy to understand maps and materials about the risks they face to and actions to be taken for reducing damage
- Restriction of settlement in the risk areas or promotion of people's sound understanding of the signs of disasters for living with risks
- Public awareness rising for understanding about human activities affect the geology and taking necessary measures to the current issues
  - Inspection and repair of old irrigation systems
- Development of a monitoring system in landslide risk area: Observation of rainfall and signs
- Development of information dissemination system on disaster risks to reach to the residents
- Capacity development of researchers through participation in international conferences and workshops
- Enhancement of coordination capabilities of Committee of Emergency Situations

Thank you very much
for your kind cooperation!

Thanks for beautiful scenery!

Thanks for good interpretation,
Ms. Veronika Grushevskaya!

Thanks for delicious food!