ネパール治水砂防技術交流会

特　別　講　演　会

「Need of Landslide Inventory and Hazard Mapping in Nepal」

（ネパールの土砂災害目録とハザードマップの必要性）

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開　催　：　平成３１年　３月　７日

Recent Status of Landslide Hazard Management , Needs of Landslide Inventory and Hazard Mapping in Nepal

Presentation at NFAD (Sabo Frontier Foundation), Tokyo
March 7, 2019

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Landslide Disaster Management in Nepal
A Near-future perspective

Prepared by
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Nepal-Japan Friendship Association of Water Induced Disaster (NFAD), Japan
Department of Water Induced Disaster Management (DWIDM)

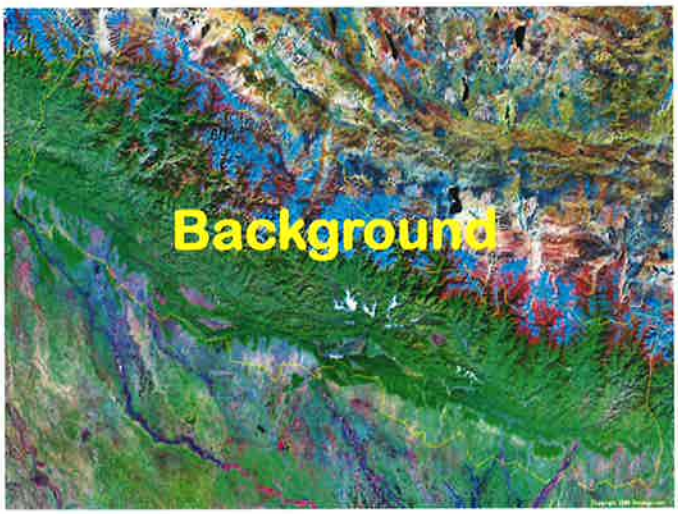
2016

Available in web site of NFAD

Landslide Disaster Management in Nepal
A Future Perspective

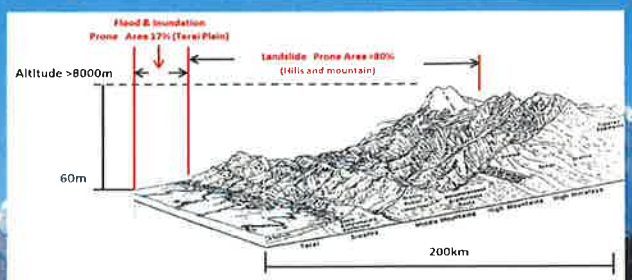
Coverage

- Background
- Issues due to landslide Disaster in Nepal
- Impacts of landslide
- Landslide Disaster by Gorkha Earthquake
- J Rapid study of Gorkha Earthquake induced landslide
- Recent Status of Landslide Hazard Management in Nepal
- Landslide Hazard Mapping in Nepal till now
- Needs of Landslide Inventory and Hazard map
- What will be necessary for LS hazard mapping

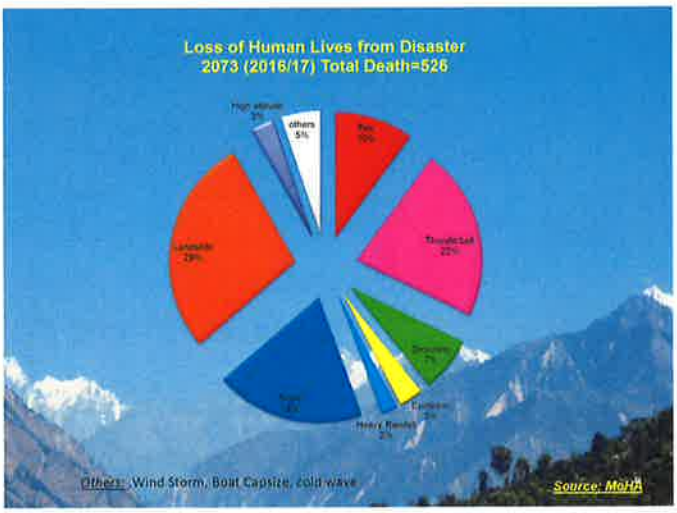


Area Coverage of Nepal

The Himalayas (4000 - 8848 m)	= 15 %
The Hills/Mountains (330- 4000 m)	= 68 %
The Terai Plain (60- 330 m)	= 17 %

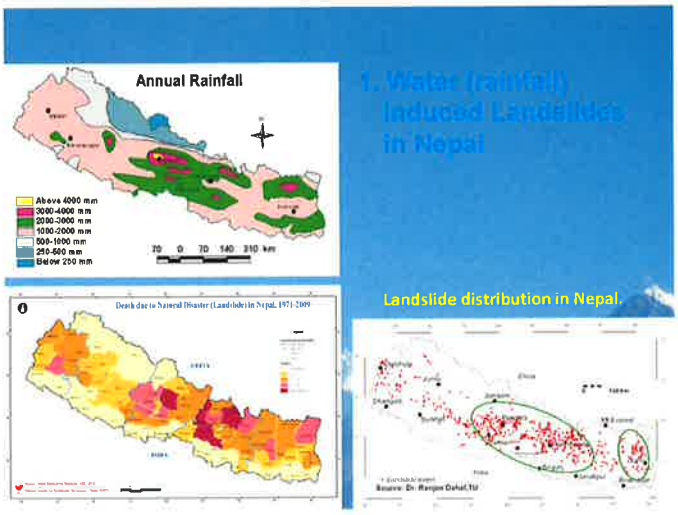


Area of Nepal 147,181 sq. km

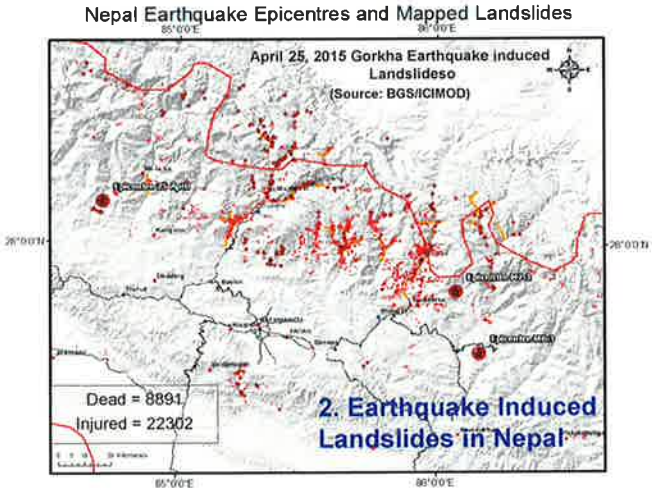


Main Causes/category of Landslide in Nepal are:

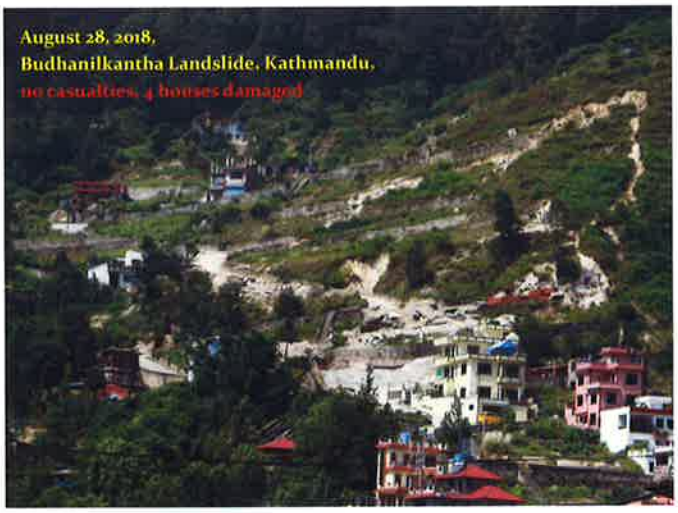
- Water Induced (ground water) Landslide
- Earthquake Induced Landslide
- Anthropogenic landslide

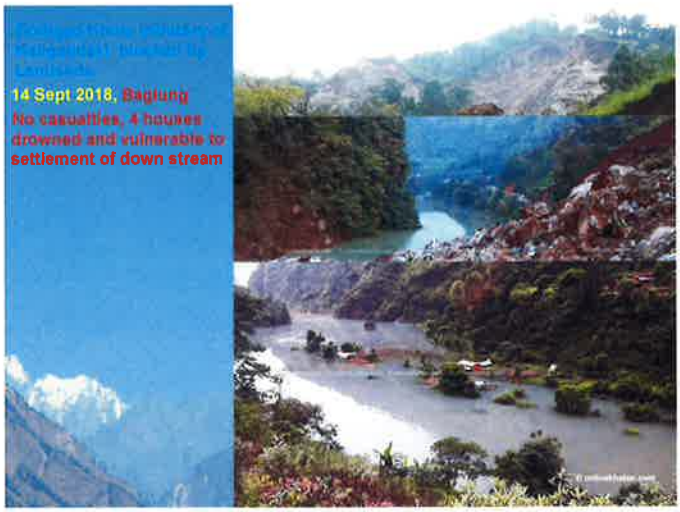


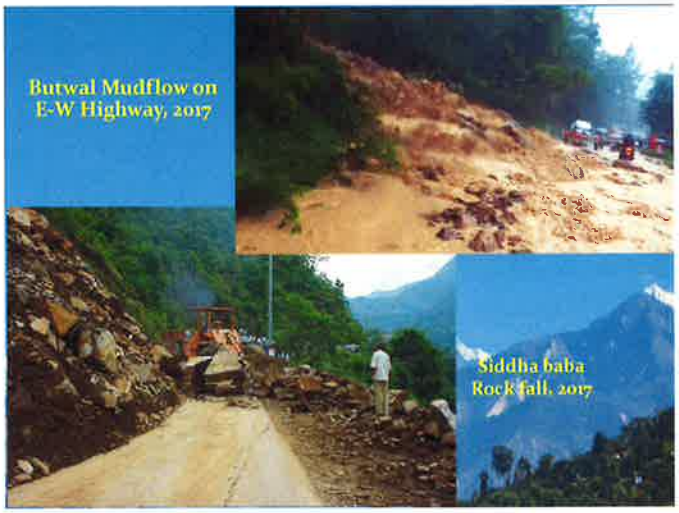
Nepal Earthquake Epicentres and Mapped Landslides



Issues due to Landslide Disaster in Nepal




14 Sept 2018, Baglung
No casualties, 4 houses drowned and vulnerable to settlement of down stream


Butwal Mudflow on E-W Highway, 2017
Siddha baba Rock fall, 2017


Bhote Khosi Disaster 2016
July 6, 2016, more than 200 houses were swept away by the flood and bank cutting.


Taplejung Disaster 2015
June 10, 2015, debris and mud flow type of mass movement killed 53 people.

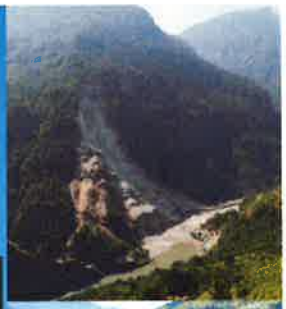

August 2, 2014, Killed 156 people with more than 40 houses buried.
Jure Landslide Disaster 2014
Killed 9 people and more than 4400 people were affected.
May 5 2012,


Gorkha Earthquake Induced Landslide
Affecting Trishuli A Hydropower
Trishuli A Hydropower
Photo bySC Amatya Oct 29 2015

Kaligandaki Landslide Damming due to Gorkha Earthquake

Threat ening down stream settlement

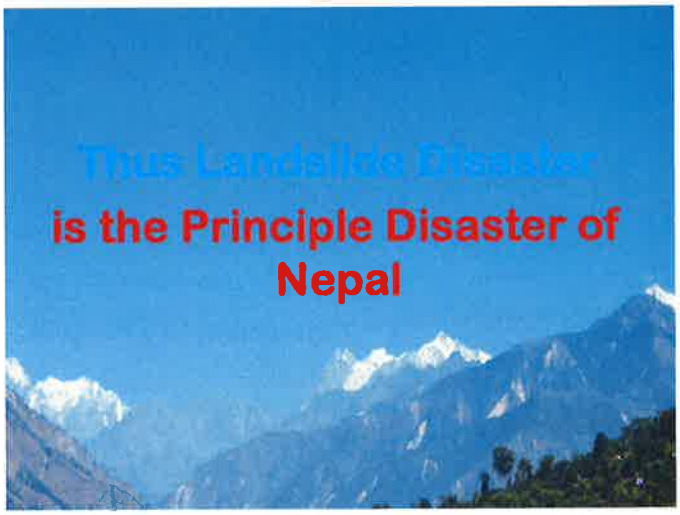
26 May 2015



Beni, Myagdi

Thus Landslide Disaster

is the Principle Disaster of Nepal



Impacts of landslide

Road

Sindhuli Road

Naubise Road

Mu-Na Road

Ilam Road

Jure Landslide Damming

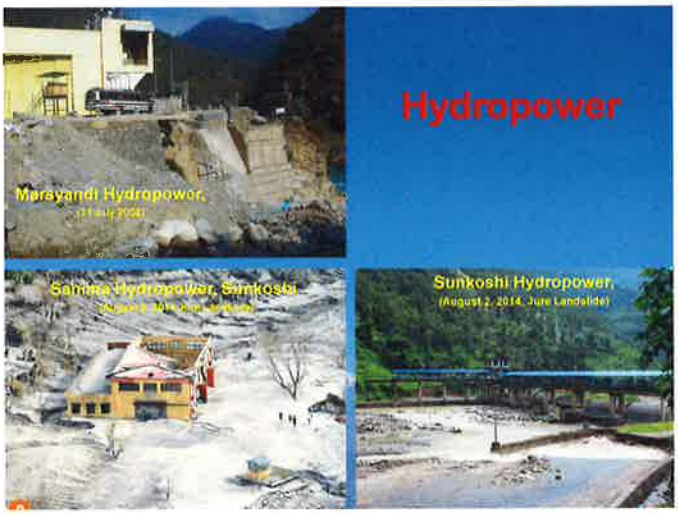
Threat ening down stream settlement

August 2, 2014

Bridge

Damaged Khahare Khola Bridge at Ch. 11+300km (Jugedi)

19 14:07

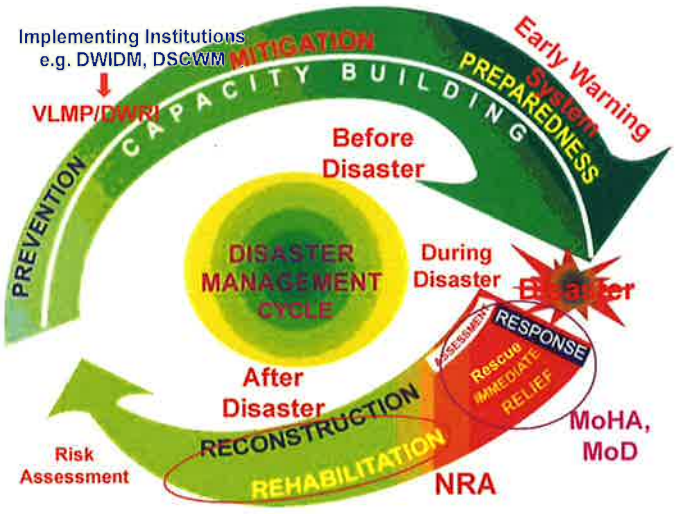


Affected to

National Goal as;

- Poverty Alleviation
- Gross Domestic Product (GDP) rate of Nepal
- Disaster affecting GDP by about 4%

Recent Situation of Landslide Hazard Management and Institution in Nepal



Institution Development of Disaster Management in Nepal

As per the Natural Calamity (Relief) Act 1982, MoHA is the nodal body of Disaster Management in Nepal from central to local government.

The MoHA is addressing to the Rescue and Relief works to immediate Response then the management of data and fund (After Disaster Phase).

To address the Before Disaster Phase the Institutions like DWIDM/DSCWM had a major role to address, Disaster management as Prevention, Preparedness, Mitigation, and Technology development of landslide in Nepal.

NFAD and DWIDM had organized one day Seminar on "Sediment Disasters and their Mitigation in Nepal". Focusing the importance of DWIDM Institute. On April 11, 2018.

This time the DWIDM/DSCWM is no more in Nepal Government. DWIDM merged to DWRI, DSCWM merged to DoF.

Recently

The new Disaster Risk Reduction and Management Act, 2017 was reformed to replace the Natural Calamity (Relief) Act 1982, which mentioned as,

- A clear multi-tier institutional structure of disaster risk reduction and management (at the center, the provinces, the districts and the local level)
- And there will be a new National Disaster Risk Reduction and Management Authority (NDRRA) at the Ministry of Home Affairs as the implementing arm of the government.
- But still the Act 2017 (Authority) is focused on Rescue and Relief works of Disaster area only.

History of Landslide Disaster Management Institute Development in Nepal

The Shallow landslide management was started in Nepal since 1974 by Department of Soil Conservation and Watershed Management (DSCWM) under MoF.

The Deep seated landslide management was initiated in Nepal since 1991 after the establishment of The Water Induced Disaster Prevention Technical Centre (DPTC) under then Ministry of Water Resources and Support of GoJ.

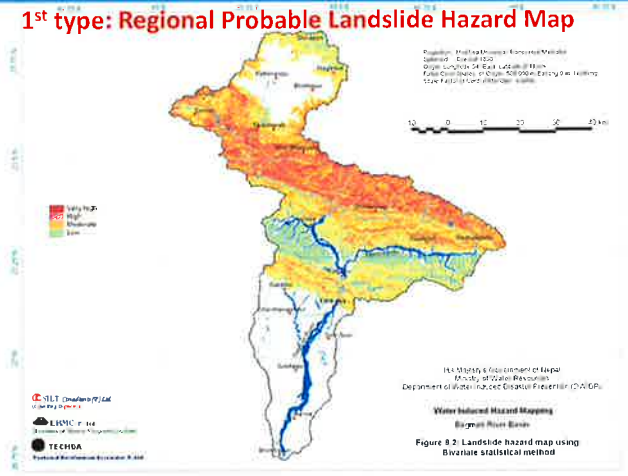
- The DPTC was institutionalized to Department of Water Induced Disaster Prevention (DWIDP) on 2000
- Renamed as Department of Water Induced Disaster Management (DWIDM) on 2016 with addition of Landslide Study and Management Division.
- It was merged to DWRI on July 2018.
- The Vulnerable Landslide Management Project was established on January 17, 2017 under then DWIDM and now under DWRI

Landslide Hazard Mapping Methods applied in Nepal till now

Types of Hazard Maps Available

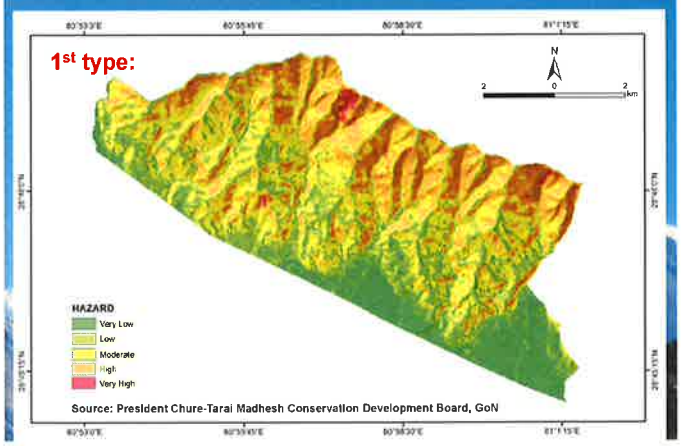
1. **Regional HM** based on Satellite image, Aerial Photo and Topographical map using GIS Tool with scores.
2. **Community HM** based on Local Information, Image/Aerial Photo and Topographical map.
3. **General Practiced HM** (used in Japan and Nepal) Landslide Inventory Map, Landslide Hazard Map with Ranking Level using AHP evaluation method and Detailed Individual Landslide Hazard Map

1st type: Regional Probable Landslide Hazard Map



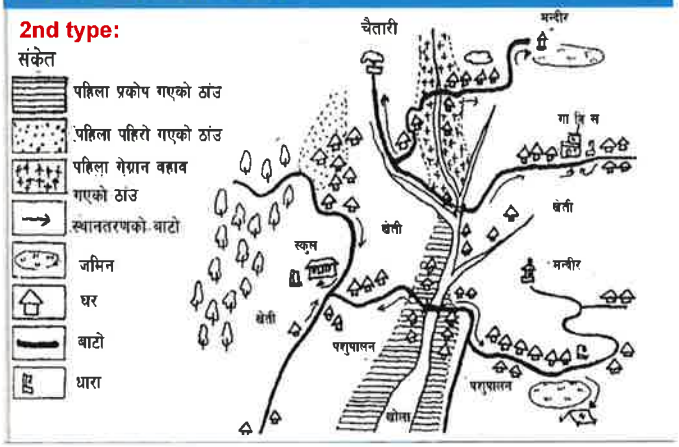
Landslide hazard map of Chure region of Ghodaghodi Nagarpalika, Kailali.

1st type:



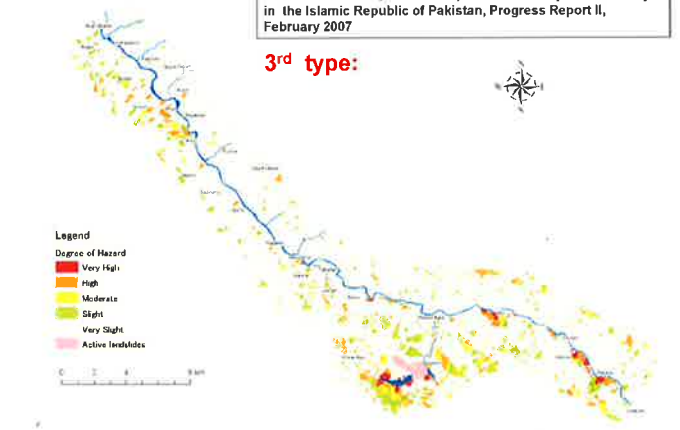
Example of Hazard Map prepared by local community people

2nd type:



Source: JICA/Govt. of Pakistan, Pakistan Transport Plan study in the Islamic Republic of Pakistan, Progress Report II, February 2007

3rd type:



Landslides hazard assessment by AHP (Analytical Hierarchy Process)

Landslide Hazard map of Kurikoma Region, Miyagi prefecture, Japan

3rd type:

Landslide Hazard Map with Ranking Level

Institutions/Projects are involving to prepare Landslide Hazard maps in Nepal:

- ICIMOD – inventory and Hazard maps of limited area for their own purpose – Type 1 Hazard map
- DMG – Prepared Hazard maps of limited area – Type 1
- The Project on Rehabilitation and Recovery from Nepal Earthquake (JICA) did some works about investigation and hazard maps of Gorkha and Sindhupalchok. Type 1 HM
- DWIDM – prepared landslide Hazard Maps of more than 10 watersheds of central and eastern region Type 1 HM
- JRapid program Japan (after Gorkha Earthquake 2015) – prepared Earthquake Induced landslide Hazard maps and inventories of Gorkha, Dhading, Rasuwa, Nuwakot and Sindhupalchowk Type 1 Hazard map
- VLMP – Planning to prepare landslide Inventory and Hazard Maps of pocket areas of Nepal and Individual Landslide Hazard Map of Hot spot for Master Plan and EWS purpose – Type 3 HM.

Needs of Landslide Inventory and Hazard Mapping in Nepal

Besides the issues and impacts due to landslide disasters in Nepal,

There are no availability of necessary information (no data) like

Inventory Map and Hazard Map of Landslides in Nepal. (except in few pocket areas)

In this regard,

Nepal is in need of Water Induced and Earthquake induced

Landslide Inventory and Hazard maps

Which will provide information for Landslide Disaster Management, Land Use and Early Warning System (EWS) as well.

More over,

The manpower (capacity building) having knowledge of Landslide Hazard management is very much limited in Nepal.

To address them,

The Vulnerable Landslide Management Project (VLMP) under DWRI organized recently a "Comprehensive Training on Landslide Risk Management in Nepal" from 9-14 January 2019 (5 days) for Engineering professionals of DWRI and Line Agencies.

The Landslide Disaster Management Modules are

1. General Background and Issues of Landslide Disaster Management in Nepal
2. Mass Movement (Landslide)-Def., Cause, Classification, and Mitigation measures of slow moving landslide and Slope failure (Structural and Nonstructural)
3. Debris Flow: Def. Cause, Classification, Mitigation measures (Structural +Non)
4. Survey and Investigation of Landslide with LS Map+ Master Plan
5. Hazard Mapping of LS + Slope Failure+ Debris Flow + Disaster Management
6. Early Warning System (EWS) – Need and Application for LS+DF+SF
7. Geo-physical Survey: Electrical Resistivity Tomography and its Application in LS
8. Bio-Engineering Need and its Role and Application in Landslide Mitigation (x2)
9. Design Procedures of Structures applied in Landslide Mitigation Measures (x3)
10. Slope Stability Analysis

What will be necessary for Landslide Hazard Mapping in Nepal

As we mentioned, to address the requirements of Landslide Inventory and Hazard map of Nepal,

The AHP evaluation method is more appropriate in case of Nepal

The AHP evaluation method provides the inventory of landslides, landslide Hazard map with ranking and help to select the hot spot of landslides (affecting, settlement, infrastructures, river damming and so on)

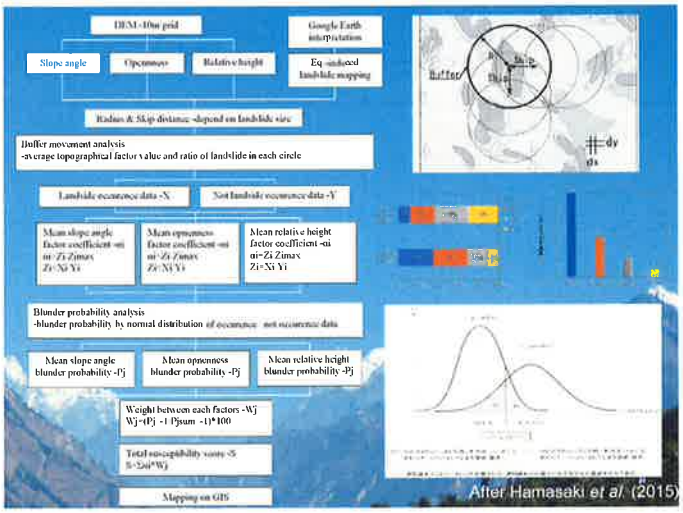
Then we can prepare the individual landslide Hazard map with zoning which will support to prepare Early Warning System (EWS) and land use in the hazard area of landslide such as,

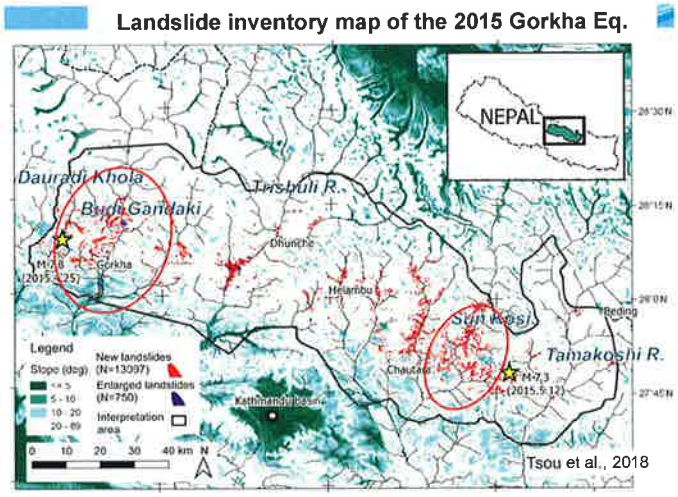
Thus, the Landslide Hazard Map will support to planning and designing of the structural and non-structural countermeasures as,

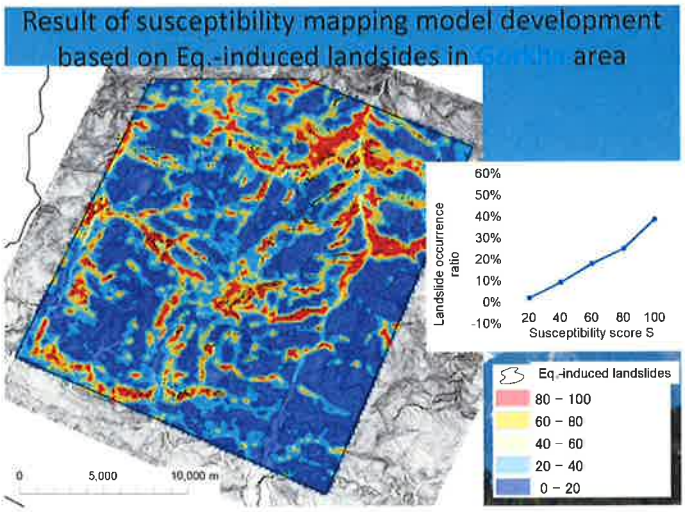
- Design of Landslide Mitigation Measures
- Prepare Land use and Community Awareness
- Development of Early Warning System
- Easy to Develop Policy, Acts, Rules and Regulation and so on.

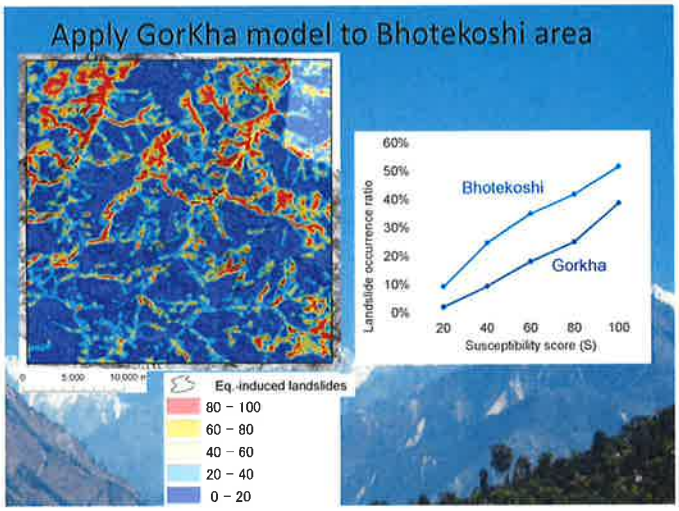
Software Development for Hazard Map Preparation

"Evaluation of Landslide Risks cause by Earthquakes in the Himalayas of Nepal and Their Uses in Preventing regional disasters" (Research Grant in Aid, Kakenhi 16H03149)









Conclusion

The manpower (capacity building) having knowledge of Landslide Hazard management is needed to be increased in Nepal.

To prepare the Landslide Inventory and Hazard Map and Landslide Management in Nepal, the application of AHP Evaluation Method is more appropriate.

So, capacity building on AHP evaluation Methods to the engineers and geologist of related line agencies of Nepal is needed.

Still the Modified Act 2017 (Authority), MoHA is focused on Reacue and Relief works of Disaster area only.

And this time, only one institute related to Landslide Management is remained, that is Vulnerable landslide Management (VLMP) in Nepal under Department of Water Resources and Irrigation (DWRI) as study and implementation Institution.

The data of former DWIDM are now more vulnerable to vanish after merged to DWRI. So this sector also have to be addressed in some extent.

Any way, this time we are doing effort to develop the Vulnerable Landslide Management Project (VLMP)/DWRI as

The Authentic Institute related to Landslide Study and Management Institute of Nepal in Near Future.

Information

Karnali Province (6): Largest in area (27,984 sq.km) and least developed – Nepal Development Research Institute (NDRI) prioritizing to prepare landslide inventory and hazard map for infrastructure development