

*GUIDELINES INTEGRATING CLIMATE CHANGE PROJECTION INTO
LANDSLIDE RISK ASSESSMENT AND MAPPING AT THE RIVER
BASIN LEVEL*

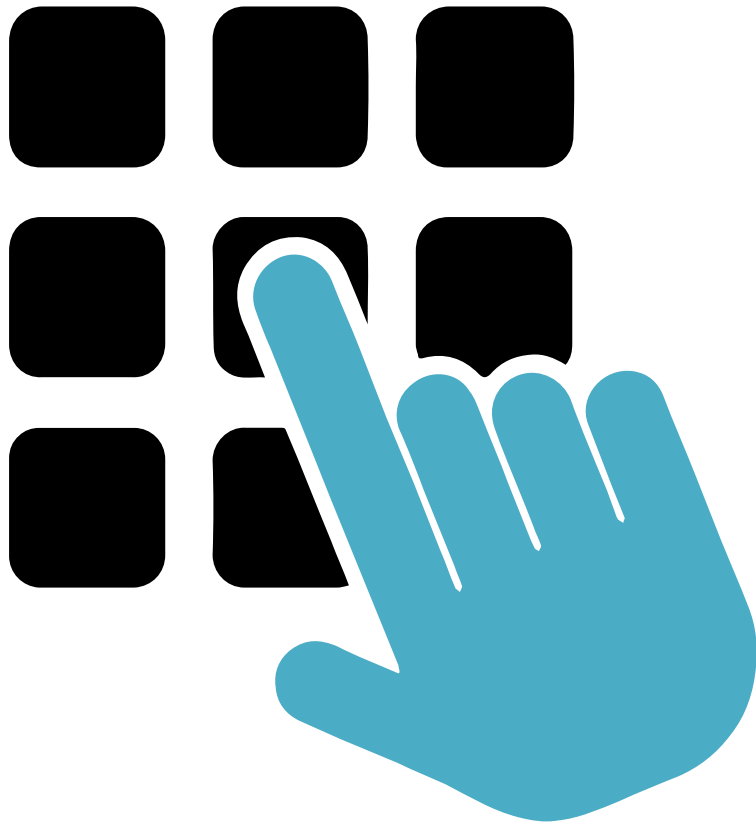
**STRATEGY FOR GUIDELINE
IMPLEMENTATION AND WAY FORWARD**

**Final Project Seminar
23 February 2021**

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Asian Disaster Preparedness Center



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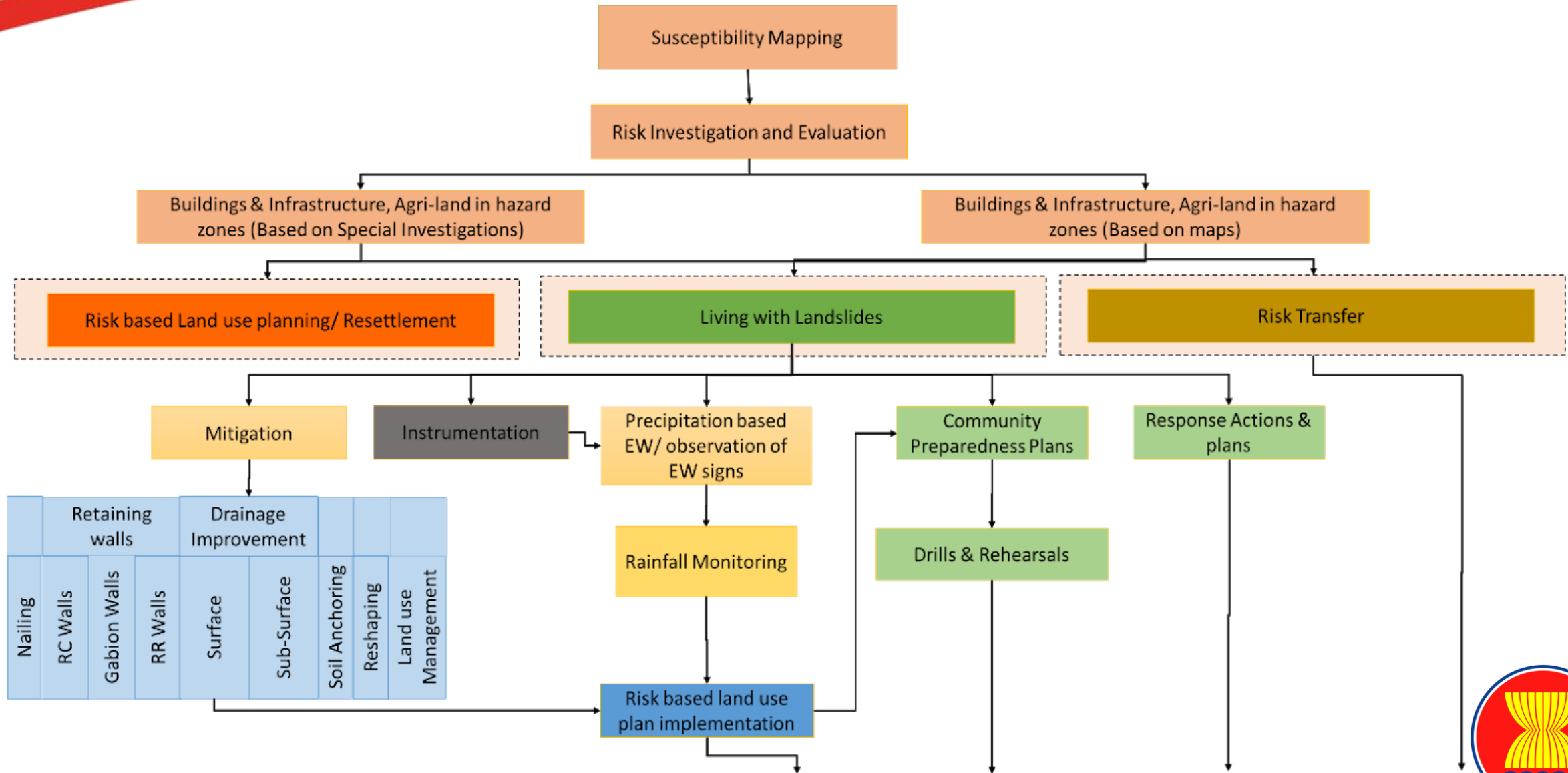
Landslide Risk Management
Framework and strategy for
risk mitigation

2

Recommendations

Landslide Risk Management Framework and strategy for risk mitigation

Landslide Risk Management Framework



Continuous Risk Monitoring & Repeat Actions for Landslide Risk Reduction

Conventional Engineering Solutions



a



b



- a. Gabion wall
- b. Soil nailing & shotcreting
- c. Random rubble wall

Nature-based Solutions: Green Solutions



a. Live Staking



a. Bamboo crib wall
(Acharya, 2020)

Hybrid Solutions



Integrating Nature-based Solutions with conventional engineering structures

Key points to take away (recommendation)

Streamlining baseline information collection, data sharing and database maintenance (landslide inventory)



On a weekend

Questionnaire No: _____ GPS Location Lat: _____ Lon: _____
Address (in the order of house no, road name, locality name, village/city name): _____

Household Survey for Landslide Risk Assessment - Lao PDR

This survey is being conducted to assess the landslide risks faced by the local communities to strengthen the local disaster risk reduction mechanisms, no personal information is being collected and the data collected will be strictly used by the local authorities and the study team and will not be shared with a third party.

1. Household details

1. Information on individuals and families

Residents	Age	Gender	Education	Occupation	Distance to workplace (Km)	Mode of transport to work	Differently abled (Yes / No)
Family 1							
Head							
Family 2							
Head							
Family 3							
Head							
Temporary residents (if any)							
Head							

Education	Occupation	Mode of transport
1. Currently Schooling	1. Government	<u>Infrastructure:</u>
2. Primary school	2. Private sector job	1. Gravel road
3. Secondary school	3. Self employed - trade & business	2. Paved road (concrete/bitumen)
4. Graduate	4. Self employed - Agriculture	3. Unpaved/mud road
5. Post graduate	5. House wife	<u>Vehicle:</u>
6. Diploma	6. Retired	a. Car
7. No formal education	7. Labour	b. Bike
	8. Unemployed	c. Bicycle
		d. Bus
		e. Train

1	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

tc)

1	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24

bars

Details

1. Built-up area

Land in which the building is situated _____ (Wa/Rai/ngan/Hectares) area of
t: _____ (Wa/Rai/ngan/Hectares) (or % of the total built up area
_____%)

se (Wa/Rai/ngan/Rai) _____

of the land in which the house is built

☐ Lease ☐ Illegle settlement ☐ Other _____

or a single storied house)

use ☐ Multi-family house ☐ Commercial (shop) ☐ Commercial (Workshop)

☐ School ☐ Hospital ☐ Other _____

unistoried flat)

2nd Floor _____ 3rd floor _____ 4th floor _____ Other floors _____

station for filling the blanks above: 1. All floors residential 2. Dwelling

) 4. Commercial (Workshop) 5. Office's 6. School

Other _____

Details of the house/building

tion ☐ 1 - 10, ☐ 11 - 20, ☐ 21 - 30, ☐ 31 - 40, ☐ 41 - 50,
☐ 51 - 70, ☐ 71 - 80, ☐ 81 - 90, ☐ 91 - 100, ☐ >100 years ago

ased on engineering, architectural, technical assistance to construct the house

Don't know

e house? ☐ Architect / Draftsman

☐ Head of the house

☐ Mason

☐ By a

cy (Specify: _____), ☐ Construction firm (Please specify: _____)

.....) ☐ Others (Please specify: _____)

e construction of this house? ☐ No formal approval, ☐ Ministry of Public Works and Transport

overment, ☐ Authorized construction company (Please specify: _____)

.....) ☐ Others (please specify: _____)

es at the house

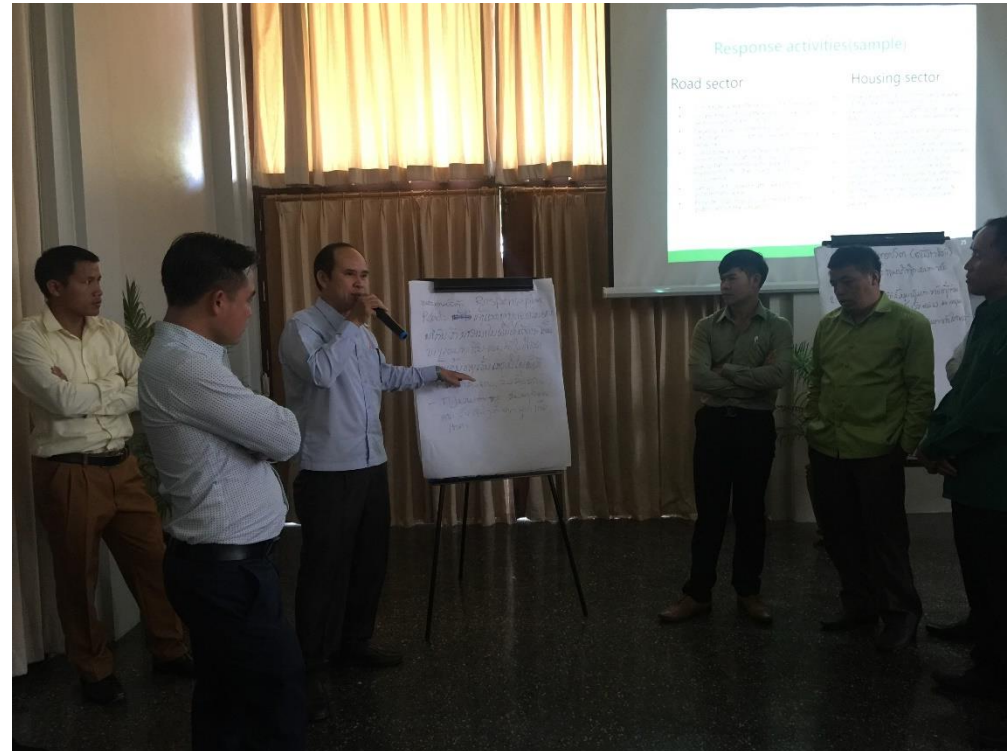
Services	Yes	No
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
il	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>

Streamlining baseline information collection, data sharing and database maintenance (landslide inventory)

1. The responsibility for collection of baseline data lies with a diverse number of sector level agencies (Eg: Roads Department) that have official mandates for data collection, data maintenance, data verification, data sharing, etc. These agencies should consider it as their responsibility and have mandates to cover data collection to satisfy the needs of the landslide risk assessment components(hazard, exposure, vulnerability related data).
2. Record keeping of baseline data, is a systemized process which include verification and data maintenance. The respective national agency is responsible for record keeping (for example, the Department of Roads should keep all landslide records related to the road network), should carry out necessary verifications and maintain a database that is easily accessible for other user agencies.



Designating an agency to provide dedicated landslide related work and assessment



Designating an agency to provide dedicated landslide related work and assessment

Government should take action to establish a dedicated technical agency or agencies to undertake landslide DRR functions and responsibilities. The agency will be tasked with the following key landslide DRR functions, among others:

- Landslide early warning
- Landslide hazard and risk mapping
- Landslide risk minimization activities that may include
 - Structural mitigation
 - Enhancement of community preparedness to ensure safety in areas with moderate landslide hazards
 - Promotion of resilient construction practices in landslide prone areas
 - Human settlement planning, including resettlement of vulnerable people living in high landslide hazard prone areas
- Recovery project implementation after large scale landslide disaster events





**Sharing landslide
risk knowledge
widely and
bridging
information gaps**



Sharing landslide risk knowledge widely and bridging information gaps

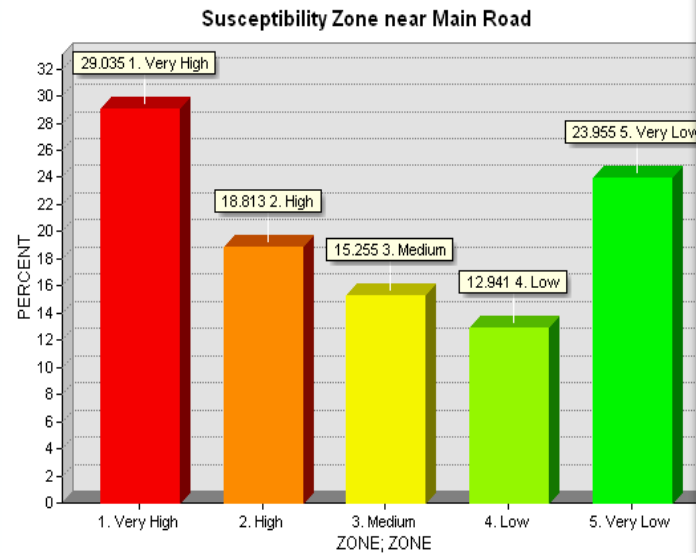
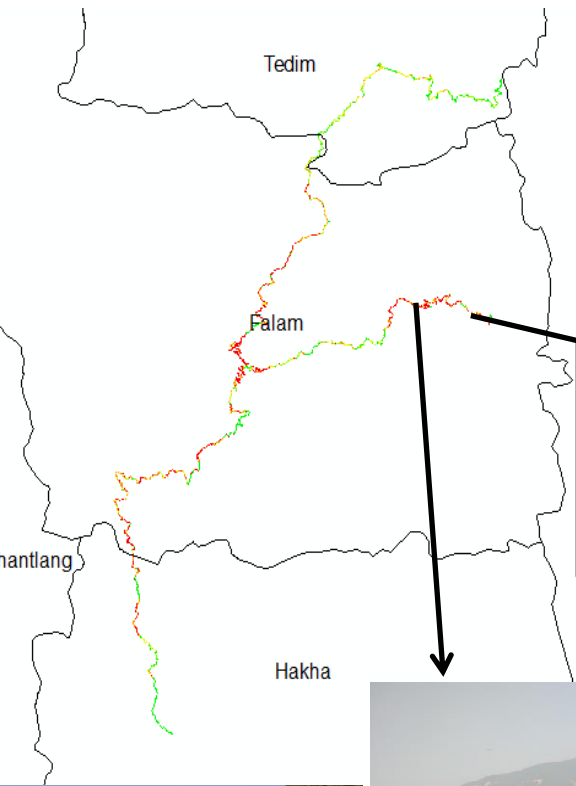
Risk knowledge programs and sharing must recognize that different stakeholders use risk information for different purposes and it is therefore essential to map these information needs and share risk knowledge with the designated agencies. A sample of risk knowledge purposes are as follows:

- General resilience building through identification of geo-political areas affected by landslide hazards.
- Risk management scheme design through analysis of potential disaster scenarios in sectors that can potentially be affected, such as the economy, population, infrastructure, etc.
- Estimation of physical damage value and economic losses after potential disaster events.
- A quantitative basis for defining financial needs and priorities for economic recovery and reconstruction in case of a disaster event.
- Analysis of a government's capacity to meet its own post-disaster needs and to identify external assistance needed, such as for international cooperation for immediate and long-term recovery.
- Determination of disaster impacts on overall economic development and macro-level planning decisions.
- Assignment of a baseline for monitoring risk reduction measure progress.
- Defining changes or modifications to public policies to lessen disaster impact and facilitate economic recovery after disaster events.

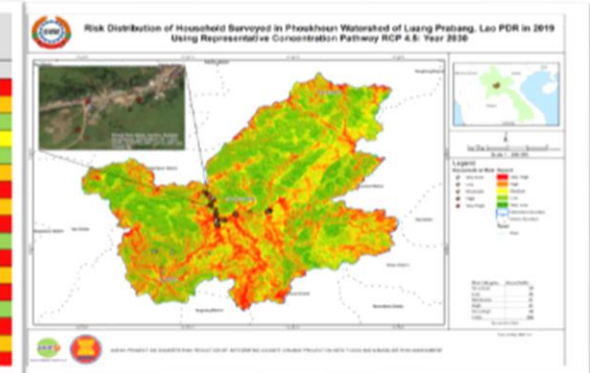
Current mandates, roles and stakeholder agency functions must be critically evaluated, and agency needs identified.



Applying landslide risk assessment data in decision support functions and practice



S No	Household No	Lat	Long	Hazard Value	Vulnerability Value	Capacity Value	Risk Value	Class
1	A001	19.46944	102.5894	1	0.425083333	0.266667	0.52604061	Very High
2	A002	19.47278	102.5947	1	0.513555556	0.666667	0.25421	High
4	A004	19.46944	102.5894	1	0.355981481	0.616667	0.1904982	Low
5	A005	19.46944	102.59	1	0.254777778	0.366667	0.2293	Moderate
6	A006	19.46978	102.5901	1	0.326842593	0.766667	0.14068442	Very Low
7	A007	19.47111	102.5936	1	0.639195767	0.766667	0.27513209	High
8	A008	19.47139	102.5919	1	0.624330966	0.316667	0.65061859	Very High
9	A009	19.46944	102.5931	1	0.398253968	0.416667	0.31541714	High
10	A010	19.46813	102.5881	1	0.448481481	0.166667	0.88799333	Very High
11	A011	19.47056	102.5903	1	0.466537037	0.816667	0.18851905	Low
12	A012	19.46917	102.5881	1	0.328481481	0.216667	0.50030256	Very High
13	A013	19.46686	102.5839	0.75	0.383237037	0.366667	0.258685	High
14	A014	19.4716	102.5933	1	0.556472222	0.366667	0.500825	Very High
15	A015	19.47151	102.5912	1	0.445346561	0.866667	0.16957427	Low
16	A016	19.47154	102.5936	1	0.513157407	0.416667	0.40642067	Very High
17	A017	19.46807	102.5883	1	0.45452963	0.616667	0.24323477	High
18	A018	19.47064	102.5909	1	0.394416667	0.266667	0.48809061	Very High



$$\text{Potential RISK} = (\text{total number of vulnerable HH exposed to high and very high landslide hazard zone}) \times (\text{cost of basic needs such as water and food per HH during emergency})$$



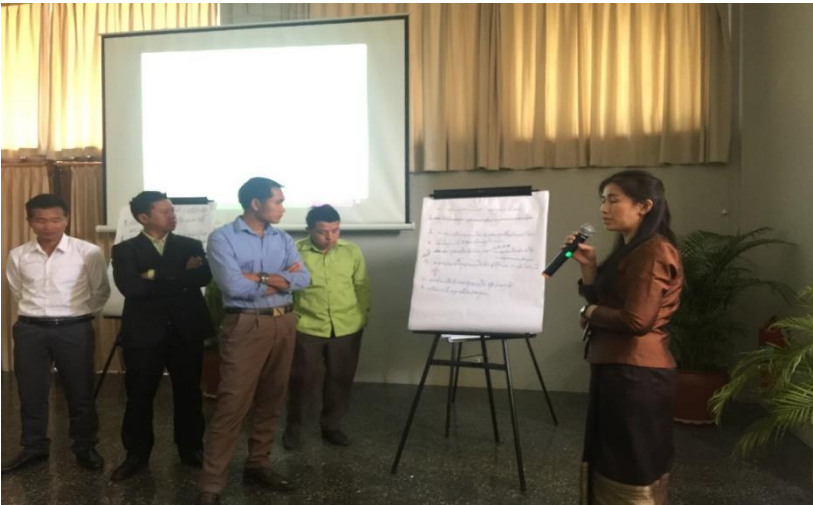
Applying landslide risk assessment data in decision support functions and practice

Landslide risk assessment data can be used in a number of decision support functions, as follows:

- Land use zonation and zoning ordinances. Example: Limiting development in high risk areas and encouraging development in low risk areas.
- Building codes and bylaws. Example: Imposing building controls depending on risk levels to protect existing and new development against hazards.
- Land Acquisition. Examples: Avoiding purchase of land unsuitable for development, rehabilitating high-risk lands, using open spaces for emergency operations, etc.
- Relocation. Example: Mandatory or voluntary relocation of affected families to safe areas.
- Subdivision Regulations. Example: Not allowing sub-division of sloping land into smaller plots.
- Property Taxation. Example: Offering private developers household tax breaks for the added cost of building to a higher level of hazard resistance.



Promoting inter-agency coordination for managing landslide risk



Promoting inter-agency coordination for managing landslide risk

Landslide risk reduction planning and implementation should be holistic and focus on both those that contribute either positively or negatively to risk creation, including stakeholder agencies involved in the development process.

It is essential to have good coordination between NDMOs and these stakeholder agencies in order to promote application of risk knowledge in their activities.

The country NDMOs should be responsible for knowledge management interventions to promote risk assessment data application in development planning and mainstreaming at sector, agency, and local government levels.





Thank you

