Community Based Landslide Vulnerability and Risk Assessment: Method and Tools

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Concept: Vulnerability and Risk

Risk = f(Hp*Dp)
Vulnerability = f (E*S/A) or Dp
f(E-A)*S

Hp = hazard probability, Dp = Damage probability, E = Exposure, S = Sensitivity, A = Adaptive capacity
Livelihood vulnerability

**Exposure**
- Life
- Properties
- Infrastructure
- Livelihood support system
- Environmental resources

**Capacity**
- Assets/wealth
- Information
- Technology/skills
- Access/equity
- Service infrastructures
- Institutions

**Sensitivity**
- Food
- Health
- Education
- Transportation and communication
- Infrastructure services - market
Approaches

- **Risk-hazard approach** (Hazard of a place and exposure)
- **Political economy approach** (Assess to resources and decision making processes)
- **Resilience approach** (Propensity of social and ecological systems to suffer harm from external stresses and shocks).
- **Livelihood approach** (Access to physical, natural, social and financial capital or assets)
- **Integrated approach** (Risk-hazard and the political economy approach combined: the hazard-of-place or the hazards of place with the social profile of communities)
Why CBDRM?

- Local communities are both the primary victims and the first to respond to emergencies when disasters strike.
- Provides opportunities to participate in identifying and evaluating risk and formulate and implement measures to reduce risk.
- It eventually empowers communities with self-developed and culturally acceptable ways of coping.
Participatory Rural Appraisal (PRA) Processes

- Gathering of scattered stakeholders and groups
- Collection of information and data
- Cross-checking and triangulation of information
- Identification of the main problem and preparation of action plans
Participatory Rural Appraisal (PRA) tools

1. Social/ resources/ physical/ hazard/ institutional mapping
2. Prioritization of problems/ interests/ needs
3. Wellbeing ranking
4. Seasonal calendar
5. Trend line/ timeline
6. Problem tree analysis
7. Cause and effects analysis
8. Key informants interview
9. Structured or semi-structured questionnaire survey
10. Transact walk
11. Group discussion
# Hazard Identification and Mapping

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<thead>
<tr>
<th>Description</th>
<th>Methods</th>
<th>Tools</th>
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<tbody>
<tr>
<td>Inventory and mapping of landslide hazard</td>
<td>Group Discussion</td>
<td>Checklist/mapping guidelines</td>
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<tr>
<td>Causal factors of landslide</td>
<td>Group Discussion, Key Informant Interview</td>
<td>Problem tree</td>
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<tr>
<td>Landslide hazard ranking</td>
<td>Group Discussion</td>
<td>Pair-wise ranking matrix</td>
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<td>Frequency, magnitude and recurrence interval of landslide hazard (occurrence probability)</td>
<td>Key Informants Interview and Group Discussion</td>
<td>Historic timeline</td>
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<td>Temporal distribution of landslide hazard</td>
<td>Group Discussion and Records</td>
<td>Seasonal calendar of the occurrence of hazard</td>
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<tr>
<td>Landslide hazard mapping</td>
<td>Social hazard mapping</td>
<td>Mapping guidelines</td>
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## Exposure Assessment

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<tr>
<th>Description</th>
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<tr>
<td>Elements exposed to hazards: type and quantity of resources, livelihood assets and infrastructure within hazard prone area</td>
<td>Household Survey, Group Discussion, Group discussion</td>
<td>Questionnaire and Checklist</td>
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<td>Social mapping – resource mapping</td>
<td>Seasonal calendar of agricultural crops, livestock grazing, socio-cultural events</td>
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<td>Social mapping: Exposure mapping</td>
<td>Mapping guidelines</td>
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**Description:**
Elements exposed to hazards: type and quantity of resources, livelihood assets and infrastructure within hazard prone area.
## Sensitivity Assessment

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<tr>
<td>Cause and effect analysis</td>
<td>Group Discussion</td>
<td>Problem tree</td>
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<td>Historical damage of properties and infrastructure from hazards</td>
<td>Group Discussion, Key Informant Interview, Household Survey and review of loss record in the past</td>
<td>Checklist, Questionnaires Historical timeline</td>
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<td>Assess to basic needs (self sufficiency in food, availability of clean drinking water and energy, availability of health services, availability of communication services)</td>
<td>Group Discussion and Household Survey</td>
<td>Checklist and Questionnaires</td>
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Adaptive Capacity, Vulnerability and Risk Assessment

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<tr>
<td>Adaptive Capacity</td>
<td>Socio-economic and demographic profile</td>
<td>Group Discussion, Household Survey, Institutional Mapping (formal and informal)</td>
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<td>Vulnerability</td>
<td>$V = (E \times S) - A$</td>
<td>Vulnerability Index</td>
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<td>Risk</td>
<td>Hazard probability* Damage probability (Relative ranking)</td>
<td>Group Discussion, Checklist</td>
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<td>Disaster Risk Management Planning</td>
<td>Identification of structural and non-structural measures</td>
<td>Group Discussion and Key Informants Interview</td>
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Example: Pair wise Ranking of Hazard for Prioritization

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Cause and Effect Analysis

**Cause**
- Shifting cultivation/deforestation
- Open grazing system
- Fragile geology
- Steep slope
- Heavy rainfall
- Inappropriate collection of stone and sand
- Unmanaged irrigation channel

**Hazard**

**Effect**
- Land cutting
- Crop destroyed
- Damage road
- Destroyed irrigation channel and water pipe
- Lost of livestock, houses, human beings
Historical Timeline
Institutional Mapping (Venn Diagram)
Risk Matrix Using Pair Ranking

**CONSEQUENCES**
- Catastrophic
- Major
- Moderate
- Minor
- Very Minor

**LIKERIHOODS**
- Rare
- Unlikely
- Possible
- Likely
- Almost Certain

**RISK LEVELS**
- Extreme Risk: Immediate Action is Needed without any delay
- High Risk: Immediate Action needed with proper consultation
- Medium Risk: Frequent observation and measures needed
- Low Risk: Annual observation needed, measures could be taken
Participatory Risk Mapping Approaches and Steps

1. Collection and production of base map and preparation of other logistics
2. Consultation with stakeholders
3. Familiarization of the area and rapport building
4. Familiarization with the base map
5. Preparing the legend for mapping
6. Putting community information on the map
7. Putting hazard information on the map
8. Planning for Disaster Risk Reduction
9. Integrating data into Geographic Information System (GIS)
Participatory Hazard Map
Thank you