Social and ethical perspectives of landslide risk mitigation measures

Bjørn Kalsnes and Bjørn Vidar Vangelsten, NGI

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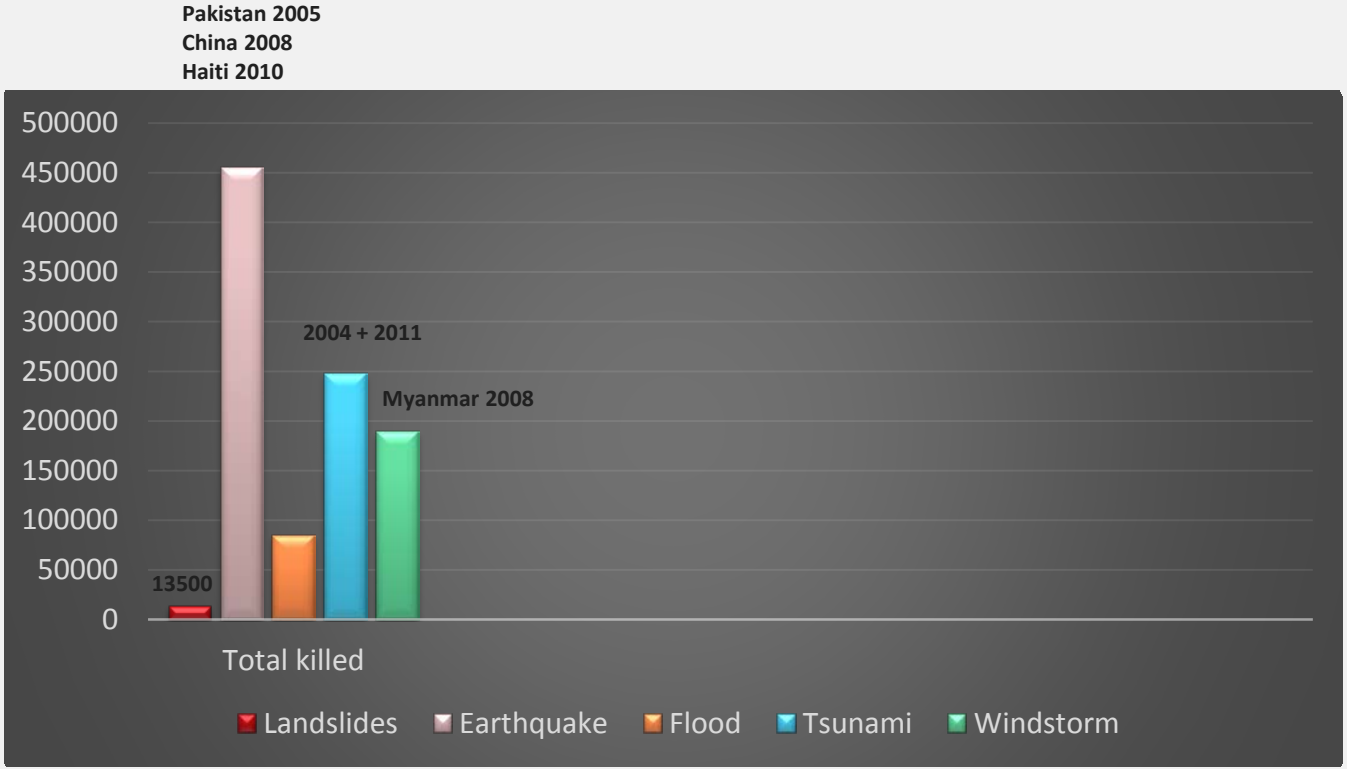
CRED data period 2000-2015



Risk Assessment - changing trend

"Hazardous events only become disasters when people's lives and livelihoods are swept away"

-Kofi Annan (2003)

Trend: from hazard-dominated analyses to more conceptually-correct approaches which recognize the importance of vulnerability

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Landslide Sarno 1998

- On May 5, 1998 Sarno and neighbouring villages in the Campania region were devastated by a series of landslides.
- 180 houses were destroyed, 450 severely damaged, and 161 people died in what was one of the biggest catastrophes of its kind in modern Italy.
- The landslides had been caused by several days of torrential rainfalls, but were also blamed on agricultural, residential and industrial overexploitation and the lack of any substantial environmental programs.
- The catastrophe prompted the Italian Ministry of the Environment to introduce a couple of legislative measures for environmental protection which have come to be known as *legge Sarno*.

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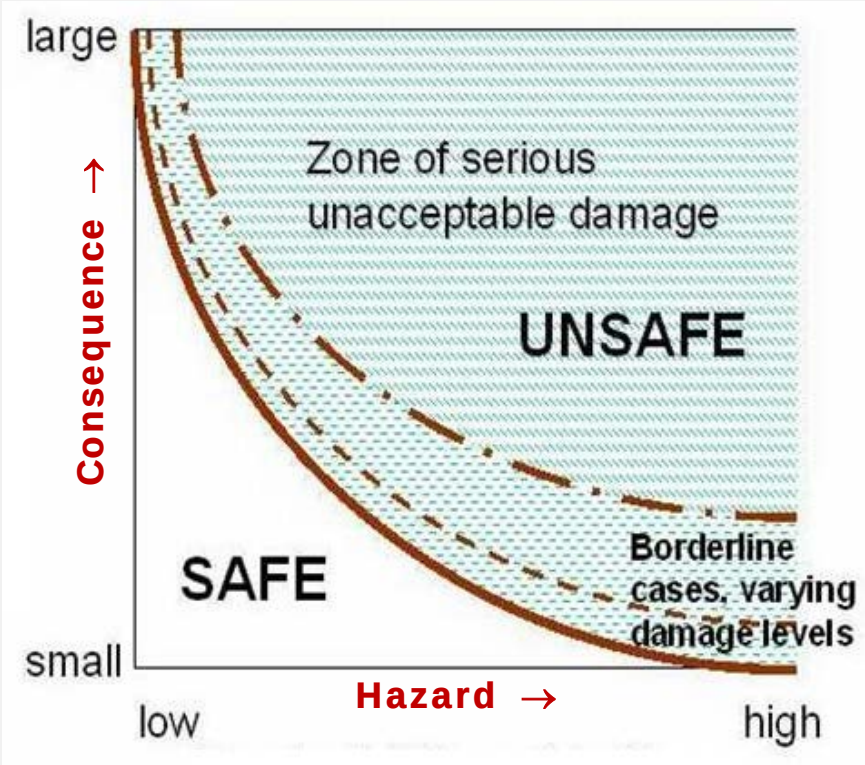
Mitigation measures Sarno

Risk acceptance – need for mitigation measures



Mitigation measures landslides

Physical (structural) measures

Slope stabilisation, drainage, erosion protection, channelling, vegetation, ground improvement, barriers, elevated land, anchoring and retaining structures etc

Non-structural measures

Early warning systems, land-use planning, public awareness, emergency preparedness, enforcement of building codes and good construction practice, measures to pool and transfer the risks etc

Classification of mitigation measures – Key points (www. Safeland-fp7.eu)

Classification		Component of risk addressed	Brief description	Notes and other terms used
STRUCTURAL	Stabilization	Hazard (H)	engineering works to reduce the probability of occurrence of landsliding	Preventive, remedial, hard, soft, active stabilization
	Control	Vulnerability (V)	engineering works to protect, reinforce, isolate the elements at risk from the influence of landsliding	Preventive, hard, soft, passive stabilization
NON STRUCTURAL	Avoidance	Elements (E)	temporary and/or permanent reduction of exposure through: warning systems and emergency evacuation or safe sheltering, land-use planning and/or relocation of existing facilities	Direct temporary and/or permanent reduction of the number and/or value of elements at risk. Monitoring and warning or alarm systems and associated civil protection procedures, often described as reducing vulnerability, in actual fact operate through temporary, selective avoidance.
	Tolerance	Elements (E)	Awareness, acceptance and/or sharing of risk	Indirect reduction of the number and/or value of elements at risk

Key (ethical) questions in the decision-making process

- Who benefits, who looses?
- What is the impact on the physical environment?
- What risk is acceptable?

Roles (Dolce and di Bucci, from Wyss and Peppoloni)

1. Scientists (evaluation of risk level, cost-benefits)
2. Political decision-makers (definition of acceptable risk level, identification of specific actions)
3. Technical decision-makers (adoption of the most suitable technical solutions, implementation)

Other actors: Professionals, mass media, citizens…

SafeLand Case study: Nocera Inferiore, Italy (ref. IIASA and UNISA / Scolobig et al, EGU 2012)

- Population : 47,021
- Landslide risk area (Monte Albino slope): ~ 4,000 residents
- Last landslide: 2005

Stakeholder processes for identifying "appropriate" risk mitigation strategies

- **Goal:** To learn how to convert better scientific information about landslides into actual policies and practices that will prevent and mitigate risk.
  - What are the options available?
  - How expensive and effective are they?
  - What factors cause people to decide to act to mitigate and prevent the risks?
  - How can alternative mitigation and prevention options be ranked and communicated?
  - What processes are necessary to gain consensus in a community and move towards effective action?

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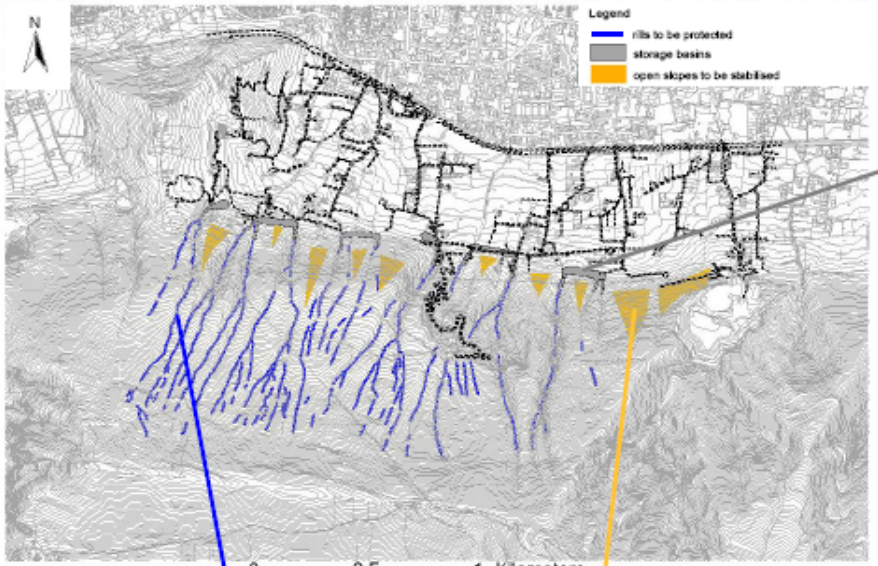
Main aim:

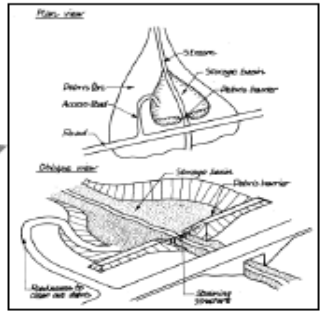
- Develop and test a **risk communication and stakeholder led process** for selecting risk mitigation measures that are considered most appropriate from the **technical, economic, environmental and social** perspectives.
- The intent is to **inform the political process and to carry out a process** for reaching a **compromise among participants on mitigation** measures.

Risk mitigation options – Nocera Inferiore

Group	Aim (social sc.)	Solution (geotechnical eng.)
Hierarchial	Protect lives and properties	No large, unaestetic expensive structural measures. Mix of active and limited passive measures.
Egalitarian	Careful stewardship of the mountains	Preserve the fragile ecosystem. Mitigation with low environmental impact (forests). Monitoring.
Individualistic	Rational individual choice-Relocation	Based on cost-benefit analyses. Relocation an option.
Compromise	Combination	Soil cover removal. Naturalistic engineering works. Slope reshaping. Monitoring.

The compromise proposal





Storage basins

Active control works

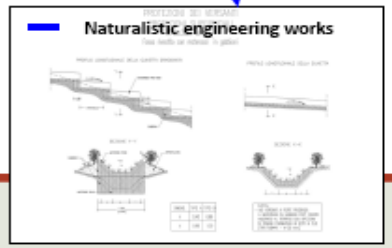
- over the open slopes
- along the rills

Passive control works

- storage basins, located at the mouth of the basins, to be designed for alluvial phenomena due to rainfall having a return period T = 200 years

Monitoring

Territorial survey



Possible types of mitigation measures

- Soil cover removal
- Naturalistic engineering works
- Slope reshaping

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Conclusions

- Stakeholder involvement important for decision making.
- Risk acceptance a key component.
- Potential conflict between those who prefer structural measures and those who prefer organisational measures (environment protection).

Thanks for your attention!

- bgk@ngi.no
- bvv@ngi.no
- www.ngi.no