



Scientific practices and social behavior when managing landslide risks: A comparison of experiences between developing and developed countries.



Graziella Devoli

Norwegian Water Resources and Energy Directorate, Oslo, Norway (gde@nve.no)

Are there any differences or similarities in landslide prevention efforts between developed and developing countries?

Is it possible to exchange knowledge and experiences learned from projects financed and performed in developing countries?

General considerations (Developed vs Developing)

High-income countries are investing a large amount of money on landslide researches and programs at national level. Many of them participate with their scientists in projects at international level helping low-income countries to prevent landslides. In the last 10–20 years knowledge has been transferred to poor countries and natural disaster capacity has been built.

Many low-income countries have in recent years (especially after severe catastrophes) started landslide hazard programs under national government with limited national funds, but they have received and still receive help from high-income countries in form of development projects focusing on landslide hazard mapping, local early warning systems and local capacity building. Many scientists, public and local officials, Civil Defense personnel have learned how to prevent landslide and have been trained. Many good scientific practices have been promoted and good results have been achieved.

Being from a developed country I expect (both as an ordinary citizen and as landslide expert) my country to be better organized in preventing landslide hazards than developing countries (years of investigations, economical stability, quality of life, culture, amount of funds and investments, quality of landslide investigations, larger number of experienced scientists, better technology, stable job conditions, good salaries, etc.).

Surprisingly, in spite of the “better” conditions, people in developed countries die because of landslide risk communication coming from a supposedly responsible government, and damages to infrastructures are increasing. Inappropriate scientific practices are sometimes justified and expensive mitigation measures are often preferred, instead of alternative and less expensive actions, to cover the rapid and poor landslide assessment or because of the long tradition of a culture of reaction. Cost-benefits analyses are often lacking. In other cases, actions are not taken at all, because (national authorities) responsibilities are delegated to local authorities or individuals (incapable of understanding the processes and dealing with that).

Prevention is possible and often cost-effective, but requires many actions and a myriad of measures, both public and private, and they must work harmoniously together. Some important ones are under government control, but are not always obvious. Many governments have not yet understood the benefits of a coordinated effort in landslide prevention, their role and how to organize the efforts.

As a landslide expert that worked for many years in a developing country (1) (Nicaragua) I have experienced that coordinated efforts, at all level, can make possible an effective landslide prevention and institutions can work harmoniously together (whenever funds were available and all the institutions involved worked and collaborated together). Good communication between landslide experts and population can be established when well organized Civil Defense authorities are used as intermediaries and if scientific studies and field routines are systematically performed. However, lack of economical resources, weak and changing governments and diversion of funds to other issues, make scientific governmental institutions unstable and scientific investigations are brutally interrupted.

There exists little evidence that shows the effectiveness of landslide prevention and few published documents examine the efficacy of investment to reduce disaster risk (2) for both developing and developed countries.

There are common social threats that limit landslide prevention. Among them weak and immature (“natural hazard risk management”) governments rarely make good coherent decisions or are unable to coordinate efforts because of their scarce knowledge on long-term landslide risk management.



Tasks	Nicaragua		Norway	
	Achievements	Limitations	Achievements	Limitations
1. Creation and application of natural laws concerning disasters/national strategies where roles and limits of responsibility of federal, state, provincial, municipal and private entities are well defined	<ul style="list-style-type: none"> “Ley 337” defines roles and responsibilities for the different ministries, universities, private consultants before, during and after natural disaster emergencies. The SINAPRED was created with the purpose to coordinate emergency efforts and ministries involved 	<ul style="list-style-type: none"> Changes in politics can diverge priorities within the natural hazards and law could not be applied Lack of national landslide strategies and loss-reduction programs 	<ul style="list-style-type: none"> Available natural disaster law Began this year the discussion to elaborate a national strategy for floods and landslides at governmental level 	<ul style="list-style-type: none"> The natural disaster law needs to be updated Still unclear roles and limits of responsibilities Lack of national landslide strategies and loss-reduction programs
2. National/Governmental institution in charge to coordinate landslide prevention efforts	<ul style="list-style-type: none"> The Instituto Nicaraguense de Estudios Territoriales (INETER), scientific leader for natural disaster prevention, obtained in 1999 the responsibility also for landslide prevention. A group of landslide experts was created in 1999. 	<ul style="list-style-type: none"> Internal communication difficult at the beginnings Limited economical resources and bad salaries Very limited national funds for landslides (low priority respect to earthquakes and volcanic eruptions, but also to other political interests) Interrupted international funds (Nicaragua is not a priority for many donors) Lack of continuity in researches and field works Migrations of experts 	<ul style="list-style-type: none"> The Norwegian Water Resources and Energy Directorate (NVE) was assigned in 2009 the responsibility to coordinate landslide prevention efforts. A group of landslide experts was created in 2009. 	<ul style="list-style-type: none"> Lack of landslide experts inside the institution Difficult internal communication
3. Establishment of fruitful multidisciplinary and inter-institutional collaboration among scientists	<ul style="list-style-type: none"> Landslide courses were organized to trained Nicaraguan scientists (private and public). Inter-institutional and multidisciplinary projects were organized including engineers, geologists, GIS experts, planners, landowners, developers and public officials from national and local authorities and private companies financed by international donors. Projects were coordinated by the national scientific authority. An important scientific network exists at national level and for the Central American region. Master programs on hazard and risk management were created at the UNAN-Managua and other Universities. 	<ul style="list-style-type: none"> Lack of local scientists having landslide experience Difficult communication at the beginnings between “landslide experts” and local geologists and other disciplines Lack of consensus at the beginnings in the use and acceptance of landslide terminology Internal bureaucracy and strong hierarchy at the beginnings in each one of the institutions involved to find the persons to train Unethical local geologists (performing projects without having landslide assessment experience) Difficult to update the scientific community without funds 	<ul style="list-style-type: none"> Available “landslide” scientific community and landslide experts in public and private institutions Multidisciplinary and inter-institutional collaborations in relation to landslide prevention is in progress Geohazards master programs are organizing at the UIO-Oslo and NTNU -Trondheim 	<ul style="list-style-type: none"> National coordination is needed Landslide scientific community must be updated especially for certain types of landslides (hazard and risk assessments methods, models, technologies) Difficult communication sometimes among “landslide experts” and between landslide experts and other disciplines Difficult inter-institutional communication Lack of consensus in the use and acceptance of landslide terminology
4. Provide good risk assessments in which landslide experts report transparently and in an explicit way what is really known and the limitations of the methods and tools used	<ul style="list-style-type: none"> Available landslide inventory maps for many critical areas. Available landslide susceptibility map for the entire country. Most of the municipalities located in landslide prone areas obtained hazard maps in the first 10 years. Landslide critical sites are well identified Each mapping project and products was discussed, before and after, with the local communities. Limitation and methods were explained. New investigations were performed after new landslide events (also as part of research projects with local and international Universities). A landslide database was started in 2001 Risk assessments analyses are available for the most critical municipalities. Evacuation and emergency plans made by the Civil Defense are available in each municipality. Critical assets and shelters are identified Early warning systems for landslides are in progress 	<ul style="list-style-type: none"> Methods and technologies for landslide hazard and risk assessment were not available in the country Methods were adapted from other countries Landslide terminology and classification was non-existent need to be adapted to Nicaragua context Lack of landslide hazard and risk assessment programs at national level to continue the mapping process Lack of international funds and limited international collaborations Lack of human resources, young expertise, updated methods and technologies 	<ul style="list-style-type: none"> National susceptibility maps available for snow avalanches and rock-falls Maps of potential unstable quick clay areas are available Susceptibility maps for debris flows are in progress Hazard maps are available only in few areas (but considering only some types of landslides) A hazard mapping plan was finalized in 2011 to identify areas that need to have a hazard maps in the future A landslide database was started in 2001 Early warning systems for landslides are in progress 	<ul style="list-style-type: none"> Landslide inventory maps are not regularly performed Lack of a general susceptibility overview: One susceptibility map for each one type of landslide Lack of hazard maps for many critical municipalities Hazard assessment and risk methods should be established for some type of landslides Hazard and risk assessment are performed separately and independently
5. Share and systematically communicate the landslide knowledge more effectively with all private and public stakeholders involved, paying attention to providing balanced information about risks and addressing inevitable uncertainties in mapping natural hazard, assessment, warning, and forecasting	<ul style="list-style-type: none"> Workshops were organized to discuss projects organizations and expected results (representatives from local authorities, private, national authorities, civil defense, and other ministries, always involved). Constant communication is maintained with the local communities also in case of “calm” through monthly bulletins. During emergencies press-conferences and press-messages are prepared and messages sent via internet, fax, radio, TV. Mass media invited often to press conference at the scientific institutions under emergencies. Mass-media (TV, radio) are used to spread emergency information and to teach about natural disasters (soap-opera Hurricane) In press conferences always landslide experts participate together with decision-makers and civil defense Technical reports, books, monthly and annual bulletins 	<ul style="list-style-type: none"> Problems at the beginnings when actions were undertaken without discussed with the expert Landslide experts not used to “popular” language and terms Contrast between media and scientists in reporting the “right” information 	<ul style="list-style-type: none"> Meetings are periodically organized with the local authorities, to present projects and scientific results. Communication is mainly via internet, reports 	<ul style="list-style-type: none"> Not analyzed in details
6. Support the mass-media in spreading correct scientific information	<ul style="list-style-type: none"> Courses were organized to teach journalists about landslide terminologies and other natural threats. Journalists invited in some field work (exchange of knowledge) 	<ul style="list-style-type: none"> Journalists unprepared on reporting natural hazards and incorrect use of terms Keeping interaction and properly communicate (experts and journalists) 	<ul style="list-style-type: none"> Facta-material: web pages 	<ul style="list-style-type: none"> Not analyzed in details
7. Perform serious risk and cost-benefit analyses before mitigation measures are taken	<ul style="list-style-type: none"> No physical mitigation measures are realized because of lack of financial resources and technology. Relocation was used in post-disaster situations Early warning systems and evacuation from critical sites is used as only mitigation measure 	<ul style="list-style-type: none"> Many physical mitigation measures (quick clays slides, snow avalanches, rock falls, and a few for debris flows) Local authorities and individual owners can require and finance mitigation measures direct to private consultants 	<ul style="list-style-type: none"> Lack of serious cost-benefit and weak hazard assessment Often expensive interventions designed only for one type of landslide Sometimes, if mitigation measures are need to protect a house, a road and a railway from the same landslide, efforts are not coordinated and different institutions perform independently the risk analysis 	
8. Assist local authorities in the application of land-use planning policies	<ul style="list-style-type: none"> Areal planning is strongly promoted Guidelines were elaborated for hazard maps for both specialists and municipalities. Land-use plans were prepared at regional level and for the main cities taking into account natural disasters extension 	<ul style="list-style-type: none"> Not analyzed in details 	<ul style="list-style-type: none"> Areal planning is strongly promoted Guidelines for quick clays Guidelines for other type of landslides and snow avalanches Local authorities are in charge of land-use policies 	<ul style="list-style-type: none"> Not analyzed in details
9. Built trust and confidence by means of a continuous contact and communication with the public and local authorities.	<ul style="list-style-type: none"> Civil Defense is an important and authoritative presence in the country. Civil Defense has a military origin, and is responsible of evacuation. Landslide courses were organized to educate Civil Defense personnel. Landslide experts made constant visits to critical sites together with the local civil defense representative and use them to explained to the people what to do (exchange of knowledge) Local guide-civil defense representatives were always involved in projects. 	<ul style="list-style-type: none"> Maintained a continuous communication, building a constant capacity, especially when engaged scientists are not available, or government gives priority to other things 	<ul style="list-style-type: none"> The communication is sometimes only between private consultants and local authorities. In the last 2 years regional offices of NVE have assisted municipalities during the emergencies. 	<ul style="list-style-type: none"> Not analyzed in details

Table 1. Some similarities and differences between Nicaragua and Norway in relation to landslide prevention

Similarities	Differences
<ul style="list-style-type: none"> Mountainous territory Low population density Lack of a landslide prevention program before 1990 Recent creation of a national entity responsible to coordinate actions (Nicaragua in 1999; Norway in 2009) Gender equality Lack of landslide hazard and risk knowledge for certain areas or for certain landslide types Uncertain data, inadequate methods or tools Lack of damages and human vulnerability analyses (Underestimation of risks) Scarcity of scientists, trained landslide experts especially with expertise on long-term landslide risk management (rely on “foreigner” experts). Few private consultant companies with landslide experience Difficult communication among “landslide experts” (because of different level of landslide knowledge), between landslide experts and other disciplines Presence of unethical private consultants and public landslide experts Decision-makers, public officials lacking of knowledge on short and long-term landslide risk management. Between landslide experts and decision makers often public officials that lack expertise about natural disasters Difficulty in communicating the benefits of a coordinated effort at national level to decision-makers Landslide experts are not able to oversee governmental decisions and avoid the incorrect translation of the risk analysis (forced to obtain results from uncertain data, or inappropriate methods). Risk to be involve in unethical decisions. Public officials often between landslide experts and decision-makers Systematic application of laws and policies for disaster prevention and mitigation 	<ul style="list-style-type: none"> Areal geographical extension Climate Economy Political stability Exposition to different natural hazards <ul style="list-style-type: none"> Nicaragua: landslides, floods, earthquake, earthquake-triggered tsunamis, volcanic eruptions, hurricanes, drought Norway: landslides, floods, landslide triggered tsunamis and snow avalanches Frequency of the natural processes and extension Loss of lives under landslide events Amount of economical losses Natural hazards laws (application) Landslide prevention responsibility: <ul style="list-style-type: none"> Nicaragua: No one → National/local responsibility Norway: Local authorities and individuals → National/local responsibility Scientific community available Amount of private consultants companies Type and time of decision making processes <ul style="list-style-type: none"> Nicaragua: Decisions are influenced by catastrophic events Norway – Long democratic processes both at institutional and inter-institutional level Authorities for post-disaster activities: <ul style="list-style-type: none"> Nicaragua: Civil Defense + national scientific authorities (+ private consultants or Universities) Norway: 1) if landslide are in inhabited areas (Police +private consultants, or from now also sometimes national coordinating authorities); 2) if landslides along road (Road authority+ evt. private consultants); 3) if along railway (Railway authorities+ evt. private consultants) Political challenges for developing countries: lack of economical resources, weak and changing governments, diversion of funds to other issues. Governmental institutions unstable and scientific investigations and actions for prevention are brutally interrupted. For developed countries: unjustified number of landslide investigations or mitigation measures because of available economical resources and lack of coordination

References:
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 2 - Natural hazards, unnatural disasters : the economics of effective prevention / The World Bank and The United Nations, 2010