A GUIDE TO COMMUNITY-BASED DISASTER RISK REDUCTION IN CENTRAL ASIA

2006 Edition

To the Reader

The present booklet covers only a small part of the virtually broad knowledge and expertise now existing globally in the area of disaster management and disaster reduction. Due to recent developments and the growing number of natural calamities in the second half of the 20th Century and the beginning of the 21st Century, the issue attracts an increased attention from scientists, political and social players; hence, the growing number of literature on the subject. Whether the increased number of natural disasters is a result of the growing population settling in previously uninhabited areas or global warming, we are not going to argue. Our goal is to provide some basic information on the key issues of disaster reduction and share this knowledge with communities, NGOs and other implementing agencies working at community level. However, if readers get interested in the subject and need additional information and data, we refer them to the attached References and the ISDR website: www.unisdr.org

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1. INTRODUCTION TO DISASTERS

1.1. GLOBAL TRENDS

The frequency, magnitude and impact of disasters are increasing and disasters triggered by natural hazards have disrupted social, economic and environmental community activities worldwide. Available international data show that disasters have taken, over the last 10 years, more than 478,000 lives, affected 2.5 billion people and caused direct economic losses in the amount of 690 billion US dollars worldwide.

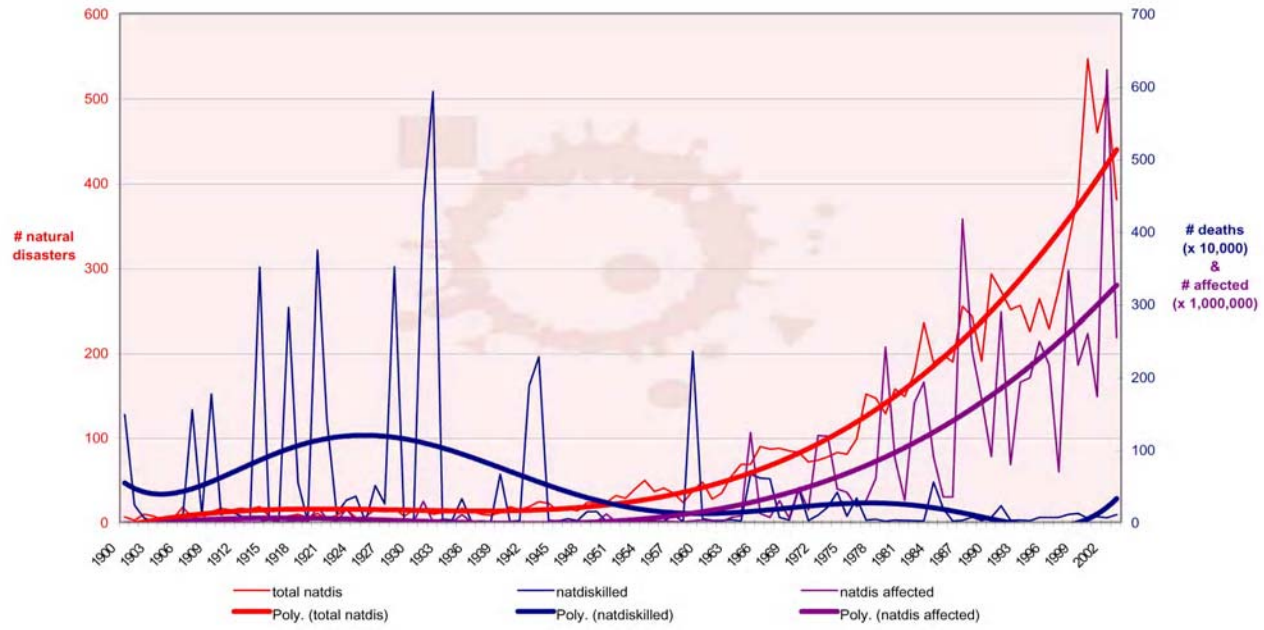


Figure 1. Disasters resulted in over 50,000 deaths and $60 million losses in 2003

The considerable impact of disasters on development is illustrated clearly by the figures mentioned above, and recent financial studies underline the urgent need for a shift from sole disaster response to disaster risk reduction. UNESCO reports that only $4 out of every $100 allocated for humanitarian assistance today are spent on risk reduction measures, despite research highlighting that $1 spent on risk reduction helps save up to $25 in avoided disaster loss. Disasters erode gains from poverty reduction and socio-economic development. Therefore, to reduce the negative effects of human activity on the environment and to build the capacity of vulnerable population to protect itself against natural hazards, efforts should be made to ensure that disaster risk reduction is an important aspect of poverty reduction and general development initiatives in the coming years.

1.2. CENTRAL ASIA

These global trends proved to be also relevant to Central Asia and disaster risk reduction should therefore be seen as one of the cornerstones of sustainable development in the sub-region. According to the European Community Humanitarian Office (ECHO), natural disasters in Central Asia, including landslides, floods and earthquakes, have killed, over the last 10 years, about 2,500 people and affected approximately 5.5 million others (almost 10 per cent of the total population). Landslides, floods and earthquakes are a continuous threat to the population. Besides, Central Asia is located in a highly seismic area, and according to NGO Geohazard International (USA), there exists an approximately 40 % probability that a large earthquake with a magnitude up to 9-9.5 on MSK 64 Scale will hit the region in the coming 20 years. Without adequate preventive measures, an earthquake of this magnitude may kill thousands of people and have a catastrophic long-term impact on the economy.

Tajikistan and Kyrgyzstan are especially vulnerable; both countries not only are disaster prone but also have limited financial resources and physical resilience. Steep valleys with few trees and towering mountains leave towns and villages extremely prone to the effects of gravity, making regular earthquakes more devastating, and propelling constant landslides, mudflows, floods and avalanches. In the last few years, Central Asia went through a major development yet there is still a need to protect numerous communities living in poverty. Disasters and environmental degradation are widespread, and a strong relation exists between environmental conditions and

poverty. Disasters lead to social, economic and environmental losses. It is often the cumulative effect of *high-frequency* and *low-impact* disasters that cause most of the losses, particularly among the poorest section of the community. The social impact of disasters includes loss of lives, injuries, disease outbreaks, disruption of social services and malnourishment. Economic losses include loss of livelihoods, assets (e.g. homes and livestock), infrastructure and communication, and result in discontinued development programmes. Environmental losses are often the most significant, as the poor very much depend on a well functioning environment for their livelihoods.

The number of affected people depends, to a large extent, on the vulnerability level of the population concerned. As disasters tend to hit the poorest in the society most, they often have to start from scratch. This group has little or no financial and physical resilience, and therefore has to struggle to rebuild their lives, livelihoods and assets. To such people living in a challenging financial situation, long-term solutions are an expensive choice, yet cheaper solutions tend to be more costly in the long run; which is a well known problem encountered by poverty reduction efforts. Finally, disasters have an indirect impact on the poorest groups of the society because disaster response efforts also cost money diverted from development initiatives. Poverty reduction strategies therefore should work towards disaster risk reduction as part of poverty reduction.

2. DISASTER RISK REDUCTION

In the past years, the number of stakeholders working in disaster-related areas has increased. The terminology they use has become equally sophisticated and often can be confusing, including the term "disaster risk reduction". The ISDR System applies this term to refer to the larger picture of efforts aimed at reducing disaster risks. The following are internationally agreed definitions of a few basic terms:

Disaster Risk Reduction (Disaster Reduction): Definition

The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (*prevention*) or to limit (*mitigation and preparedness*) the adverse impacts of hazards, within the broad context of sustainable development:

- Risk awareness and assessment, including hazard analysis and vulnerability/capacity analysis;
- Knowledge development, including education, training, research and information;
- Public commitment and institutional frameworks, including organizational, policy, legislation and community action;
- Application of measures including environmental management, land use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments;
- Early warning systems including forecasting, dissemination of warnings, preparedness measures, and reaction capacities.

Source: ISDR Glossary

Disaster is a serious disruption of a community or a society functioning, causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources. In other words, a natural hazard (potential threat) can lead to different outcomes. Therefore, it is important to differentiate a hazard from a disaster.

Disaster risk management is an important part of disaster risk reduction because it comprises all forms of relevant activities, including structural and non-structural measures to avoid (*prevention*) or to limit (*mitigation and preparedness*) adverse hazard effects. These actions need to be accompanied by a systematic process of administrative decisions, organizational and operational skills and capacities to implement policies and strategies and to facilitate the coping capacities of a community or a society with regard to the impacts of natural hazards and related environmental and technological disasters.

Acceptable risk differs from one community to another. Each community must therefore estimate its own vulnerability to hazards as well as its investments in disaster risk reduction. The term *acceptable risk* can also be understood in several different ways: within engineering, for example, acceptable risk is widely used to describe structural and non-structural measures undertaken to reduce possible damage at a level which does not

harm people and property, according to codes or «accepted practices» based, among other things, on a known probability of hazards.

In Central Asia which suffers from constant threats of natural hazards, it is crucial to invest in education and training aimed at the protection of highly prone areas, learning of cost-effective ways to construct buildings and use land in a responsible manner. Micro-crediting is also widely recognized as a useful tool to help reduce poverty. However, at this stage in the Central Asian sub-region, micro-crediting is seldom associated with disaster risk reduction. Potential benefits of getting small loans to decrease the impact of natural disasters should be further developed and pursued.

The complexity of disaster risk reduction can be illustrated by the following table highlighting links between different processes:

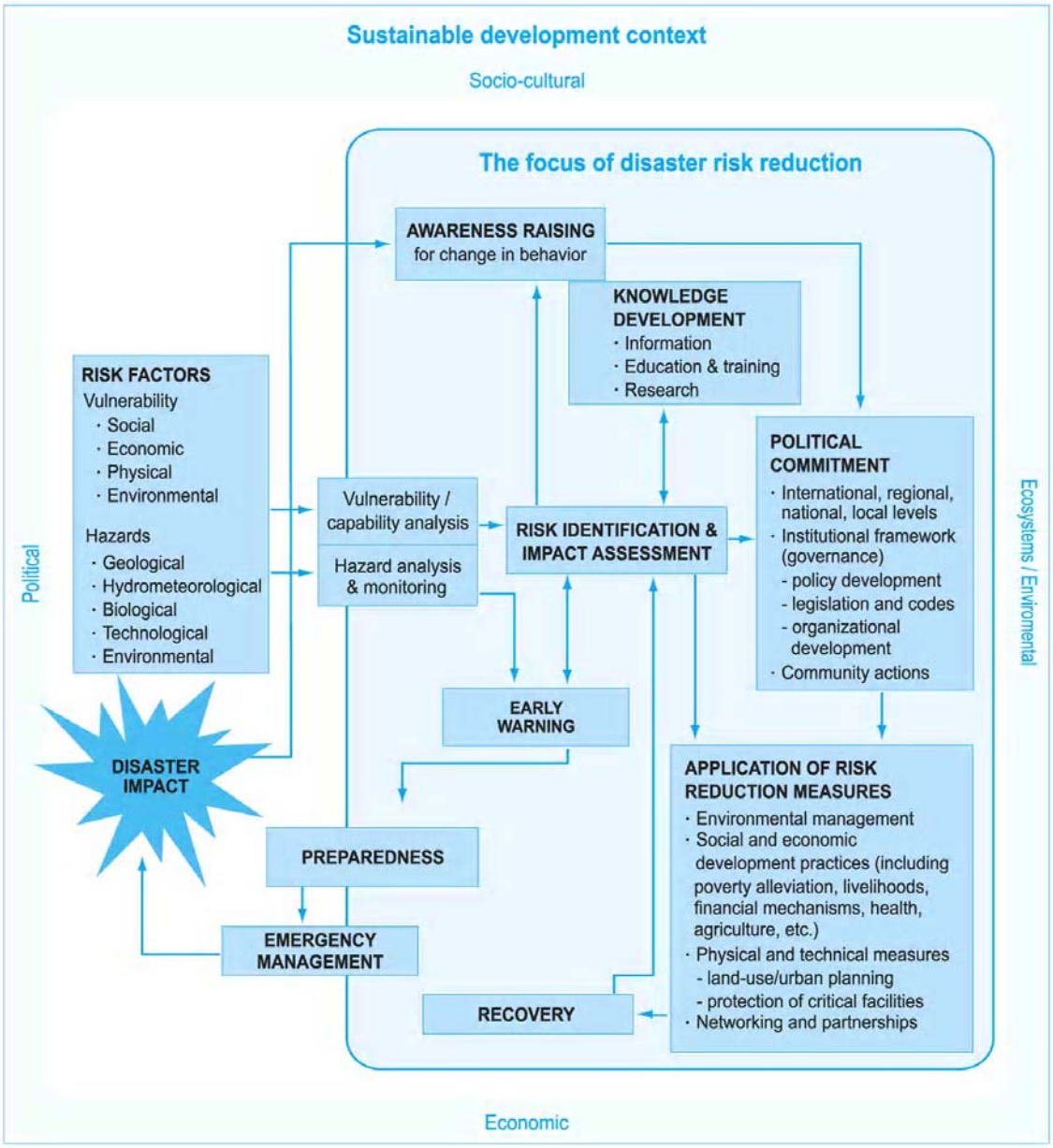


Figure 2. The disaster risk reduction process (Source: Living with Risk, ISDR 2002)

In January 2005, the Second World Conference on Disaster Reduction (WCDR II) was held in Kobe, Japan. The outcome document known as "Hyogo Framework for Action 2005-2015: Building the Resilience of Nations and Communities to Disasters" is a unanimous international acknowledgement of the fact that efforts aimed at reducing disaster risks should be systematically integrated into policies, plans and programmes of sustainable development and poverty reduction, and should be supported through bilateral, regional and international cooperation, including partnership agreements. Efforts to reduce disaster risks should be made at community level to national and global political levels in view of integrated actions and policies of numerous stakeholders.

Disaster risk reduction implies an integral process consisting of several factors influencing each other. To facilitate the understanding of the concept, all activities can be subdivided into the four following phases:

1. Risk assessment
2. Risk awareness
3. Early warning systems
4. Disaster management

Each of the four phases will be further discussed in the coming chapters under the section entitled "Community-Based Disaster Risk Reduction".

3. DISASTER MANAGEMENT CYCLE

The four main aspects of the recognized disaster management cycle include the following:

- Prevention and Mitigation
- Preparedness
- Response
- Recovery (rehabilitation and reconstruction)

This figure illustrates the four main aspects of the recognized disaster management cycle

1) Prevention and mitigation includes structural and non-structural measures undertaken to limit the impact of potential hazards. Prevention and mitigation measures depend on the hazard which should be mitigated:

a. For *earthquake safety*, common actions would be to retrofit vulnerable buildings and install seismic monitoring systems;

b. For *floods*, it would be the construction of dikes and dams, forestation and construction of flood control basins/reservoirs;

c. For *landslides*, it would be to construct erosion control dams or retaining walls.

2) Preparedness helps communities reduce the likelihood or severity of impact or certain disasters, particularly slow-onset disasters, many of which arise from land degradation. Preparedness deals proactively with risk identification and results in increased community resilience and the capacity to overcome the impact of disasters. Common preparedness measures, regardless of the type of hazard, would be: preparedness and hazard maps, food and material stockpiling, emergency drills, installation of early warning systems, and preparation of emergency kits.

3) Response. In the grip of a disaster, many of the stricken communities will be in a state of shock or too hungry to think beyond their immediate needs. A community that has discussed and thought through the problem in advance will know what it needs and how to respond. It will also know when it should call upon outside assistance and how to effectively manage this assistance. In slow-onset disasters, the timing of assistance is often critical. Without this *preparedness* and associated resilience, disaster relief can entrench dependence on international relief agencies. In these situations, typical actions by support teams include rescue efforts, first aid, fire fighting, monitoring of secondary disasters, construction of temporary housing, establishing tent villages.

4) Recovery (rehabilitation and reconstruction). This phase needs strong leadership. Once proactive and integrated land use is planned and disaster risk reduction activities in place, communities can initiate important medium and long-term development in their areas. If successfully managed, the aid flowing into the area will also be successfully managed. A common approach would be disaster-resistant reconstruction, appropriate land use planning, livelihood support and industrial rehabilitation planning.

4. HAZARD ASSESSMENT, RISK ASSESSMENT, RISK AWARENESS

4.1. HAZARD

A hazard is a potentially damaging physical event, phenomenon or human activity which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation. It is important to have a general understanding of the nature of hazards since it involves a consideration of a wide range of physical phenomena. A spectrum of geophysical, meteorological, hydrological, environmental, technical, biological and even socio-political hazards taken individually or in a complex interaction, can threaten lives and development. Hazards have often been divided into “natural” or “technological” depending on their origins. However, their intensity, frequency and impacts can be influenced by environmental degradation. And, because of the intricate and complex relationship between different hazards, cataloguing a hazard is often a challenging and difficult task. In the same way, primary hazards can and often give rise to collateral or secondary hazards that can pose even a greater threat to a community. In Central Asia which is prone to frequent earthquakes, earthquake-related damage is often caused by secondary hazards such as landslides.

While all types of disasters most directly affect the poor, people of different age and ethnic groups and those with different levels of physical and cognitive ability, differently respond to disasters. A systematic illustration of hazards is show in the following table.

Hazard Classification

NATURAL HAZARDS

Natural processes or phenomena occurring in the biosphere that may constitute a damaging event. Natural hazards can be classified according to their geological, hydrometeorological or biological origins.

ORIGIN	PHENOMENON/EXAMPLE
Hydrometeorological hazards Natural processes or phenomena of atmospheric, hydrological or oceanographic nature.	• Floods, debris and mudflows • Tropical cyclones, storm surges, wind, rain and other severe storms, blizzards, lightning • Droughts, desertification, wildland fires, temperature extremes, sand or dust storms • Permafrost, snow avalanches
Geological hazards Natural earth processes or phenomena that include processes of endogenous origin or tectonic or exogenous origin, such as mass movement.	• Earthquakes • Volcanic activity and emissions • Mass movements, landslides, rockslides, liquefaction, submarine slides • Surface collapse, geological fault activity
Biological hazards Processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances.	• Outbreaks of epidemic diseases, plant or animal contagion and extensive infestations

TECHNOLOGICAL HAZARDS

Danger associated with technological or industrial accidents, infrastructure failures or certain human activities which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation, sometimes referred to as anthropogenic hazards. Examples include industrial pollution, nuclear release and radioactivity, toxic waste, dam failure, transport, industrial or technological accidents (explosions, fires, spills, etc.).

ENVIRONMENTAL DEGRADATION

Processes induced by human behaviour and activities (sometimes combined with natural hazards) that damage the natural resource base or adversely alter natural processes or ecosystems. Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards. Examples include land degradation, deforestation, desertification, wildland fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise and ozone depletion.

4.2. HAZARD ASSESSMENT AND RISK ASSESSMENT

The objective of a *hazard assessment* is to identify the occurrence probability of a specific hazard in a specific interval, as well as its intensity and area of impact. Assessment usually begins with the identification of potential hazards such as land degradation, water contamination and poor land use. Both hazard assessment and vulnerability/capacity assessment utilize formal procedures that include gathering of primary data, monitoring of hazards and vulnerability factors, data processing, mapping and social survey techniques.

Risk assessment includes detailed quantitative and qualitative understanding of risk, its physical, social, economical and environmental factors and consequences. It is the required first step for any significant consideration of disaster reduction strategies. The distinction between risk assessment and *risk perception* has important implications for disaster risk reduction. In some cases, like vulnerability/capacity assessment exercises, risk perception may be formally included in the assessment process by incorporating people's own ideas and perceptions of the risk they are exposed to. The increasing use of computer-assisted techniques, such as geographical information systems (GIS), may widen the gap between the information produced by technical risk assessment

and people's understanding of risk. Therefore, acceptable levels of risk may vary according to relative views on objective risk versus perceived risk.

The analyses of and lessons learned from previous disaster experiences help define profiles of risks related to people, activities and places with the same attributes in the face of specific potential sources of loss or damage. To reduce and understand risks in Central Asia, it is necessary to define what could happen in the future, given a range of possible alternatives to choose from. Risk assessment based on vulnerability and hazard analysis is a required step for the adoption of adequate disaster risk policies and measures. The negative impact of a disaster will depend on the characteristics, probability and intensity of the hazard, as well as the susceptibility of the exposed elements based on physical, social, economic and environmental condition. Risk can therefore be identified in following formula:

Risk = Hazard + Vulnerability

Where **vulnerability** is defined as danger rooted in conditions of physical, social, economical and environmental exposure that need to be assessed and managed on a continuing basis. Vulnerability/capacity assessment, like hazard assessment, utilizes formal procedures that include gathering of primary data, monitoring of hazards and vulnerability factors, data processing, mapping and social survey techniques. The interaction of vulnerability factors in a community is a key to understand risk reduction and would need to be addressed according to the balance of factors coming into play. The following factors should be considered:

- *Physical factors* are usually materially oriented, and come from the field of land use and planning, engineering and architecture. Vulnerability from a physical perspective, even though continually being broadened in scope, still refers mainly to considerations and susceptibilities of location and building environment. Physical vulnerability is often determined by aspects such as population density level, the remoteness of a settlement, and the site, design and materials used for critical infrastructure and for housing.
- *Social vulnerability* is normally linked to the level of well-being of individuals, communities and society. It includes levels of literacy and education, the existence of peace and security, access to basic human rights, systems of good governance, social equity, positive traditional values, customs and ideological beliefs and overall collective organizational systems. Some groups are more vulnerable than others, and people less privileged because of their class or ethnic minority affiliations or young or old age might be worse off. Public health, including physical, mental, and psychological well-being, is a critical aspect of social vulnerability. Traditional knowledge systems, as well as cultural aspects such as indigenous beliefs, traditions and ways of coping are important determinants in risk perception. Extreme religious belief in destiny might present a challenge in moving forward towards the acceptance of a culture of prevention and protection.

- *Economic factors* including the economic status of individuals, communities and nations relates both to the possibility of higher proportional losses among the poor when a disaster strikes and to their generally more limited capacity to recover from disasters. An economy lacking in diversity is generally more vulnerable. Equally, inadequate access to basic socio-economic infrastructure such as communication networks, transport, water, healthcare facilities increases people's exposure to risk.

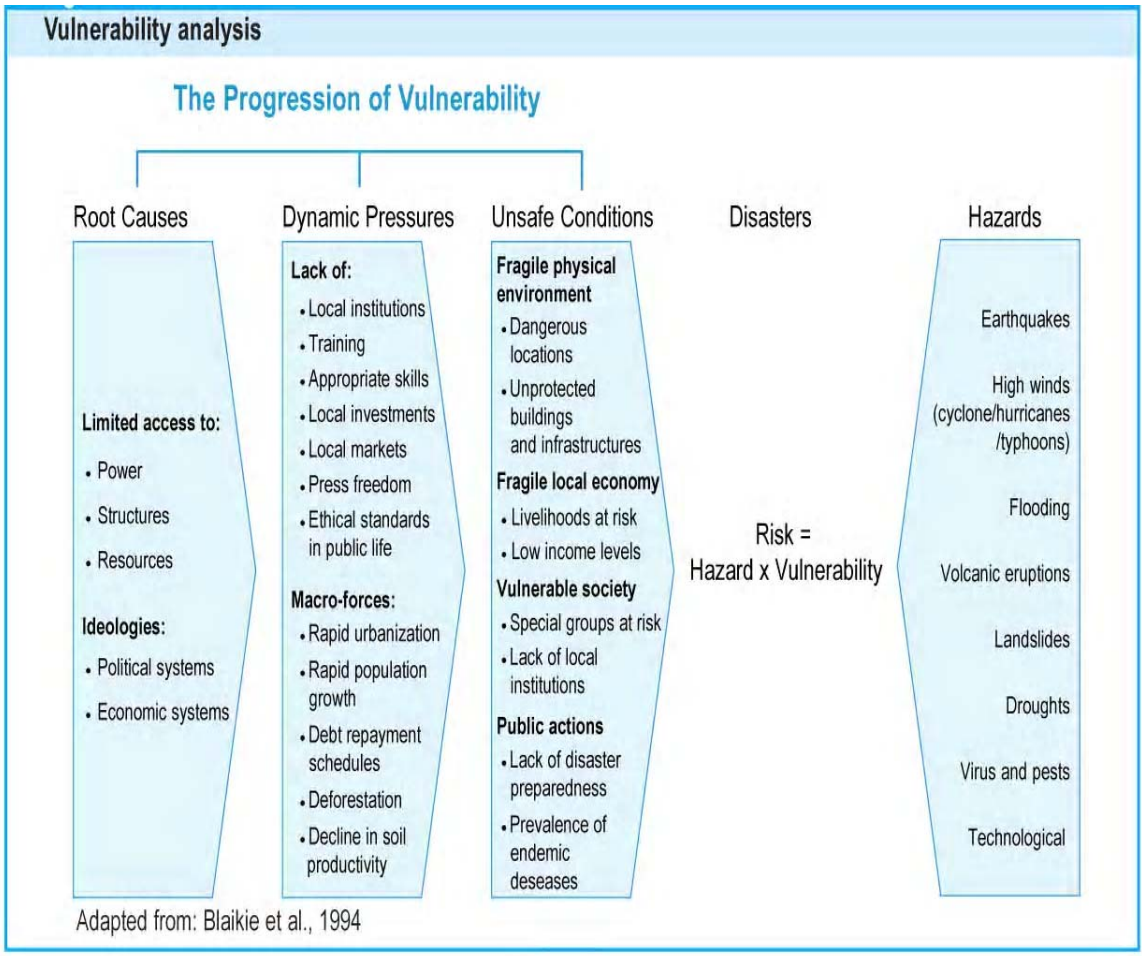
- *Environmental vulnerability* includes the extent of natural resource depletion, the state of resource depletion and the data on resource degradation. Reduced access to clean air, safe water and sanitation and inappropriate forms of waste management, especially in heavily populated and urban environments, can aggravate socio-economic vulnerability. Poorer environmental conditions such as diminished biodiversity, soil degradation or growing food scarcity can easily threaten food security for people dependent on the products of land, forests, pastures and marine environments for their livelihoods. As natural resources become scarcer, the range of options available

to communities becomes more limited, reducing the availability of coping solutions and reducing local resilience to hazards or capacity to recover from disasters. Over a period of time, environmental factors can further increase vulnerability by creating new and undesirable patterns of social discord, economic destitution and eventually forced migration of entire communities.

The complementary evaluation of vulnerabilities and coping capacities presents numerous challenges and should involve an active participation of communities at risk. The risk assessment process is an opportunity for community leaders to raise risk awareness, develop ideas and confront preconceptions within his or her community.

In spite of the above factors, no consistent methodology or standard sets of practices are available to address disaster risk reduction in all cities and local areas. However, some activities carried out in several settings can be beneficial when backed by sustained commitment to disaster risk reduction. Generally, these activities include risk and vulnerability analysis, building local institutional knowledge and capabilities, increasing public awareness and participation, and protecting critical public infrastructure. Ideally disaster risk management should be mainstreamed into daily local government actions with dedicated human and financial resources.

Following is a sample mechanism of vulnerability analysis that could be applied by community leaders for vulnerability assessment:



Source: Living With Risk, ISDR 2002

4.3. RISK AWARENESS

If a local community is involved in the risk assessment process, this is also an opportunity for raising awareness about potential hazards. Some of these hazards may be already known by the community while others are not. Changes in attitude must be seen as a process, and when this particular process is completed, hazards are recognized or accepted. When this happens, it is possible to bring about a change in land use practices that contribute to disaster risk reduction.

Awareness at community level is necessary to achieve consensus and secure commitment from local authorities to introduce disaster risk reduction policies. Most local authorities have facilities and budgets allocated or easily

available to emergency response. In contrast, very few local authorities have permanent facilities to monitor potential risks and to motivate public and private efforts to manage risks before a disaster occurs. As resources and decision-making powers often remain with or are determined by national decision makers, it can be difficult to systematically forecast, monitor or assess disaster risk in specific areas. With competing priorities set by multiple national agendas that are often challenged by strong competition for limited national and external resources, local officials often delegate decisions and responsibilities relating to disaster risks to central authorities if there is no strong local support to address more immediate concerns.

Information dissemination and public awareness raising, as concepts and in general terms, are not that easy to handle because they include everything from facts to deeper understanding, and may sometimes include lies and deceptions. Information screening is an area where power relationships strongly operate. When information is passed on, it is crucial to know what kind of information it is and what it is aimed at. Information can be subdivided into four categories:

1. **Data:** Basic, unorganized facts, usually in a statistical format, such as wind speed, rainfall intensity, death tolls.
2. **Information:** Organized data, descriptions such as "a flood might be on the way".
3. **Knowledge:** Combined information with understanding of accepted facts, generating awareness and the ability to predict events.
4. **Wisdom:** Capacity to make value judgments based on experience, understanding and principle.

5. COMMUNITY-BASED DISASTER RISK REDUCTION

5.1. CONCEPT

By "community", we imply both rural villages and urban neighbourhoods. It could be difficult for an outsider to identify a community as the description of "where a community starts and ends" depends on feedback from the community itself. A community can therefore be defined in several ways, and most definitions include shared experiences, locality, culture, language and social interests. These characteristics imply that a community needs to have some common social structures as glues, which can be schools, community policies, common rules and regulations and most often a clearly defined geographical area. Community-based disaster risk reduction is a process within a community and for the community; which means that activities and actions vary from one community to another. In specialized literature, this is often referred to as a "bottom-up" process because solutions are coming from the community itself and not in the form of a request from higher authorities. Reducing risk in communities should address the root causes of risks and address it through local knowledge and expertise.

Disaster risk reduction is most effective at community level where specific local needs can be met. Isolated government and institutional interventions often prove to be insufficient, occasional and only reactive, and are far more costly than developing local disaster risk reduction capabilities.

The common process for most communities involves situation analysis, risk mapping, mitigation activities, community training, and risk monitoring and evaluation. To make disaster risk reduction sustainable in communities, a large

number of diverse actors must be involved in the process and committed to follow up further actions. Involvement from the most vulnerable groups is considered vital for successful and sustainable long-term achievements. Quite often, financial assistance for the implementation of specific projects comes from central government level or external donors: this may bring about complications as decisions are not made in the community. This is particularly important for mitigation projects such as reinforcing river banks, for community members should participate in the design and construction processes to ensure community ownership and maintenance skills.
The successful use of a community-based disaster risk reduction approach is based on the combination of all capacities, including all strengths and resources available for reducing disaster risk or impact within a community, society or organization. Capacity, which may also be described as "capability" in specialized literature, can include physical, institutional, social or economic means as well as skilled collective or personal attributes such as leadership and management. In fact, efforts targeting the development of human skills or social infrastructure within a community or organization should also address disaster risk. In general terms, capacity building refers to the development of institutional, financial, political and other resources such as technology at different levels and sectors of the society.

5.2. COMMUNITY-BASED APPROACHES TO DISASTER RISK REDUCTION

The following boxes provide examples of community-based approaches to disaster risk reduction:

Participatory Rural Appraisal (PRA)

The method known as "Participatory Rural Appraisal" (PRA) facilitates the documentation of local knowledge and interpretation of risk, synthesizing this understanding with "outside" approaches and perception. Communities usually respond positively to PRA techniques because communication and interaction take place at the community level. Where possible, the PRA facilitation speaks the local language, and diagrammes are initially developed with the use of readily available resources. Outsiders familiar with the PRA techniques become facilitators and then co-workers with the community as it becomes apparent that the community has significant knowledge and coping capacities. These are often expressed in local idioms and may not be initially recognized as such.

Following are five (5) key principles that form the basis of any PRA activity:

Participation: Success of PRA techniques depends on local people's participation in sharing information and responsibilities.
Flexibility: Current circumstances are always assessed and techniques are adapted to suit a particular community best.
Teamwork: It is best to have a mix of sector specialists and a large representation of women.
Optimal Ignorance: To be efficient, PRA work collects just enough information to make necessary recommendations and decisions.
Systematic: Data is accurate and carefully organized.

Source: Land use, Disaster Risk & Rewards, ISDR 2004

Example of Steps for Applying Early Warning Arrangements Together with a Preparedness Plan Based on Community Actions

- Engage in technical assistance to conduct detailed hazard zoning in hazard-prone areas;
- Organize a local hazard group of experts consisting of representatives from the political and technical leadership in the community, the police, civil defence agency and people living in hazard-prone areas;
- Develop criteria for hazard assessment, including installation of meteorological equipment;
- Prepare programme of action for different hazard levels, including procedures for warning and evacuation; and
- Hire external assistance for training local avalanche group about the nature of the hazard.

A Successful Community-Based Disaster Risk Reduction Initiative : ***The Tuscion Community Project in Tajikistan***

An excellent example of community-based initiatives is the "Slope Stabilization Project" implemented in Tuscion Djamoat, Tajikistan, in 1999 with financial and technical support from FOCUS Humanitarian Assistance (USA). Tuscion is located in the western part of Mountainous Badakhshan in one of Tajikistan's least developed and most isolated regions. Geologically, Tuscion is a seismo-tectonic intra-mountain basin. Sagging and slumping processes within inhabited and irrigated areas began in 1995. The processes were apparently stimulated by excessive irrigation when many people began farming on the slopes after the collapse of the Soviet Union. No control of water was exercised. As a result, lands in Tuscion received much more water than needed and there was practically no control over irrigation, in violation of all standards and norms. The farmers had no source of information regarding optimum watering rates for their crops or for the stability of the land. Thus, a combination of natural and man-related factors brought about a sharp change in the local situation and created conditions conducive to landslides, ground subsidence, debris flows, etc.

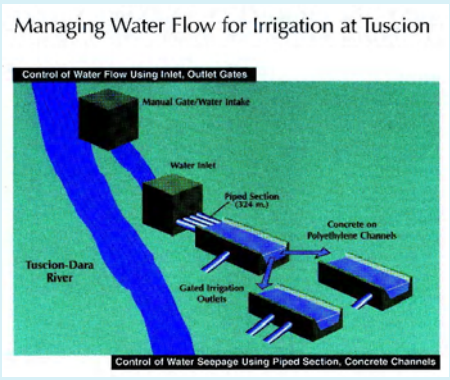
A substantial part of the 3,000-member community and houses, schools, other infrastructure and agricultural fields are located on and just under the site of an ancient landslide on the steep slope of the valley. Some parts of the slope had begun to slide in previous years. Several houses collapsed, many buildings suffered larger and larger cracks, large boulders rolled off the slope and crashed into the houses below, small areas slumping suddenly and the planted poplar trees leaning further each year. A community-based action was taken, aiming to mitigate these hazards through three simultaneous projects: (i) Improvement of the three main water channels; (ii) Disaster Mitigation and Preparedness Training; and (iii) Forestation and Protection.

The main project objective was to establish a sustainable community organization that would monitor and regulate the timing and amount of water used for irrigation purposes, and promote other agricultural rules and standards. The proposed community organization, known as "Water Users' Association", was established on the basis of the existing Farmers' Association, and one of its main objectives today is the identification of feasible solutions and local ownership of mitigation policies and activities.

Utmost attention was paid to forestation in water-logged sectors and along the channel tracks. Due to the area's high altitude and climate, careful selection of species was a high priority of national NGO *Kuhiston* which provided assistance to the Tuscion community. Most of the selected species such as poplars and willow trees were donated by Khorog Botanical Gardens. Protection of newly planted trees was another problem. To deal with this, agreements were signed between the local government and the farmers who planted the trees, and the farmers are now the full owners of the trees.

Still the main source of slope instability was the three main channels that lost 70 per cent of their waters into the ground and into natural erosive and tectonic depressions.

The designed complex of measures aimed at engineering slope stabilization included:



- Hydrological isolation of the three main channels;
- Regulation of the water that released into the irrigation ditches;
- Strict rationing and regulation of the irrigation process in all irrigated areas; and
- Piped drainage of irrigation waters from the springs at the out-wedging zones.

The engineering works have substantially reduced the number of households for immediate relocation. Now, several years after the project completion, there is an agreement that the project was a timely and professional intervention. Its success is very much related to large involvement of local experts – engineers and workers. In the years following the project completion, the Tuscion community also initiated its own follow-up activities - rehabilitation of other channels, forestation and community training. The project is a model of sustainable community-based disaster risk reduction initiatives.

5.3. DISASTER RISK REDUCTION AS PART OF LOCAL PLANNING

The first essential steps of community-based disaster risk reduction include awareness of potential causal factors of disasters. This can be achieved through risk analysis, as described above. Local governments should be involved from the very beginning and should be working closely together with other agencies involved in the process. The next step for the community would be to draw up a "strategic risk reduction plan" aimed at identifying and complementing risks associated with natural phenomena. This process can be divided into the following steps:

1. **Baseline Data:** The first stage involves the establishment of baseline data in the hazard-prone area. Study units (or involved parties) differ depending on different geographical conditions prevailing in the high-risk area. The study units can be represented by housing blocks, farmlands, wood lands, pastures, etc. The goal is to identify hazards and vulnerabilities. Frequently used methods include:

    - Community workshops
    - Semi-structured interviews
    - Verification surveys
    - Satellite imagery of areas densely used and risk areas
    - Various field databases for information gathering

2. **Risk Maps:** In this second stage, geographical information can be collected and processed with the application of geographical information system (GIS) software. Risk maps must be based on the results of the risk analysis. Different indicators must be established for each factor so that the information can be transferred to the GIS. A 0-5 scale can be used to describe the following categories: no risk; very low risk; low risk; moderate risk; high risk; very high risk. Values should be allocated to various indicators so that it becomes possible to adjust the results which are weighted depending on the importance of the factor in relation to all others. The final outcome can be ranged on a disaster risk map.

3. **Strategic Risk Plan:** These maps are often used for the development of strategic risk reduction plans with the communities and local authorities through three stages (information, consultation and coordination). Such a plan is a tool designed in agreement with committed actors to encourage the integration of processes that could reverse situations identified as problematic with regard to disaster risk.

5.4. EARLY WARNING SYSTEMS

To be effective, early warning systems should be people-centred and should integrate the following four elements: (1) Knowledge of risk faced; (2) Technical monitoring and warning services; (3) Dissemination of meaningful warnings to those at risk; (4) Public awareness and preparedness to act. Failure in any of these four elements can mean failure of the entire early warning system.

Early warning systems are recognized by the Hyogo Framework for Action (HFA) as an important element of disaster risk reduction and, as such, they help protect development gains from increased occurrence and impacts of disasters. The increased occurrence and impact of disasters are due to the size and vulnerability of exposed populations and also to the increased frequency and severity of some hydrometeorological hazards that could possibly be caused by climate change.

Taking various shapes, early warning systems have repeatedly proved to be a critical element in saving lives, property and agricultural assets. Early warning information must be as accurate, as timely and as credible as possible so that people can trust it and act on it. People need to know exactly where to go for safety and which route to take.

Scientific forecasts about potential hazards are commonly broadcast on the radio and television and published in the newspapers. However, when using the media, it is most important to ensure careful and proper interpretation and conveying of the warning information to avoid unnecessary panic and to minimize inaccurate reports.

Local governments provide a vital link between national-level warning and communities at risk. While radio and TV may transmit warnings to the most remote parts of the country, it is local governments that must team up

with the local Red Cross and Red Crescent branch and NGOs to ensure that the warnings are understood by the population at risk, shelters are ready in case of emergency and evacuation is provided if needed.

For the sake of efficiency, early warning systems need to be people-centred. The objective of a people centred early warning system is to empower individuals and communities threatened by hazards to act in adequate time and manner to reduce the possibility of personal injury, loss of life, damage to property and the environment, including the loss of livelihoods.

Risk knowledge is essential to set up an early warning system and should be based on a combination of hazards and vulnerabilities to hazards. Risk assessment requires systematic collection and analysis of data and should take into account the dynamics and variability of hazards and vulnerabilities arising from processes such as urbanization, rural land use, environmental degradation and climate change. Risk assessment and risk maps help motivate people, prioritize early warning system needs and guide preparations for response and disaster prevention activities.

Monitoring and warning service: Warning services lie at the core of the system. They must have a sound scientific basis for predicting and forecasting and must reliably operate 24 hours a day. Continuous monitoring of hazard parameters and precursors is necessary to generate accurate and timely warnings. Where possible, warning services for different hazards should be coordinated to benefit from shared institutional, procedural and communication networks.

Dissemination and communication: Warnings should reach those at risk. For people to understand warnings, they must convey clear, useful information that enable proper responses. Regional, national and community-level communication channels and tools must be pre-identified and a single authoritative voice established. The use of multiple communication channels is necessary to ensure everyone is reached, to guard against any possible failure of a channel and to reinforce the warning message.

Response capacity: Communities must respect the warning service and know how to react to warnings. This requires systematic education and preparedness programmes led by disaster management authorities. It is essential that disaster management plans are in place and are well practiced and tested. The community at risk should be well informed on options for safe behaviour and on means to avoid damage and loss of property.

Strong inter-linkages are required between all the elements underpinned by effective governance and institutional arrangements, including good communication practices. This requires the involvement of a broad range of actors, some not traditionally identified as dealing with the subject. It also requires technical capacities corresponding to sustainable development and community development agendas and to disaster risk reduction programmes.

Sample Checklist for People-Centred Early Warning Systems

Risk Knowledge	*Monitoring & Warning Service*
Systematically collect data and undertake risk assessments • Are hazards and vulnerabilities well known? • What are the patterns and trends in these factors? • Are risk maps and data widely available?	**Develop hazard monitoring and early warning services** • Are the right parameters being monitored? • Is there a sound scientific basis for making forecasts? • Can accurate and timely warnings be generated?
Dissemination & Communication	***Response Capacity***
Communicate risk information and early warning • Do warnings reach all of those at risk? • Are the risks and the warnings understood? • Is the warning information clear and usable?	**Build national and community response capacities** • Are response plans up-to-date and tested? • Are local capacities and knowledge used? • Are people prepared and ready to react to warnings?

Source: ISDR Platform for the Promotion of Early Warning (PPEW)

Early Warning Systems at Community Level: Roles & Responsibilities

Developing and implementing an effective early warning system requires contribution and coordination of a wide range of individuals and institutions. Each has a particular function for which it should be responsible and accountable.

Communities, particularly those most vulnerable, are at the core of people-centred early warning systems. Their inputs to system design and their ability to respond ultimately determines the extent of risk associated with natural hazards. They should be aware of the hazard and the related effect to which they are exposed to, and be able to take specific actions to minimize the threat of loss or damage.

Local governments usually have direct responsibilities for citizens' safety and a considerable knowledge of the hazards to which their communities are exposed. They must be actively involved in the design, development and maintenance of early warning systems. Also, it is necessary that they understand the information received and are able to advise, instruct or organize the local population in a manner that increases their safety and reduces the risk of losing resources on which they depend.

NGOs, including volunteers, play a critical role in raising awareness among individuals and organizations involved in early warning systems, particularly at community level. In addition, they play an important advocacy role to help ensure that early warning stays on the agenda of government policy makers.

Technological fixes are, in many ways, the easier part of developing an early warning system. The real challenge lays in the creation of a people-centred early warning system sensitive to human psychology. The following box might help take steps in this direction:

Early Warning Systems for Different Hazards: Advantages & Challenges

Earthquake: The world's plate boundaries and earthquakes have been identified and extensively studied. Regional earthquake monitoring systems have been installed in most earthquake-prone regions. However, earthquake prediction capability remains vague because, among other things, the location, magnitude and time of occurrence of earthquakes cannot be forecasted yet. In the light of this, critical systems such as gas supply lines can be shut down and fire stations and ambulance doors opened before the most severe shaking reaches the location. The warning to be issued depends on both the distance from the epicentre and the depth of the earthquake, and the lead time may be just a few seconds. It is better to act on an initial earthquake shock as a warning of possible further shocks and hazards such as fire or building collapse. It is, for instance, recommended to quickly shut off a gas stove and move to a safer place.

Flood: Dedicated systems to monitor and forecast river basin floods are well established in developed countries, but there are still steps to be taken in Central Asia. Operational global flood forecast from specialized warning systems provide warnings three days before the feared event but several initiatives are under way to extend that time period. Most flood warning systems are stand-alone national operations, but warning systems have been developed covering several international rivers, like Rhine and Elbe in Europe and Zambezi in Southern Africa. A unique example of flood monitoring and early warning system is the one established in Tajikistan in the area of Lake Sarez in Mountainous Badakhshan, as part of the -2006 Lake Sarez Risk Mitigation Project (2000-2006).

Landslide: The timing of landslides can be predicted provided slopes are monitored, which often is not the case. Landslide early warning systems need to take into account observations of uphill environmental degradation due to deforestation, land use systems and wildland fires.

Drought: Early warning systems for drought are complex and still underdeveloped. They rely to a large extent on monitoring of observed patterns for monthly and seasonal rainfall, stream flow, ground water level of snow pack and other parameters and use of historical and statistical data. Requirements for early warning range from a few weeks to several months. Nonetheless, many countries have developed drought early warning systems capable of combining information from various sources and providing warnings of the imminent onset of drought. Traditional forecasting remains an important source of climate information in many rural communities. There is a growing appreciation that traditional observations and outlook methods may have scientific validity, and there is an increased interest in harmonizing traditional and modern scientific methods of climate prediction.

A Unique Example of Flood Monitoring and Early Warning System : ***The Lake Sarez Risk Mitigation Project in Tajikistan***

"On 6 February 1911 at 23:15, a strong tremor was felt in Khorog. In the village of Sarez in Mountainous Badakhshan, one of Tajikistan's least developed and most isolated regions, people rushed out of their houses screaming with horror. Two houses collapsed, four gave cracks. A wild rumble was heard from the west. It merged with the howl of falling avalanches. The moon above Mardjanai got pale. In the morning, everything was covered with dust hanging in the air, and the land continued to shake. When some boys reached Usoy (the site of a dam), they did not see the village. A huge mountain of rocks was found in its place."

That was the beginning of the Lake Sarez story.

Practically immediately after the disaster, the scientific circles of Russia began discussing the question of the stability of the new dam and the probability of a catastrophic flood from the growing lake. It is worth noting that forecasts - both favourable and terrifying – were made not only by scientists and experts but also by people with little in common with the problem. There were two points of view with regard to the Lake Sarez problem. The first of them was that the newly formed Usoy Dam was unstable and a catastrophic flood from the lake was a probability involving all the imaginable consequences. The second one was that Usoy Dam was a natural stable formation and the lake would exist for quite a long time, similarly to other conformable lakes.

Despite an enormous amount of data, the problem of Lake Sarez and the stability of Usoy Dam still cause a lot of argument. Practically all research works agree that Usoy Dam is a stable formation that cannot collapse under the pressure of the lake water and that the dam erosion due to the raise of the water level will not be disastrous.

In 1999, the European Community Humanitarian Office (ECHO) allocated funds for a number of measures aimed at assessing the nature of the hazard and developing an emergency communication system for settlements in close proximity to the lake. The project resulted in:

- ✓ The implementation of *preparedness activities* by vulnerable groups and other groups, including local communities, local administration, the Ministry of Emergency and Civil Defence staff, non-governmental and international humanitarian organizations with a disaster response mandate;
- ✓ An assessment of human resources and institutional infrastructure for the development of a detailed plan of action for emergency situations;

- ✓ A series of workshops in remote villages and towns, local and provincial *khukumats* with the objective of raising awareness and developing the potential of the project beneficiaries, their involvement in the planning process, creation of local search and rescue teams, and emergency training; and
- ✓ Design and establishment of a two-way emergency communication system. The system consists of 11 HF radio stations located at Usoy Dam, Dushanbe, Khorog, the regional centre of Rushan.

It is worth noting that radios were installed in the homes of local residents to make them accessible for emergency use and monitored for warnings at all times. Where possible, radios were located in houses on higher ground above the river in case of flooding. The houses hosting the radios had been carefully selected by local leaders to make sure that capable and reliable families would take responsibility. In most villages, both the host household and their neighbours were trained to operate and maintain the radios and the solar systems powering them. For several years, this chain of communication had been the local residents' only link with the outside world. It has immensely changed their lives, and has been helpful in a number of emergencies caused by local hazards, traffic and other accidents.

The Lake Sarez Mitigation Project, launched in 2000 under the auspices of the World Bank and the Ministry of Emergency and Civil Defence of the Republic of Tajikistan, built on the existing warning system and expanded it to a fully automatic monitoring and early warning system that has no analogue in Central Asia. Two years after being fully installed in 2004, it began contributing to the main project goal of ensuring the safety of the population vulnerable to the potential outburst of Lake Sarez.

Recommendations for People-Centred Early Warning Systems

- *Making warning intelligible*: More must be done to translate warnings into a simple, understandable language for all. People need to know what to do with the warning, where to go and which route to take.
- *Making warning specific*: The majority of deaths in hurricanes are from floods and landslides. National hurricane warnings must be supplemented with local warnings of secondary hazards. This requires prior flood and landslide mapping.
- *Encourage local ownership*: Early warning systems are more likely to succeed in conveying messages through the finale mile if people at risk are associated to their design, development and maintenance. This means communities – and not just national experts - must take part in mapping local hazards, conducting practical drills and building local awareness.
- *Supplement local knowledge*: Personal experience and oral history are important, but not always reliable. Experience must be discussed critically and supplemented with public education on secondary risks and their causes.
- *Spread awareness through schools*: Children who are aware of risks of flood, landslide and earthquake spread awareness through their families and neighbourhoods, and become more receptive as adults.

6. PUBLIC AWARENESS

Public awareness processes aimed at informing the general population about risks and the ways people can act to reduce their exposure to hazards are critical to disaster risk reduction. Public awareness activities foster changes in behaviour leading towards building a culture of risk reduction. It involves public information dissemination, education, radio or television broadcasts, use of print media, as well as the establishment of information centres and networks, community and participatory actions. In this process, a sustained programme of information and knowledge sharing between residents and external specialists is essential. Over-reliance on technical experts and one-way communication is inefficient and marginalizes disadvantaged groups' direct access to disaster risk reduction knowledge. Even though sharing information with both men and women is also important, capturing female knowledge of local ecosystems, vulnerabilities and capacities remains a continuous challenge. In Central Asia, knowledge and professional abilities are available in most communities yet it is quite seldom that all recourses are fully utilized. A special effort is needed to reactivate traditional values to enhance coping mechanisms and strategies. These should and can easily exist along with modern technologies aimed at building resilience to disasters.

6.1. AWARENESS STARTS AT AN EARLY AGE

When a disaster strikes, children are among the most vulnerable groups, especially those attending school in times of disaster. Disasters such as the earthquake in Pakistan (2005) where over 16,000 children died in collapsed school buildings or the mudslide on Leyte Island in the Philippines (2006), where more than 200 school children were buried alive, are just a few tragic examples of why more needs to be done to protect our children during catastrophic events.

To ensure sustainability, child training should be done with support from parents. Few children would continue and take the subject seriously if parents failed to accept it at home. At the same time, children are widely known to be influential and effective communicators and more often than not, lessons learned at school are later transmitted to their home environments. There are many documented occasions when the safety of a family or the insistent prodding of a child to protect an important element or feature of the household, is traced back to a "safety lesson" learned at school or training.

6.1.1. Community Training for Children

Training centres and community training are increasingly used to disseminate information to the public. Such initiatives foster growth of smaller informal training sessions adapted to local contexts and are often based on local practices. Structured programmes are conducted at both national and community levels with the aim of increasing subject knowledge as well as the necessary communication and motivational skills. However, to succeed with local capacity building, internal organizational training is also needed to enhance skills.

Many opportunities exist whereby educational programmes can be used to introduce hazards, surrounding conditions of vulnerability and community risk. Teachers can use their imagination to integrate disaster risk reduction into even most elementary curricula, even if there are no settled national guidelines – since including disaster risk reduction in national curricula is a lengthy and costly process because new textbooks need to be developed and teachers trained. Today, most countries in Central Asia have not yet adopted a national approach but there are a number of initiatives developed by organizations Red Crescent Society, Mercy Corps, CARE International, Oxfam, UNDP, UNICEF and local NGOs such as *For the Earth*. These organizations either work through schools or arrange community training for children.

Children In Emergencies

Each year, natural disasters leave dozens of people dead, hundreds of others injured and thousands homeless in Tajikistan. How to get prepared and minimize disaster consequences? We practically learn nothing about it at school and at home, it is not so easy to find information or get advice…

This led the environmental NGO *For the Earth* to launch a training programme called "Children in Emergencies" in 1999. The programme helps children and their parents become aware of the conditions, causes and consequences of natural disasters, get prepared and cope with them.

Over the past few years, *For the Earth* has implemented a number of small projects in the cities of Dushanbe, Khorog and Rushan, and in Tuscion District and communities of Bartang River Valley. The NGO developed several booklets and manuals that are currently used by many schools and organizations. Training in disaster mitigation and preparedness has covered hundreds of school teachers and youth, and thousands of school students have been trained in basic disaster prevention and preparedness.

The main goal of the programme is to reduce disaster impact through child and community training.

The programme involves:

- Designing and developing training programmes for secondary school students in disaster reduction (adequate behaviour before, during and after a disaster);
- Developing training manuals in disaster preparedness, and translating and adapting existing material for school teachers and the general public;
- Training school teachers and newly recruited trainers in disaster reduction training skills; and
- Attracting the attention of schools and other public bodies on the issue of disaster reduction, and lobbying to include relevant material into school curricula.

6.1.2. Education at School

Schools are generally regarded as institutions of learning, promoting cultural values and passing on both traditional and conventional knowledge to younger generations. Protecting our children from natural hazards therefore requires two distinct yet inseparable priorities for action: disaster risk education and school safety.

Education associated with disaster risk reduction and preparedness represents a long-term goal which can only be achieved through a planned process. A key factor for education would be to keep a steady and consistent approach, beginning at an early age and continuing through generations. Educational institutions have an important role to play in stimulating and maintaining practices that serve public well-being. Teachers are also key players as admired community leaders whose opinion and dedication are respected in matters of public interest. For this reason, teachers can support and communicate the importance of safer school construction which is a crucial element. In the context of Central Asia, numerous hazards and prevailing risk conditions require increased attention and a wider public involvement in learning about disaster risk reduction. To work towards increased informal and formal disaster risk reduction, education at primary and secondary levels therefore is needed to foster awareness and better understanding.

6.1.3. Example of Pedagogical Innovations

Child-to-child or peer-to-peer approach is increasingly used in education. Distinct characteristics of the child-to-child technique imply direct involvement of children in the education process. This approach builds on a philosophy that assumes that child behaviour at school is associated with their behaviours at home, and that child actions would be closely related to learning as well. The chance that lessons are internalized increases with the length and steadiness of the learning period. Involving children in decision making rather than merely using them as communicators of adult messages has proved to be an important requisite of success.

The child-to-child framework focuses on the following six-step approach to learning:

1. Identify a local disaster risk reduction issue and understand it well;
2. Find out more about disaster risk reduction;
3. Discuss what has been found and develop an action plan;
4. Take actions towards disaster risk reduction;
5. Evaluate and discuss results; and
6. Discuss how to increase effectiveness and sustain actions.

6.1.4. When a Disaster Strikes…

Children surviving natural disasters such as earthquakes, floods or landslides have several challenges to cope with at home and at school. They suffer from the trauma of losing closed ones, their homes or property. These children along with their families and communities also face a further threat of diseases and illnesses due to shortage of food, clean water, shelter, and due to poor hygiene conditions. There are several examples of how adults can support children to improve their conditions and continue with their life.

In crisis situations, adults will also be traumatized by losses incurred and uncertainty faced by their families, communities and themselves. As a result, their own misery and stress may cause them to forget about children's need for love, affection and security. In an emergency, parents, family members and teachers are all important sources of support for children.

The following considerations might help adults handle the situation:

- All children react differently to crisis situations: some may withdraw and become very quiet; others might appear to be coping well but inside they may be feeling hurt, sad and scared. The stress of crisis situations may also cause some children to become more aggressive.
- In crises situations, children need constant love, affection and security, and hope that the situation will improve. Try to avoid pushing or scolding children as this may add to sufferings they are going through.
- Games and support activities are the best way for children to deal with the stress.
- Some children may ask why disasters happen or feel guilty or responsible for the problem. Adults should spend time listening and talking to them about their feelings during and even months after the disaster.
- After a disaster, children need regular routines so they can feel secure and stable again. Set times for going to school, eating, playing and sleeping.
- Create a safe and clean area for children to play with one another.
- Spend time with children comforting them, talking to them or telling them stories regularly.
- If a child suffers from diarrhoea, give him/her plenty to drink, light food to eat, particularly salty food.
- Children who have fever should be kept cool, uncovered and wiped with a damp cloth.
- There should be a special place designed for going to the toilets if no latrine is available.

All the above-mentioned actions can end up being a lengthy process that needs a high level of political commitment. Rather than waiting for the Government to take decisions, local communities can start working at them on their own through a bottom-up approach. Three vital priorities should be taken into consideration:

1. *Teach about hazards and risk reduction*: Promote teaching in primary and secondary schools of locally important hazards and the ways to reduce risks.

2. *Turn schools into centres for community disaster risk reduction*: Theuse of participatory vulnerability assessment tools makes schools an example of how the surrounding community can map its own hazards, assess its vulnerability and capacity in the face of those hazards, and develop action plans to address the risk.

3. *Protect schools*: Take steps to assess hazards threatening schools and the ways to address them - ideally through a multi-hazard approach that would include, where appropriate, such hazards as earthquakes, landslides, floods, mudflows, snow avalanches and drought. New schools should be designed, located and constructed with hazards in mind. Old schools should be strengthened if necessary. All schools should be properly maintained.

6.1.5. Education as a Global Priority

"Knowledge and Education" is represented in the Hyogo Framework for Action under Priority for Action number three. In 2006, the International Strategy for Disaster Reduction (ISDR) global campaign entitled "Disaster Risk Reduction Begins at School" was launched and the 2006 International Day for Disaster Reduction was celebrated in Kazakhstan, Kyrgyzstan and Tajikistan with a special emphasis on child involvement, like art competitions. Communities can also celebrate this Day in their own schools and think of some other special activities.

6.2. SCHOOL SAFETY

History has shown that schools are highly vulnerable to earthquake damage, and therefore both structural and non-structural measures must be taken into consideration. A comprehensive approach to school safety is still rare but it is easy to justify. Such an approach should embrace design, location, building materials, building methods, supervision of construction, inspection and associated building codes as well as maintenance and monitoring of structures. Schools, training centres, university buildings with health care facilities and other essential public and private structures are exposed to collapse, inundation and other damage in extreme natural events. This endangers building occupants and interrupts or destroys important community functions. In addition, because schools and other larger structures often serve as shelters in time of emergencies, their loss can place a double burden on any affected community.

Non-structural protection is a good way of getting parents and communities involved. For example, parents can be briefed on what can be done to keep equipment and books from flying around in classrooms during an earthquake. These can be simple measures such as fastened cabinets, bookshelves and blackboards. All furniture with loose items inside should have proper closing mechanisms or strings as security measures. Considering that 50 per cent of damage comes from loose objects inside the building, these non-structural measures would have a significant contribution.

Structural damage such as partial or total collapse of buildings or infrastructure is the most common consequence of natural disasters, including earthquakes, floods and landslides. The integrity of the structure may be compromised. Structural mitigation aims to reduce this type of damage and eventually save lives. Structural mitigation is a science that requires the expertise of civil engineers. It begins with the design of new buildings and constructions and includes retrofitting and strengthening of old ones. Finally, it is most important to ensure good maintenance of buildings and constructions. Poor maintenance is often the cause of indirect damage. Retrofitting of schools is more demanding and costly than non-structural measures.

In retrofitting schools, there are several weaknesses to be addressed:

- Short columns are a common architectural design in most of reinforced concrete buildings that cause severe damage during an earthquake;
- Inadequate design features in construction joints can result in damage to adjacent buildings during an earthquake;
- In-filled walls of light steel structures fail due to inadequate connections with steel frames;
- Lightweight roofs collapse because of lack of tensile reinforcement; and

Adobe construction and non-reinforced masonry are very vulnerable because of lack of connecting beams and because of their heavy roofing tiles.

6.3. ROLES AND RESPONSIBILITIES

Disaster reduction requires joint efforts of different parties - dependent on their availability, capacity level, knowledge and skills. The following table may provide useful advice to vulnerable communities, donors and implementing partners:

Roles & Responsibilities

What children can do

- Children and youth can take advantage of the first aid and other risk reduction training provided by NGOs and quite often by national societies of the Red Cross and Red Crescent. It is also possible for older children to teach younger children.
- Children and youth can pass on to their parents what they are learning about hazards and risk reduction in school.

What parents can do

- Parents can ask questions about school safety at school board meetings. They can lobby governmental officials for the resources required for school safety.
- Parents can join other community members to support their children's learning of risk reduction and help spread the use of participatory risk assessment in the community.
- Parents who have lost children in school disasters can join together as an association or an NGO to do whatever they can to prevent other parents from suffering similar losses. The way grieving parents organize will take diverse, culturally appropriate forms around the world.
- Parent & Teacher Associations exist in various forms in many countries. These can become forums for discussion of what their children and youth learn about safety and hazard and how schools can be protected.

What educators and other professionals can do

- Professionals are working hard to enrich education with knowledge important to sustainable human development, peace, justice and safety. Nevertheless, there are ways that their efforts focus more clearly on natural hazards without detracting from the work they do in other important areas.
- Schools can come up with initiatives to teach classes once a week on disaster risk reduction and natural hazards, and use other lessons, such as geography/biology, to take the children out and mark out risk zones and/or draw risk maps of their community.

What international organizations can do

- Together with professionals, educators, communities, children and youth, they can develop a short list of "quick win" actions that can rapidly increase the safety of schools and raise the risk awareness level among school teachers and children.
- They can support coalitions and partnerships between schools and create knowledge network amongst schools.
- They can develop and provide educational material.

What donors can do

- Include disaster risk reduction measures in their funding of school construction projects.
- Fund educational projects for disaster risk reduction.

Source: *Let Our Children Teach Us! A Review of the Role of Education and Knowledge in Disaster Risk Reduction,* ISDR System Thematic Cluster/Platform on Knowledge and Education, July 2006

6.4. MEDIA

Local media often play a critical role in providing information during disasters; however, they receive very little help from outside. In rural areas, most people give preference to the radio. The media's convergence with disaster risk reduction derives from the need to inform, educate and empower communities with relevant knowledge for influencing public actions and policies towards disaster preparedness and mitigation.

Information exchange is crucial in enhancing disaster risk reduction at all stages. The media are today the major channel for spreading information to a larger audience. In Central Asia, and especially in Kazakhstan, media have played an increasing role to convey disaster risk reduction messages. Stronger cooperation between media and the disaster risk reduction community in Central Asia would clearly benefit the population and should be

encouraged.
Media can play different roles depending on the stage of disaster risk reduction process. In pre-disaster phase, the primary role of the media is to emphasize the importance of disaster risk reduction and disaster preparedness. It should encourage decision makers and at-risk communities to undertake appropriate actions to avoid future disasters. Media can do this by highlighting potential sources of risk or vulnerabilities, analyzing risk patterns and educating communities about measures they can undertake at family, community and organizational levels to mitigate hazards and reduce their vulnerability.

Media can use different ways to reach the public. Some of these ways may include:

- *Skilfully produced radio or TV programmes*: Such programmes can go beyond simple exchange of information by using entertaining soap operas to promote greater awareness of risk such as earthquakes or infectious diseases. In Tajikistan, a "Radio Theatre for Children" has been used, and in Afghanistan, the evaluation of a long-running radio soap entitled "New Homes and New Life" proved that listeners change their attitudes and behaviour after hearing the drama (Source: World Disaster Report, IFRC 2005).

- *Organize dialogues with local experts*: Dialogue among experts on the causes of disasters, risk and vulnerabilities and on the identification of appropriate solutions would play an important role in focusing communication among stakeholders on disaster problems and also in public awareness raising. Therefore, media should consider holding forums among representatives of scientific organizations, e.g. the Meteorological Department and other government departments, local NGOs, national societies of the Red Cross and Red Crescent and UNDP.
- *Public auditing*: Media can conduct surveys and opinion polls to rate the relevance, quality and quantity of the relief and rehabilitation assistance.

- *Research articles and programmes*: Media professionals can conduct research on specific issues such as risk generation factors in communities and publish them in newspapers or on radio/TV broadcasts.

- *Interviews*: Media can interview disaster management officials, e.g. the Director of the National Disaster Management Office, the President of the National Society of the Red Cross and Red Crescent Society, etc.
- *Field visits*: Media professionals can cover the plight of the vulnerable or disaster affected people to advocate for disaster risk reduction or the provision of appropriate relief and rehabilitation.

- *Warning and preparedness message dissemination*: When the hazard season is approaching, media can publish and broadcast warnings and preparedness messages to inform the general public about the risk and possible disasters they may face and actions they may take to avoid or minimize the loss of life and property.

Key Concerns for Media Messages

At times, the disaster risk reduction community finds it difficult to formulate its messages in a way that gets the media's interest. To ensure that the messages are adequately prepared and transmitted into local newspapers, radio and TV channels, both the information sources and media must make sure these messages are understandable and meet information requirements. It is advisable to comply with the following guidelines.

A good message must:

- Address public concern
- Contain what people want to know
- Give guidance on how to respond
- Provide accurate and timely information
- Use examples, stories and analogies to make a point
- Never assume that there is a common understanding between experts and target groups

To be effective, knowledge must be presented in a way that relates to local conditions and customs. While this has long been accepted as a cardinal principle in sustainable development, it is not as yet integrated in risk reduction strategies. Understanding that virtually any disaster risk reduction effort is essentially local in nature

and requires community actions, communities can voice their needs to donors and the general public by using the following strategies:

- Sharing information from disaster assessment
- Promoting public auditing at all levels of disaster response
- Supporting better access to information and communications technology for vulnerable communities
- Building information-sharing partnerships with local government authorities and civil society networks
- Keeping this process ongoing
- Exchanging information
- Reaching broader audience

7. SUMMARY

Even though disaster risk reduction seems to be a relatively new issue, it has existed for centuries where the elderly gathered and found solutions to their problems. Local community solutions and indigenous knowledge applied over the years often can help handle current situations.

Community-based disaster risk reduction is a key to ensure safety for all. To approach hazards, it is necessary to conduct a vulnerability analysis as well as consider potential hazards in the area. To ensure sustainability, the whole community should be involved and their voice heard in the process. Often projects can fail because the community itself does not know how to maintain the investments made or because the international organizations involved do not address community needs.

Disaster risk reduction is more than implementation of projects, it calls for a change of attitude and for understanding that one's way of living might need to change. Many actors from many sectors should be involved, including the local government, education and media sectors. As children often are among those most affected by disasters and as they also represent the future, they are a key to bringing about a change of outlook in the approach to disaster risk reduction.

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GLOSSARY

This terminology, developed by UN/ISDR in 2004 in cooperation with other experts in the field, presents the following basic definitions on disaster risk reduction in order to promote a common understanding on this subject, for use by the public, authorities and practitioners.

Acceptable risk

The level of loss a society or community considers acceptable given existing social, economic, political, cultural, technical and environmental conditions.

In engineering terms, acceptable risk is also used to assess structural and non-structural measures undertaken to reduce possible damage at a level which does not harm people and property, according to codes or "accepted practice" based, among other issues, on a known probability of hazard.

Biological hazard

Processes of organic origin or those conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Examples of biological hazards: outbreaks of epidemic diseases, plant or animal contagion, insect plagues and extensive infestations.

Building codes

Ordinances and regulations controlling the design, construction, materials, alteration and occupancy of any structure to insure human safety and welfare. Building codes include both technical and functional standards.

Capacity

A combination of all the strengths and resources available within a community, society or organization that can reduce the level of risk or the effects of a disaster.

Capacity may include physical, institutional, social or economic means as well as skilled personal or collective attributes such as leadership and management. Capacity may also be described as capability.

Capacity building

Efforts aimed at developing human skills or societal infrastructures within a community or organization needed to reduce the level of risk.

In extended understanding, capacity building also includes development of institutional, financial, political and other resources, such as technology at different levels and sectors of the society.

Climate change

The climate of a place or region is changed if over an extended period (typically decades or longer) there is a statistically significant change in measurements of either the mean state or variability of the climate for that place or region.

Changes in climate may be due to natural processes or to persistent anthropogenic changes in atmosphere or in land use. Note that the definition of climate change used in the United Nations Framework Convention on Climate Change is more restricted, as it includes only those changes which are attributable directly or indirectly to human activity.

Coping capacity

The means by which people or organizations use available resources and abilities to face adverse consequences that could lead to a disaster.

In general, this involves managing resources, both in normal times as well as during crises or adverse conditions. The strengthening of coping capacities usually builds resilience to withstand the effects of natural and human-induced hazards.

Counter measures

All measures taken to counter and reduce disaster risk. They most commonly refer to engineering (structural) measures but can also include non-structural measures and tools designed and employed to avoid or limit the adverse impact of natural hazards and related environmental and technological disasters.

Disaster

A serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources.

A disaster is a function of the risk process. It results from the combination of hazards, conditions of vulnerability and insufficient capacity or measures to reduce the potential negative consequences of risk.

Disaster risk management

The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters. This comprises all forms of activities, including structural and non-structural measures to avoid (prevention) or to limit (mitigation and preparedness) the adverse effects of hazards.

Disaster risk reduction (disaster reduction)

The conceptual framework of elements considered with the possibilities to minimize vulnerabilities and disaster risks throughout a society, to avoid (prevention) or to limit (mitigation and preparedness) the adverse impacts of hazards, within the broad context of sustainable development.

The Disaster Risk Reduction Framework is composed of the following fields of action, as described in the 2002 version of the ISDR publication entitled "Living with Risk: A Global Review of Disaster Reduction Initiatives" (page 23):

- *Risk awareness and assessment, including hazard analysis and vulnerability/capacity analysis;*
- *Knowledge development including education, training, research and information;*
- *Public commitment and institutional frameworks, including organizational, policy, legislation and community action;*
- *Application of measures including environmental management, land use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments;*
- *Early warning systems including forecasting, dissemination of warnings, preparedness measures and reaction capacities.*

Early warning

The provision of timely and effective information, through identified institutions, that allows individuals exposed to a hazard to take action to avoid or reduce their risk and prepare for effective response.

Early warning systems include a chain of concerns, namely: understanding and mapping the hazard; monitoring and forecasting impending events; processing and disseminating understandable warnings to political authorities and the population; and undertaking appropriate and timely actions in response to the warnings.

Ecosystem

A complex set of relationships of living organisms functioning as a unit and interacting with their physical environment.

The boundaries of what could be called an ecosystem are somewhat arbitrary, depending on the focus of interest or study. Thus the extent of an ecosystem may range from very small spatial scales to, ultimately, the entire Earth (IPCC, 2001).

El Nino-Southern Oscillation (ENSO)

A complex interaction of the tropical Pacific Ocean and the global atmosphere that results in irregularly occurring episodes of changed ocean and weather patterns in many parts of the world, often with significant impacts, such as altered marine habitats, rainfall changes, floods, droughts, and changes in storm patterns.

The El Nino part of ENSO refers to the well-above-average ocean temperatures along the coasts of Ecuador, Peru and northern Chile and across the eastern equatorial Pacific Ocean, while the Southern Oscillation refers to the associated global patterns of changed atmospheric pressure and rainfall. La Nina is approximately the opposite condition to El Nino. Each El Nino or La Nina episode usually lasts for several seasons.

Emergency management

The organization and management of resources and responsibilities for dealing with all aspects of emergencies, in particularly preparedness, response and rehabilitation.

Emergency management involves plans, structures and arrangements established to engage the normal endeavours of government, voluntary and private agencies in a comprehensive and coordinated way to respond to the whole spectrum of emergency needs. This is also known as disaster management.

Environmental impact assessment (EIA)
Studies undertaken in order to assess the effect on a specified environment of the introduction of any new factor, which may upset the current ecological balance.

EIA is a policy making tool that serves to provide evidence and analysis of environmental impacts of activities from conception to decision-making. It is utilised extensively in national programming and for international development assistance projects. An EIA must include a detailed risk assessment and provide alternatives solutions or options.

Environmental degradation
The reduction of the capacity of the environment to meet social and ecological objectives and needs.

Potential effects are varied and may contribute to an increase in vulnerability and the frequency and intensity of natural hazards.

Some examples: land degradation, deforestation, desertification, wildland fires, loss of biodiversity, land, water and air pollution, climate change, sea level rise and ozone depletion.

Forecast
Definite statement or statistical estimate of the occurrence of a future event (UNESCO, WMO).

This term is used with different meanings in different disciplines.

Geological hazard
Natural earth processes or phenomena that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Geological hazard includes internal earth processes or tectonic origin, such as earthquakes, geological fault activity, tsunamis, volcanic activity and emissions as well as external processes such as mass movements: landslides, rockslides, rock falls or avalanches, surfaces collapses, expansive soils and debris or mud flows.

Geological hazards can be single, sequential or combined in their origin and effects.

Geographic information systems (GIS)
Analysis that combine relational databases with spatial interpretation and outputs often in form of maps. A more elaborate definition is that of computer programmes for capturing, storing, checking, integrating, analyzing and displaying data about the Earth that is spatially referenced.

Geographical information systems are increasingly being utilised for hazard and vulnerability mapping and analysis, as well as for the application of disaster risk management measures.

Greenhouse gas (GHG)
A gas, such as water vapour, carbon dioxide, methane, chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs), that absorbs and re-emits infrared radiation, warming the Earth's surface and contributing to climate change (UNEP, 1998).

Hazard
A potentially damaging physical event, phenomenon or human activity that may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hazards can include latent conditions that may represent future threats and can have different origins: natural (geological, hydrometeorological and biological) or induced by human processes (environmental degradation and technological hazards). Hazards can be single, sequential or combined in their origin and effects. Each hazard is characterized by its location, intensity, frequency and probability.

Hazard analysis
Identification, studies and monitoring of any hazard to determine its potential, origin, characteristics and behaviour.

Hydrometeorological hazards
Natural processes or phenomena of atmospheric, hydrological or oceanographic nature, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Hydrometeorological hazards include: floods, debris and mud floods, tropical cyclones, storm surges, thunder/hailstorms, rain and wind storms, blizzards and other severe storms, drought, desertification, wildland fires, temperature extremes, sand or dust storms, permafrost and snow or ice avalanches. Hydrometeorological hazards can be single, sequential or combined in their origin and effects.

La Nina

(see El Nino-Southern Oscillation).

Land-use planning

Branch of physical and socio-economic planning that determines the means and assesses the values or limitations of various options in which land is to be utilized, with the corresponding effects on different segments of the population or interests of a community taken into account in resulting decisions.

Land-use planning involves studies and mapping, analysis of environmental and hazard data, formulation of alternative land-use decisions and design of a long-range plan for different geographical and administrative scales.

Land-use planning can help to mitigate disasters and reduce risks by discouraging high-density settlements and construction of key installations in hazard-prone areas, control of population density and expansion, and in the siting of service routes for transport, power, water, sewage and other critical facilities.

Mitigation

Structural and non-structural measures undertaken to limit the adverse impact of natural hazards, environmental degradation and technological hazards.

Natural hazards

Natural processes or phenomena occurring in the biosphere that may constitute a damaging event.

Natural hazards can be classified by origin, namely: geological, hydrometeorological or biological. Hazardous events can vary in magnitude or intensity, frequency, duration, area of extent, speed of onset, spatial dispersion and temporal spacing.

Preparedness

Activities and measures taken in advance to ensure effective response to the impact of hazards, including the issuance of timely and effective early warnings and the temporary evacuation of people and property from threatened locations.

Prevention

Activities to provide outright avoidance of the adverse impact of hazards and means to minimize related environmental, technological and biological disasters.

Depending on social and technical feasibility and cost/benefit considerations, investing in preventive measures is justified in areas frequently affected by disasters. In the context of public awareness and education related to disaster risk reduction, changing attitudes and behaviour contribute to promoting a "culture of prevention".

Public awareness

The processes of informing the general population, increasing levels of consciousness about risks and how people can act to reduce their exposure to hazards. This is particularly important for public officials in fulfilling their responsibilities to save lives and property in the event of a disaster.

Public awareness activities foster changes in behaviour leading towards a culture of risk reduction. This involves public information, dissemination, education, radio or television broadcasts, use of printed media, as well as the establishment of information centres and networks and community and participation actions.

Public information

Information, facts and knowledge provided or learned as a result of research or study, available to be disseminated to the public.

Recovery

Decisions and actions taken after a disaster with a view to restoring or improving the pre-disaster living conditions of the stricken community, while encouraging and facilitating necessary adjustments to reduce disaster risk.

Recovery affords an opportunity to develop and apply disaster risk reduction measures.

Relief / response

The provision of assistance or intervention during or immediately after a disaster to meet the life preservation and basic subsistence needs of those people affected. It can be of an immediate, short-term or protracted duration.

Resilience / resilient

The capacity of a system, community or society potentially exposed to hazards to adapt by resisting or changing in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree

to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Retrofitting (or upgrading)

Reinforcement of structures to become more resistant and resilient to the forces of natural hazards.

Retrofitting involves consideration of changes in the mass, stiffness, damping, load path and ductility of materials, as well as radical changes such as the introduction of energy absorbing dampers and base isolation systems. Examples of retrofitting include the consideration of wind loading to strengthen and minimize the wind force, or in earthquake prone areas, the strengthening of structures.

Risk

The probability of harmful consequences, or expected losses (deaths, injuries, property, livelihoods, economic activity disrupted or environment damaged) resulting from interactions between natural or human-induced hazards and vulnerable conditions.

Conventionally risk is expressed by the notation Risk = Hazard x Vulnerability. Some disciplines also include the concept of exposure to refer particularly to the physical aspects of vulnerability.

Beyond expressing a possibility *of physical harm, it is crucial to recognize that risks are inherent or can be created or exist within social systems. It is important to consider the social contexts in which risks occur and that people therefore do not necessarily share the same perceptions of risk and their underlying causes.*

Risk assessment/analysis

A methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability that could pose a potential threat or harm to people, property, livelihoods and the environment on which they depend.

The process of conducting a risk assessment is based on a review of both the technical features of hazards such as their location, intensity, frequency and probability; and also the analysis of the physical, social, economic and environmental dimensions of vulnerability and exposure, while taking particular account of the coping capabilities pertinent to the risk scenarios.

Structural / non-structural measures

Structural measures refer to any physical construction to reduce or avoid possible impacts of hazards, which include engineering measures and construction of hazard-resistant and protective structures and infrastructure.

Non-structural measures refer to policies, awareness, knowledge development, public commitment, and methods and operating practices, including participatory mechanisms and the provision of information, which can reduce risk and related impacts.

Sustainable development

Development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts: the concept of "needs", in particular the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and the future needs. (Brundtland Commission, 1987).

Sustainable development is based on socio-cultural development, political stability and decorum, economic growth and ecosystem protection, which all relate to disaster risk reduction.

Technological hazards

Danger originating from technological or industrial accidents, dangerous procedures, infrastructure failures or certain human activities, which may cause the loss of life or injury, property damage, social and economic disruption or environmental degradation.

Some examples: industrial pollution, nuclear activities and radioactivity, toxic wastes, dam failures; transport, industrial or technological accidents (explosions, fires, spills).

Vulnerability

The conditions determined by physical, social, economic and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards.

For positive factors which increase the ability of people to cope with hazards, see definition of capacity.

Wildland fire

Any fire occurring in vegetation areas regardless of ignition sources, damages or benefits.