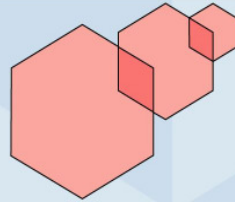




UNITED NATIONS
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Institute for Environment
and Human Security

***The Risk
Management
Section***



GIRO:
**The Integral
Risk Management
Framework**

An overview

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Foreword

The growing frequency and magnitude of extreme environmental events (such as floods, landslides and drought) have intensified research interest targeting such natural hazards – in particular with regard to the level of risk they pose in different locations, the vulnerability of communities and their capacities to cope with such events. To this end, the United Nations University established the Institute for Environment and Human Security (UNU-EHS) in December, 2003 to assess the vulnerability and coping capacity of communities facing natural and human-induced hazards in a changing environment. Through the understanding of cause and effect relationships UNU-EHS aims to offer options to help reduce risks and vulnerabilities.

In the spring of the year 2007, UNU-EHS structured itself in six thematic Sections aiming to target in a more structured approach the challenges related to the identification of threats to human security, as well as to provide policy-relevant advice and to strengthen institutional capacities in relation to human security. The Risk Management Section will focus its attention on two main issues:

- ❖ The basic notions regarding risk and the factors (social, economical, institutional, political, cultural, etc.) which are allowing for the generation of such risk in countries around the world.
- ❖ Risk management, which spans the set of measures promoted and implemented to control existing risks, as well as their generation or increase, and early warning.

In an effort to streamline its research, the Section has elaborated a conceptual framework which incorporates findings, lessons learned, and conclusions expressed by researchers and practitioners around the world who have devoted their careers to identify the root causes and factors which unfortunately have led to the generation of risks, and subsequently to disasters.

The **GIRO Framework** which is introduced and presented in this document presents a holistic view of risk management as a basis on which to promote actions not only to reduce risks, but also to restrain societies from increasing such risks or generating additional risks. The Acronym GIRO stems from the Spanish translation of the term *Integral Risk Management (Gestión Integral de Riesgo)*. The framework introduces the notion of a Setting which influences actors in certain ways leading to the generation of such risks as unforeseen and undetected by-products of activities and processes which they carry out in relation to their livelihoods, normally executed within the traditional frameworks of development. Building on the notion of the Setting and the actions carried out by Actors as part of their livelihoods, the framework is able to make the connection between such actions, the risks which are generated, and subsequently the disasters which end up affecting in a negative way such livelihoods. The assessment of the paths in which the chain **setting** → **decisions** → **risks** → **disasters** is structured permits the identification of entry points towards the identification of potential options targeting risk management.

In the following years, the Section will conduct research through pilot projects and case studies to strengthen the proposed GIRO framework in such aspects as guidelines regarding how to assess all elements of the chain, the use of indicators to assess the level of risks and the impact which risk management programs have on the reduction of such risks.

Introduction

A disaster can be described as the impact of an extreme event of natural, technological, or social origin which includes injuries, fatalities, losses of various kinds and which limits the capacities of survivors to handle its consequences using their own resources. To the survivor who sees only debris embedded in mud where his house used to be, a landslide is a very concrete disaster that may modify his life forever and which may threaten his livelihood. At first glance, it appears that his own



actions may be partially to blame for the disaster which struck his or her life, such as the construction of the house in a steep-slope area, degrading natural barriers to landslides by removing trees that were essential for the stability of the soil or by managing the runoff of rainfall and sewage in an improper fashion. However, there are deeper causes that drive people to settle in such conditions: the socio-economic limitations associated with poverty which are linked with incapacities to mobilize resources and assets; the different aspects of population pressure; economic necessity that force people to migrate from rural to urban areas in search of better opportunities; even if these may threaten their long term survival; the lack of policies, legislation, and norms regarding where to settle and under what conditions, etc. As an outcome of these prevailing socio-economic and cultural conditions and due to a lack of respect for the environment, land degradation is a common path to such disasters.

The increasing frequency and magnitude of disasters worldwide is exposing the vulnerability of communities and their lack of capacity to cope with such events. If such disasters are to be controlled in the future, a better understanding of the many interrelated variables – social, political, institutional, economic, technological and environmental – is necessary. Researchers and practitioners devoted to the topics of disaster-risk management and sustainable development are concluding that increased losses experienced by people and institutions in many developing countries in the last decades as a consequence of such disasters are direct evidence that their schemes of development are not geared to ensure long-term sustainability. They are pointing out **the need to recognize disasters as the outcome of unaddressed problems within such development schemes** in developing nations. Among the reasons for such conclusions, the following deserve mention:

- *The continuing view that the root causes of disasters are exclusively of natural origin and hence, inevitable. In this sense, disasters are perceived as external or independent from the framework of development in use.*
- *The fact that risk and vulnerability remain invisible until a natural event manifest them, unlike poverty which is now being addressed in a more visible fashion at the local, national, and international levels; and*
- *A wrong conviction that nature can always be controlled through engineering practices and therefore disasters can be avoided through such practices.*

Therefore, the main challenge within the field of disaster reduction should be to change the perceptions of people and make them recognize this notion of disasters as the outcome of a development process whereby societies have implicitly generated vulnerabilities and risks, which become evident when exposed by such disasters. If developing nations exposed to natural hazards are willing to promote a more sustainable development, a change in paradigm has to take place, whereby decision makers, individual citizens, members of the private sector and of the civil society stop

avoiding the issue and tackle it unambiguously. It will require all members of the society to look beyond proposed financial benefits to the sphere of the neglected conditions of vulnerability; to assess the long-term impacts of their decisions rather than just the short terms goals; and to balance more adequately the proposed gains from their actions and the potential risks they are incurring when undertaking such actions.

Risks: Paths to Disasters

In basic terms, disasters manifest pre-existing conditions within the social, economic, political, physical, and environmental fabric of communities and societies. Infrastructure, services, processes, organizations from the simplest to the most complex kind, and diverse systems are established in such ways that make them prone to be affected by a triggering event such as an earthquake, a flood, a landslide; or an industrial event such as an explosion, a fire, a toxic spill, etc. A conclusion to be derived is the fact that a disaster is preceded by at least two predispositions: the possibility that the triggering event takes place, usually called a **hazard** at this potential state; and a pre-disposition of people, processes, systems, infrastructure, services, organisations, or communities to be affected, damaged, or destroyed by the triggering event denominated **vulnerability**. The combination of these two predispositions is what many practitioners have defined as **risk**. Annex 1 presents a discussion on the issue of terminology employed in this context of risks and disasters.

In the case of floods, historical and recent disasters point to processes not only related to the settlement of population in high hazard areas under conditions of high vulnerability, but also socially accepted practices associated with land use which tend to change the dynamic behaviour of such floods. In some cities, more frequent and more extreme flooding is taking place in areas where such flooding rarely took place in past decades due to the narrowing of channels and changes in runoff characteristics associated with



Box 1: Two views of the same trend: whether in large cities or small towns, people think that they can build their house at the expense of narrowing the channels or rivers. However, such measures sooner or later lead to frequent floods in these houses as shown in the upper picture depicting the case of San Sebastian in Guatemala, or to floods in other parts of the city, as displayed in the lower picture from Tegucigalpa, Honduras.

urbanization. Such disasters lead to the conclusion concerning the need to focus on the social, economic, political, institutional, and cultural processes that lead to settlements in hazard areas and processes that tend to alter the dynamics of such hazards.

Through the systematization of the impacts of such disasters it is possible to identify those conditions and processes that lead to the generation of the respective risks, both from the standpoint of **actors** who are directly or indirectly responsible, as well as the characteristics of the setting that allow for the generation of such risks and their increase in urban and rural environments. In this context, the **Setting** is defined as an amalgam of social, economic, political, institutional, cultural, and environmental factors that influence the decisions made by actors along certain paths. An analysis along these lines will help identify the root causes that lead to disasters, and subsequently strategies and measures to confront such root causes and thus promote more sustainable development.



Box 2: A bridge such as this one could connect two areas of the same city, but in the larger perspective, such bridges link regions, allowing the exchange of goods, opening paths to new markets and opportunities, and contribute to the development of such areas, particularly when these are situated in remote places. The question remains: is the collapse of this bridge due to a very large, and hence infrequent event, or was it poorly designed and constructed? Source: Y. Miner, CONRED. Guatemala

The rationale for promoting research along these lines goes beyond the simple explanation of why such disasters have occurred. As stated by P. Duran de Jager (2007), Executive Director of the Federation of Municipalities of the Central American Isthmus, FEMICA; such rationale must be based on the premise of sustainable development within the framework of globalization that is beginning to span the globe particularly because such a globalization process will undoubtedly require communities to be more competitive in the twenty-first century. The current frameworks of development should be examined from the perspective of the decisions made by the respective authorities and the actions carried out by actors from the public and the private sector, civil society and

by individual citizens with the goal of identifying how to modify the patterns which are allowing for the generation of risks. Such a research must be based on an interdisciplinary approach that pinpoints how the setting is contributing to the generation or increase of risks and possible mechanisms that could be implemented to modify this trend. For example, one must go beyond the simple analysis of the behaviour of a hydrologic basin in a town or a city to the understanding of the impacts related to decades of urbanization and urban growth on the integral behaviour of the basin. Such an assessment must identify why there is no long-term vision concerning land-use planning which may incorporate restrictions related to natural hazards, explaining why no restrictions are enforced when builders wish to change the characteristics of hydraulic channels. One potential factor contributing to the generation of risks may be the overwhelming demand to use any available land in urban areas as a consequence of the migration process from rural to urban areas which collides with limited space available for low-cost housing. There is a need to learn how to design and implement rules and regulations related to land-use planning in cities in a way in which they will not be rejected by those who will be affected, but rather understood and accepted, recognizing that the proposed changes are being implemented to promote long-term development which shall not be affected by future events.

Undoubtedly, disasters are caused by large-scale events. As indicated by Andrew Maskrey, "disasters are not natural" (Maskrey, 1993), but a product of development processes which hide vulnerabilities until they are exposed by such disasters. A review of the literature suggests that disasters are the product of such factors as:

- *A mind-set focusing on "short-term" decisions in a context of "long-term" processes related to the generation of risks.*
- *Actions restricted or limited by the purchasing power of poor people who have no resources to secure safe-housing. In parallel, at the government level actions restricted or limited due to insufficient budgets compounded with the need to address many relevant issues considered as priorities (health, education, poverty eradication, transportation, energy, democracy, etc.).*
- *Policies and decisions that favour a reactive approach in case of disasters through emergency committees rather than a preventive approach in terms of risk management (a total lack of perception of risks and an explicit recognition of disasters).*
- *Lack of experience or awareness regarding the dynamical nature of natural phenomena and the impacts of social processes on such dynamics.*
- *Social processes such as population growth and migration to urban areas as a consequence of inadequate rural development policies and programmes.*
- *Land-use norms and building codes that do not necessarily incorporate aspects associated with natural or technological hazards, or their avoidance by citizens without major consequences.*



Box 3: A settlement built on steep slopes. Such settlements are initially established by people migrating from rural areas that have the expectation or remaining in such places for a short period of time. This notion of short-term occupation leads to settlements in extremely hazardous locations in the context of landslides; to the use of inadequate construction techniques; and the modification of the conditions of the soil due to deforestation and inadequate management of runoff of rainfall and sewage. Unfortunately, in many cases settlers are not able to improve their financial situation to the point that they can resettle somewhere else, and thus the settlements become permanent. Source. Y. Miner, CONRED, Guatemala

Some experts in the field of natural disasters describe disasters as "unresolved problems" from the viewpoint of development schemes employed by societies. In this regard, the new paradigm of risks highlights the notion that disasters are the result of processes which lead to the generation or increase of risks. In the context of cities, such processes may be related to the foundation of such cities in high-hazard areas but unknown to the founders at that time; or processes of urban growth throughout decades or centuries which have exhausted low-hazard areas and are now targeting high-hazard areas such as steep slopes or floodplains.

Another example which serves to exhibit the notion of disasters as "unresolved problems" from the viewpoint of development schemes can be traced back to the response by governments in the context of disasters. Since the 1960s, governments in many countries around the world established national emergency committees or commissions as a result of a disaster of major proportions to respond to

such events rather than to target the root causes leading to such disasters. For example, in Central America and the Caribbean, National Emergency Councils were established as a result of hurricanes or earthquakes that provoked fatalities, destruction of infrastructure and extensive damage, particularly to the road infrastructure and public buildings. In many cases their legal mandates restricted their activities to the response phase targeting the immediate response, rehabilitation of lifelines and reconstruction phase in some cases.

Risk management, a term introduced by LA RED¹ in Latin America, has its roots in the efforts carried out under the umbrella of the International Decade for Natural Disaster Reduction, IDNDR (UN, 1989), implemented by the United Nations between 1990 and 1999. The notion of risk management has taken a stronghold in all countries of the region, particularly in those which have experienced disasters recently. Undoubtedly, Hurricane Mitch and its impacts in Central America in

1998 was the catalyst to facilitate the change in legislation and the transformation of such emergency committees into agencies which now promote risk management within every country of the region.

A key aspect that facilitated the adoption of the risk management paradigm in Latin America was the leading role played by LA RED as a forum of academicians and practitioners targeting conceptual discussions on this subject and the extensive literature elaborated and disseminated in the language that prevails in the region: Spanish. Undoubtedly, the books published under the LA RED label by authors such as Andrew Maskrey, Gustavo Wilches-Chaux, Omar Dario Cardona, Allan Lavell, Elizabeth Mancilla, and the collection of articles by multiple authors appearing in the journal entitled *Disasters and Society* have been the key to such a success.

Nevertheless, it is also important to stress the impacts of events at the end of the millennium around the world such as the tragedy of Vargas in Venezuela in December 1999; large floods in Mozambique in the year 2000; Hurricane Mitch in Central America in 1998; as well as major floods in Bangladesh and in Europe. Such events served as incentive for



Box 4: Central areas of Tegucigalpa city were destroyed by hurricane Mitch in October, 1998. The massive landslide in the El Berrinche settlement led to many fatalities (lower picture). Unfortunately, people were not aware of the risk when they established the settlement decades before. The last event of similar proportions in this city took place in 1934, and only the very elderly have memories of such an event.

¹ La Red de Estudios Sociales en el tema de prevención de desastres naturales sponsored by the Latin American Faculty of Social Sciences, FLACSO.

governments around the world to begin to consolidate the concepts of risk management at the institutional level through legislation and the allocation of fresh resources.

At the regional level, the concepts of risk management and local or community-based risk management have been taken by agencies such as the Central American Coordinating Centre for the Prevention of Natural Disasters, CEPREDENAC; the Asian Disaster Preparedness Centre, ADPC, in Thailand and the Asian Disaster Reduction Centre ADRC in Kobe, Japan.

In January 2005 the International Strategy for Disaster Reduction of the United Nations organized and carried out the **World Conference on Disaster Reduction** in Kobe, Japan, which concluded with the adoption of the **Hyogo Framework of Action for the decade 2005 – 2015 –HFA-** under the theme "Building the Resilience of Nations and Communities to Disaster". The framework represents the commitment of the governments of 168 countries to promote and implement measures to reduce the risk of disasters, including efforts to reduce vulnerability to natural hazards. The framework promotes interactions between the international, regional, national, and local governments and is structured in terms of five priority areas for action:

1. *Ensure that disaster risk reduction (DRR) is a national and a local priority with a strong institutional basis for implementation.*
2. *Identify, assess and monitor disaster risks and enhance early warning.*
3. *Use knowledge, innovation and education to build a culture of safety and resilience at all levels.*
4. *Reduce the underlying risk factors.*
5. *Strengthen disaster preparedness for effective response at all levels.*

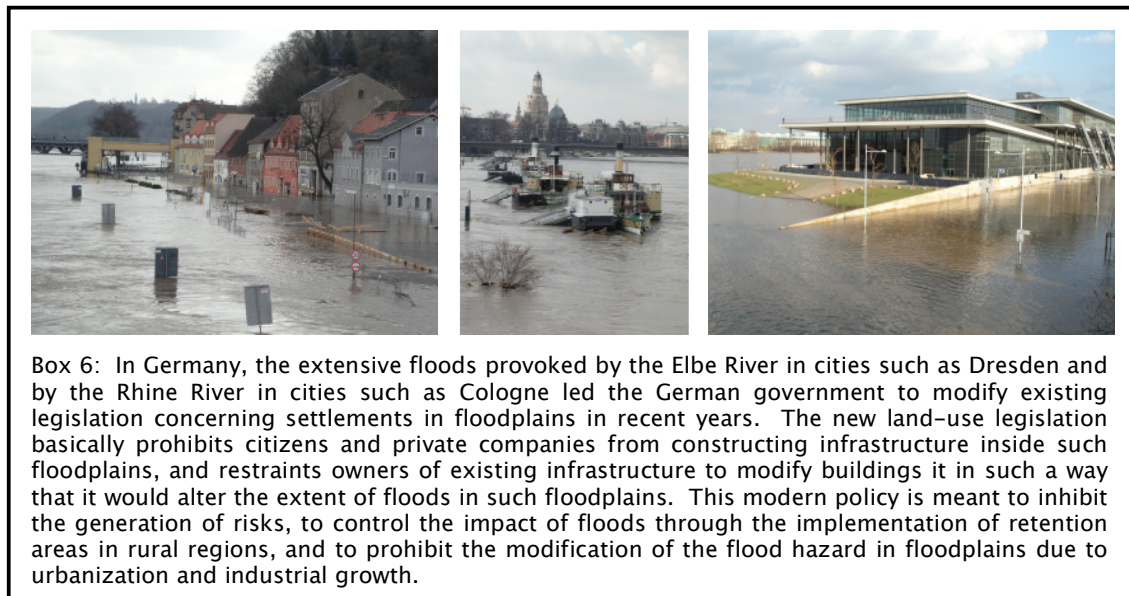


Box 5: As disasters impact at the local level, the Hyogo Framework of Action –HFA– promotes that actions are also carried out at this local level. The HFA calls for efforts to build a culture of safety and resilience, and to strengthen disaster preparedness. In Central America, the solidarity of people is a cornerstone in the efforts to build such a culture in a participatory fashion, as has been recommended by many experts.

In parallel, the Bureau of Crisis Prevention and Recovery of the United Nations Development Programme, UNDP-BCPR, has been boosting efforts in countries around the world which suffer the impacts of natural disasters. Many countries are embracing this new paradigm of risk reduction through a series of efforts in a more or less coordinated fashion at all levels. The synergies between actors at these levels have enabled the definition of policies and strategies and the implementation of various measures with the goal of reducing risks and to respond more efficiently and timely in case of a disaster. However, the paradigm shift has to cope with other issues that are also demanding the attention of governments and at the institutional level, such as globalization and climate change, which are also promoting their own paradigms.

A Turning Point in the Approach to Risk Management

A review of the literature related to the theme of risk and disaster management leads to the conclusion that to reduce disasters, it is necessary to implement a variety of measures spanning all sectors of society at all levels, from the national to the local level. The literature makes reference to the processes that lead to the generation of such risks, pinpointing in many cases and quite rightly practices rooted in social, political, institutional, economic and cultural trends which identify relevant factors such as particular ways in which political power is managed and transferred, differential access to resources and opportunities (Wisner, 2004); the competitive nature of the market and the adoption of market practices at all levels of the economy (Kreimer, 2003); discrimination patterns based on casts, gender, or ethnical groups (Narayan, 2000); and poverty, socio-economic exclusion ((ECLAC and IADB, 2000) and illiteracy as root causes leading to disasters. Researchers are pointing out how development processes may be leading poor people to the brink of disasters. In 1996, Blaikie (2004) and a group of social scientists designed a framework proposing a chain of root causes and dynamic pressures which led to the establishment of unsafe conditions, labelled the Progression of Vulnerability. This framework defines traditional political, social, and economic ideologies and power structures as root causes which lead to institutional shortcomings or limitations, as well as to macro forces (dynamic pressures) that pave the way for unsafe conditions represented in terms of unprotected buildings, exposure to hazards, livelihoods at risk due to low-income levels, lack of disaster preparedness, etc. Annex 2 presents a brief review of some frameworks which have been elaborated in the context of vulnerability and risk.



Similarly, it is important to stress the fact that civil society provides minimum attention to the issue of risk management in contrast with the more permanent attention provided to issues such as human rights, equal rights and discrimination, the fight against corruption and impunity, and so on.

Recognizing the competitive nature of people, institutions, the productive sector and societies; D. Smith (2007), Executive Secretary of CEPREDENAC during the period 2004-2008, stresses the need to encourage a change in the approaches to promote sustainable development incorporating the experiences which have been gathered concerning risks and their management as cornerstones on which to base long-term competitiveness, ensuring that advances and gains earned through such development processes are not lost as a consequence of future disasters. This vision involves shifting the analysis of the vulnerability from the point of view of poverty to the analysis of alternatives that may promote development by those decision makers in charge of development.

While the traditional elaboration of risk scenarios focuses on the analysis of hazards and vulnerabilities considering disasters as consummated events even before they happen; in the context of sustainable development, D. Smith remits such an analysis of risk scenarios to other variables such as emerging opportunities associated with globalization and priorities of the public and private sectors incorporating lessons learned concerning risks and historical disasters. This type of analysis should lead to a planning strategy linking productive sectors and ideal geographical regions, identifying aspects such as future needs in terms of communication networks and lifelines, including energy. This change in the approach to disaster-risk management should lead to the strategic analysis of development alternatives in geographical areas which may still not be populated, comparing proposed benefits that such areas may yield in contrast to hazards that exist in such areas. Similarly, this new approach should lead to the planning and implementation of infrastructure projects that pave the way for development taking into consideration what has already been identified as vulnerable in order not to create new risks, but inhibiting their generation from the beginning. This implies an acknowledgement of the integrated management of basins to prevent flooding while still promoting progress and growth in urban or rural areas within the basin. For example, the new approach should make reference to the establishment of infrastructure respecting the dynamics of the river flow in dry seasons and in the case of storms and hurricanes. Retention areas must be taken into consideration to inhibit or minimize floods in development zones in parallel with strict land-use norms incorporating buffer areas between the river and buildings to provide the security needed to ensure competitiveness at regional and international levels. The proposed approach involves a shift in the social, political, economic and cultural trends, which necessarily implies the recognition and precise assessment of hazards in order to design and enact regulations focusing on land-use planning to ensure sustained, long-term gains.

At the political level, risk management can only take root when policies promote a shift from reaction to prevention. In this sense, either existing legislation has to be upgraded, or new legislation has to be enacted. During the period between 1990 and 1999, the United Nations established the *International Decade for Natural Disaster Reduction, IDNDR*. The Yokohama Strategy for a Safer World which emanated from a global conference on this topic in 1994 provided landmark guidance to governments concerning the adoption of risk management practices as means to reduce the impacts of disasters. Such an effort led many countries to adapt their policies along the lines of risk management. In some cases, the shift was also prompted as a consequence of impacts of severe disasters in Asia, Africa, the Caribbean, and Latin America.

Box 7: The South African Disaster Management Act, No. 57 of 2002.
This legislation was enacted by the Government of South Africa to promote an integrated and coordinated risk management policy. The legislation establishes a system of disaster-risk management centres at the national, provincial, and municipal levels; and comprises 6 Key Performance Areas:

1. *Institutional capacity for DRM.*
2. *Risk assessment and monitoring.*
3. *DM planning and implementation*
4. *Response and recovery.*
5. *Awareness, education and research.*
6. *Monitoring, evaluation and improvement.*

Drought hazard map for Provinces in South Africa. Source: D. Sakulski, UNU-EHS, 2007)

More recently, the relevance of the Hyogo Framework for Action must be stressed in the context of providing fertile ground for research to lay the foundations required for risk management to take a stronghold in countries around the world. One of the five key priority areas within the HFA encompasses research activities targeting the assessment of risks. Stemming from the research agenda of UNU-EHS, the GIRO framework builds on existing models to highlight a variety of issues which need to be address in the context of risk management. However, the real application of the GIRO framework will be useful in the context of the fourth key priority area of the HFA: *reducing the underlying risk factors*. In this respect, the GIRO framework addresses the need to focus efforts both on reducing existing risks, as well as targeting those factors that continue to allow for the generation of new risks. The following paragraphs outline this framework in more detail.

The GIRO Framework - Integral Risk Management:

Recognizing the comments and facts expressed in previous sections concerning risks and their root causes, particularly the notions concerning the fact that risks emerge as unforeseen, undetected by-products of the development process, an Integral Risk Management framework (GIRO² Framework) has been elaborated taking into consideration the following premises:

- Risk management comprises the design and implementation of measures targeting complementary goals: to reduce the level of existing risks, and to restrain the creation of new risks.
- Experience shows that risk management is incorporated by communities or societies which have suffered a major disaster, or through processes which emerge from the international community. It is then feasible to conduct a risk management process within the realm of risks, as well as after such disasters.
- To be successful, risk management needs to be based on the systematization of the root causes that have led to the generation of such risks or their increase. Only when root causes associated with the generation or increase in risks have been adequately systematized, can one design an integral set of measures which will target such root causes.
- Risk management must take into account the role of **Actors** as responsible for the generation or increase regarding such risks. In addition, it must be recognized that the **Setting** which surrounds these actors plays a crucial role in predisposing actors to carry out actions in certain ways which unfortunately conduct to the generation of risks or their increase.
- Disasters and risks can be separated in the time domain. However, it is important to incorporate an additional domain which is related to the Setting in which actors are based in order to characterize the processes leading to risks in an appropriate way. The schemes of development are embedded in this domain of the setting.

The incorporation of all these elements into the proposed framework is represented in figure 1. This proposed conceptual framework makes reference to three domains: the **Domain of the Setting**, the **Domain of Risks** and the **Domain of Disasters**.

The Domain of the Setting spans policies, norms, rules, regulations, trends, and traditions to which the actors are exposed and are associated with the **Spheres of Influence** which encompass social, political, institutional, economic, and environment trends present in societies at any given time. The Domain of Risks covers the components of risks (hazards, vulnerabilities, and deficiencies in preparedness), as well as those conditions which may give rise to additional risks. Finally, the Domain of Disasters is characterized in terms of impacts produced by the event that triggered the

² GIRO is the acronym for Integral Risk Management in Spanish language (**G**estión **I**ntegral de **R**iesgo)

disaster (fatalities, injuries, economic losses, destruction of property, infrastructure, machinery, crops, etc).

The framework incorporates two complementary paths linked to risk management which can emanate from both the Risk and the Disaster Domains. As it will be discussed later, risk management measures must target all elements of the Domain of the Setting, including the Actors themselves. Such an approach ensures that conditions within this domain, in particular the Spheres of

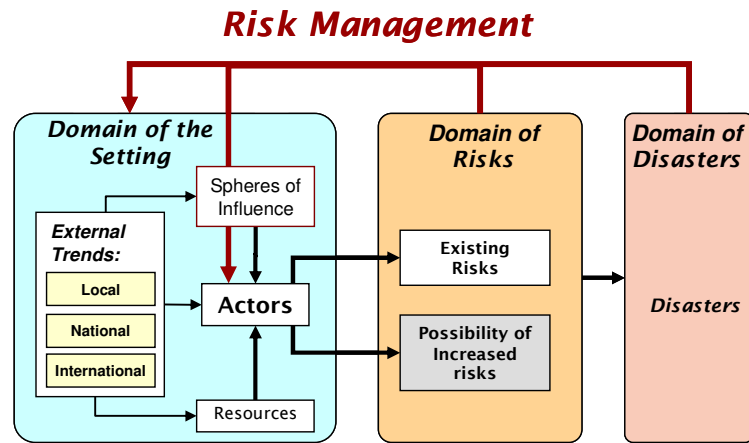


Figure 1: the GIRO Framework

in particular the Spheres of Influence, are modified so that actors are compelled to consider risk-management considerations when deciding how to carry out activities or processes with the resources at their disposal.

The Domain of the Setting

The GIRO framework is tailored around the notion that **Actors** make use of the environment or its resources to reach some goals, to gain some benefits or to generate products of various kinds. In this context, risks arise as unforeseen, undetected by-products of their actions. A systematization of experiences in developing countries leads to the identification of four types of Actors who may be responsible for the generation of risks or their increase:

- ❖ Individual citizens acting on their own.
- ❖ Government employees
- ❖ Members of civil society groups
- ❖ Members of the private sector

For example, individual citizens may decide to construct their houses using self-building techniques because such techniques may be traditionally used in their communities, or because they face financial limitations which restrict their choices. Unfortunately, some of these self-building techniques may lead to vulnerable conditions, which only manifest themselves in case of strong earthquakes or tsunamis for example. Adobe housing would be the typical example in this case.

In a similar fashion, government employees may decide to erect buildings such as schools, health centres, or public markets in areas exposed to hazards based on the fact that such areas may be the only public property available for such purposes. In addition, they may dictate the construction of such premises based on terms of reference which may not contemplate physical or structural vulnerability properly leading to unsafe buildings.

The GIRO framework proposes that the decisions made by these actors are influenced by **Spheres of Influence** which surround them (political, institutional, economic, social, and environmental) and by the resources, capitals, or assets which they possess or which they can mobilize to carry out activities to achieve proposed goals, products or results. The Spheres of Influence, the Actors, and their Resources are shaped by **External Trends** emerging from the **international level** (for

example economic policies promoted by the World Bank and the International Monetary Fund; or pressures on societies with regards to climate change, pollution, democracy or governance, etc.); influences which emerge from the **national level** (government policies targeting land-use and the economy for example), and from the **local level** (local norms and rules, ethnic traditions, cultural imprints). In this sense, the framework proposes that the Spheres of Influence play a major role in creating or modifying the perceptions that actors may have concerning aspects such as:

- *The activities that should be carried out as part of the livelihoods and goals or benefits which actors seek in the society in which they live.*
- *The recognition of certain risks, insecurities, and uncertainties which actors may face in their daily life as well as in extreme cases and the lack of recognition of other types of uncertainties and insecurities, including those associated with natural disasters.*
- *The need or not to contemplate preparedness measures in case of disasters.*

The Spheres of Influence interact with each other in direct or indirect ways. Policies which are established in the Political Sphere may be implemented through norms or regulations enacted by government institutions or by

institutions from the private sector, thereby establishing new procedures regarding how to execute certain activities. For example, new policies promoting a more sustainable use of environmental resources and targeting the reduction in pollution of the environment are usually implemented through regulations put in place by Ministries of Environment. As a consequence, such regulations may force actors to change some social norms regarding how to dispose of solid waste (actors in the private, industrial sector or individual citizens for example). Once such new trends are accepted by the population, they are embedded in the social sphere, which then also has an effect on the Actors regarding how to deal with the environment.

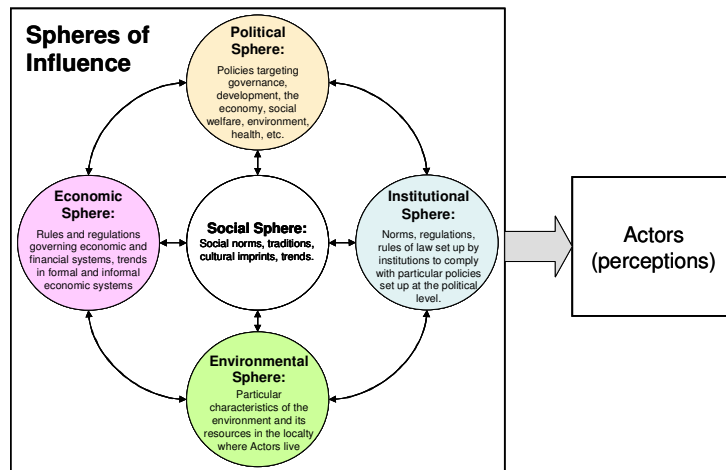


Figure 2: the Spheres of Influence and their role in creating or modifying perceptions in Actors

In the case of Colombia, the disaster in Armero as a consequence of the eruption of Nevado del Ruiz Volcano; collapse of infrastructure in Popayan and in other cities as a consequence of earthquakes; and similar disasters associated with floods prompted the national Government to implement new policies targeting disaster reduction. Subsequently, in 1998 the Colombian Government established the National System for Disaster Prevention and Response. The new system promoted the establishment of similar sub-systems at the provincial and municipal level, ensuring that disaster response would be complemented with prevention and mitigation efforts. In the case of prevention, building codes were retrofitted taking into account lessons learnt from damages to infrastructure provoked by earthquakes; and in the case of land-use planning norms, information concerning hazards was introduced into such norms. Citizens, the public and the private sector, as well as the civil society were then requested to adopt these new norms, in particular the retrofitting of infrastructure to the new standards incorporated in the upgraded building codes.

The incorporation of these changes at the institutional level have also been finding their way into the social sphere, so that real estate developers and builders are now induced to adopt the new norms. In this context, it may be stated that both the Institutional and the Social Spheres are influencing these Actors to incorporate such norms.

Unfortunately, in other countries this has not yet been the case, and people may continue to use traditional building materials and techniques adopted centuries ago, such as adobe bricks and clay-tile roofs, which are extremely vulnerable in case of earthquakes. In this case, the Spheres of Influence have not been upgraded yet to incorporate such upgrades in terms of building codes.

Box 8: The use of adobe in seismic-prone areas. During the colonial period, Spanish settlers introduced the use of adobe and clay-tiles as construction materials for houses. In the centuries that followed, the use of adobe as material for walls and clay-tiles as material for roof became a tradition in urban and rural towns throughout Latin America. However, as experience has shown over and over, houses built in this way are very vulnerable with respect to earthquakes. Unfortunately, the tradition regarding the use of adobe continues to this day throughout the region.



In other cases, social and economic issues combine to direct attention of actors into other issues. For example, the high degree of poverty faced by people living in urban settlements combined with the high degree of insecurity associated with vandalism and delinquency are inducing such people to focus on the day-to-day problems on human insecurity and poverty, rather than on the eventual problem of a natural disaster provoked by a landslide or a flood.

The conceptual framework makes an explicit link between the decisions taken by actors and the **resources or assets** which can be mobilized to carry out the proposed activities. Such decisions include the use of the environment and resources offered by the environment (land, water, air, minerals, soil, forests, etc.) to achieve expected outputs (housing, commerce, industry, agriculture, services, culture, family welfare, entertainment, etc.). The interaction between actors and the environment is highlighted explicitly in terms of the **human-environment coupling**. This notion of coupling was

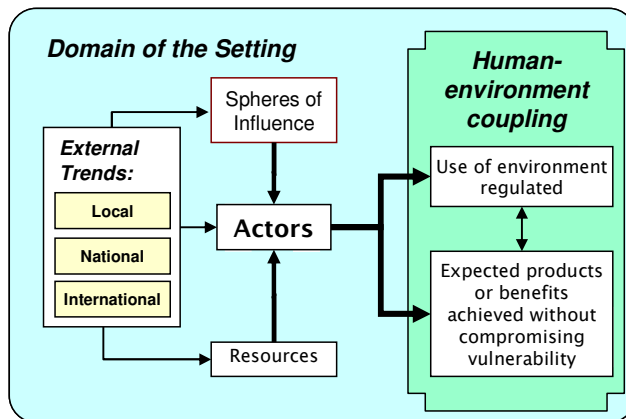


Figure 3: the Domain of the Setting in the GIRO Framework.

proposed by Gilbert White (1974) and it was introduced more recently into the model proposed by Turner et al in the context of vulnerability (2003). Figure 2 depicts the Domain of the Setting.

In the context of assets, resources and capital, it is important to recognize that the setting can play a significant role on some actors in terms of facilitating or inhibiting their capacity to mobilize such assets or resources in order to carry out various activities associated with their lifestyles and to meet their needs. Economists such as Athanasius and Székely (2001) have proposed that poor people live and are confronted permanently with a setting which inhibits their access to the

necessary resources to escape poverty (access to credit through loans in private banks for instance). As an example these authors cite those government programs to combat poverty which do not achieve their goal because they fail to remove those restrictions that prevent poor people from having access to goods and the subsequent accumulation of assets to allow them to escape out of poverty (differential access to power and assets).

The Domain of Risk

Assuming that the actors make decisions regarding the use of different types of resources (including environmental resources) to gain certain benefits or achieve expected results, lessons learnt from past disasters indicate that in several cases those decisions are made exclusively from the point of view of the proposed benefits, and usually exclude the consideration of risks associated to natural disasters³.

For example, in some cases these decisions target the establishment of settlements in high-hazard areas (flood plains, areas prone to landslides or to mass movements) or inappropriate extraction of environmental resources (sand and gravel in shores of rivers for construction purposes for example), which may modify the dynamic behaviour of such hazards. The example that has received increased international attention in this context is that of climate change, as a result of a variety of activities carried out by industries and by people throughout the world which provokes a transformation of atmospheric conditions leading to a change in hydrometeorological hazards. As explained by the experts of the Intergovernmental Panel on Climate Change, IPCC (2007), in the future more frequent and more intense hurricanes or typhoons can be expected. At a more local scale, the influences of un-planned and un-controlled urbanization processes are leading to changes in the dynamics of flooding, landslides, and mass movements on steep slopes.

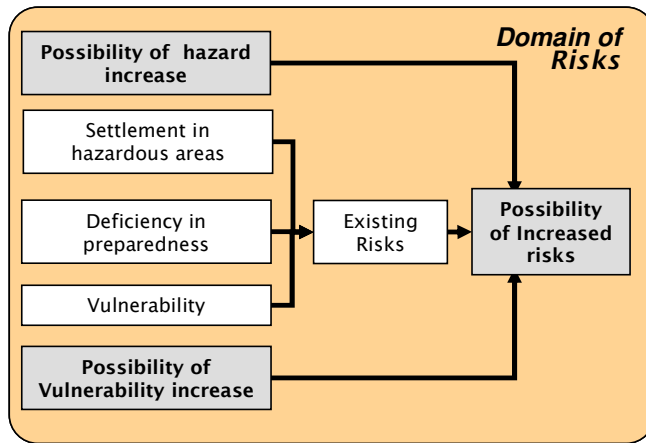


Figure 4: the Domain of Risks in the GIRO Framework

In addition, it is possible that shortages in resources may lead to the generation of new vulnerabilities or enhance existing ones as actors may have to contend with fewer resources than those required to accomplish particular processes or activities. Poverty linked to the incapacity to mobilize resources by groups of people may lead to the decision to settle in conditions of vulnerability. However, actors from the public and private sectors also generate vulnerability without being conscious about it. In this case the most likely cause is the lack of perception or negligence in extreme cases.

Finally, experience indicates that in many cases the Setting is articulated in a way that does not promote the establishment of risk management measures in case of disasters, especially in those societies that are more reactive regarding such disasters.

As a result of the establishment of vulnerabilities in areas exposed to hazards and the lack of preparedness measures, risks are generated. In addition, if those conditions continue to be present, there will always be a possibility for the generation of new risks or their increase.

As a result of the establishment of vulnerabilities in areas exposed to hazards and the lack of preparedness measures, risks are generated. In addition, if those conditions continue to be present, there will always be a possibility for the generation of new risks or their increase.

³ It is important to stress however that the decision might include an assessment of financial or economic risks (the risk of failure leading to economic losses), but does not include the notion of risks associated to natural phenomena in the context of hazards and vulnerabilities.

Analyzed in this way, disasters are a product of a process whereby risks are generated. However, it is important to emphasize the dynamic nature of risks. In other words, it should also be recognized that the level of risk which may exist at a given instant of time may be increased in the future as long as this process continues to be fuelled by actors.

Box 9: When building codes are not followed precisely. Recent earthquakes in Colombia (1985), Turkey (1999); Pakistan (2005), and China (2008) have demonstrated that in some societies, lack of enforcement of building codes has led to the destruction of buildings leading to casualties and financial losses. In many cases, such practice is used to cut expenses during the construction of such infrastructure.



The characterization of the processes which are responsible for the generation or increase in risk is performed identifying how the trends within the Spheres of Influence:

- Allow actors to make use of land situated in hazardous areas; and the extraction and use of natural resources which may open to the possibility for the increase in hazards.
- How such conditions, when linked with the inability of actors to mobilize assets or resources lead to the generation of vulnerabilities.
- Inhibit actors from considering the establishment of measures associated with disaster preparedness, especially in developing countries.
- Contribute to maintain a tradition of disaster response rather than one of risk management at the level of government agencies at all levels.

On the one hand it is necessary to analyze how the Spheres of Influence and their dynamics predispose actors to make decisions in a certain way. For example, a particular rural setting where civil and military conflicts are present may be characterized as insecure by people living there. These circumstances can force local citizens to reach the decision to migrate from such a rural area to a city, and subsequently to a settlement in a high-hazard area, for example an area exposed to landslides, as a means to manage the insecurity associated with such civil and military conflicts. A similar situation may arise in some developing countries where government programmes and policies may promote better quality of life in urban areas than in rural areas, leading to migration from rural areas to capital cities when the population makes the decision to seek better living conditions and a better quality of life for themselves and their families.

Another important aspect to characterize in relation to the setting is the viability which it may offer to people regarding the use of land in areas exposed to hazards as a consequence of the lack of regulations targeting land-use planning, or existing regulations which do not incorporate restrictions concerning the use of land in such hazardous areas. A similar situation may be associated with quality standards in the case of materials employed to build infrastructure and building codes.

The Domain of Disasters

As noted in previous sections, a disaster takes place when an event associated with a hazard manifests itself provoking losses and disrupting daily activities in those sectors that have been affected. According to the proposed GIRO framework, a disaster must be preceded by a condition of risk, represented in terms of the combination of a hazard, vulnerability, and deficiencies in preparedness. In this sense, it must be understood that both vulnerability and deficiencies in preparedness existed before the event associated with the hazard manifested itself.

The disaster is characterized in terms of a variety of factors such as:

- Number of fatalities or injuries.
- Damaged or destroyed infrastructure, resources, assets, capitals, and other goods.
- Processes, services and activities stopped or partially interrupted, including life-lines.

The extent or impact of a disaster is usually quantified using typical “damage and needs assessments”, which are conducted by technical experts. The information related to the impacts is then used to plan and execute activities related to immediate response, rehabilitation of life-lines, and reconstruction.

Some institutions such as the Economic Commission of Latin America and the Caribbean, ECLAC, have introduced the notion of regarding the use of the term “**impacts**” to characterize fatalities or injuries (impacts on humans); and the use of the term “**effects**” to characterize the destruction or damage of infrastructure, resources, etc, as well as the partial or total interruption of processes, services, and activities.

The disaster-risk management community has established a characterization of disasters using two classes or levels:

An emergency: when the impacts and effects can be handled using local resources, without the need to request additional resources from an upper level (coping capacity).

A disaster: when the impacts and effects cannot be handled using local resources, and hence the need to request additional resources from an upper level (coping capacity surpassed).



Box 10: A disaster triggered by a landslide during hurricane Mitch in Honduras in 1998 (Source: COPECO).

A proper systematization of disasters in terms of impacts and effects can be used to identify vulnerabilities and deficiencies in preparedness that led to such impacts and effects, as well as the role of the hazard (exposition to the hazard). A comparison between sites which undergo emergencies and sites which undergo disasters associated with events of the same magnitude can then be used to identify more precisely such vulnerabilities and deficiencies in preparedness, as well as the role of the hazard.

In addition to the detail assessment of the pre-existing risk conditions, additional research into the causes of the disaster allow experts to pinpoint the factors within the setting that allowed for the generation of such risks (trends within the Spheres of Influence).

Domain of Disasters

Disaster

Impacts on people; on the society, the economy, the environment

Figure 5: The Domain of Disasters in the GIRO Framework

General Comments

The GIRO framework has been developed in a particular way to structure the root causes that lead to risks which precede disasters in terms of the three Domains under the risk management paradigm. As in the case of other conceptual frameworks, the framework proposes that the generation of risks is an interdisciplinary process. However, the introduction of the notion of actors from different sectors is made explicitly to avoid the allocation of responsibilities to abstract figures such as the "state", the "private sector" and "civil society". In this regard, the model stipulates that risks are generated by actors who may not be aware of the process of generation of risk altogether. Although the model makes no explicit reference to the interaction between actors in terms of their decisions, such interactions may be considered within the Domain of the Setting.

As in the case of the conceptual framework proposed by Blaikie and co-authors (2004) and as in the case of the framework proposed UNDP-BCPR (2007), this GIRO conceptual framework links the generation of risks to actors through the occupation and transformation of certain geographical areas of the environment or through the use of environmental resources for various purposes or to reach some goals. In this sense, the conceptual framework aims to explain among others:

- The **Exposure to hazards** as a result of the establishment of informal settlements in high hazard areas such as steep slopes and shores of rivers and creeks.
- The **increase of hazards** by practices of the occupation of river banks, urban growth accompanied by a waterproofing of surfaces and narrowing of channels in urban areas leading to greater hazard of flooding; or as a consequence of the occupation and modification of high-slope areas accompanied by deforestation, linked with poor handling of sewage and runoff that increases the hazard of landslides in these areas.
- The worsening of the level of risk by the gradual occupation of land and the process of generation and increase of vulnerabilities.

Figure 5 outlines an application of the GIRO framework in the case of capital cities of Latin America in the context of landslide-related risks. International influences associated with globalization and international trade may promote national governments to target programs to improve industrial conditions in such cities and introduce fresh financial resources from international sources into the city (political sphere of influence). National programs may thrust such international efforts through the enlargement of networks of roads and life-lines via programs implemented by Ministries of Public Works, Telecommunications, and Energy to continue to attract the attention of foreign investors. As a consequence, such capital cities become attractive targets for people migrating from rural areas in search of better opportunities to increase their wellbeing and their quality of life.

At the more local level of the city, existing trends in occupation of steep slopes by friends or relatives (social sphere of influence) may serve as an example for migrants to follow, particularly in those cases where migrants have no capacity to move financial resources required to settle in low hazard areas. In addition, it is important to stress that in some of these cities there are no specific prohibitions regarding settlements in steep slopes in the context of land-use ordinances or norms and building codes may not necessarily target all hazards which may be present within the city, but just a few (institutional sphere).

As a result, the Spheres of Influence may motivate people from rural areas to migrate to urban areas and to settle in steep slopes when other options are out of reach to such people. The end result is an urban settlement in steep slopes, where houses can be considered as vulnerable, and where settlers, due to lack of experience, do not incorporate any measures associated to preparedness leading to the establishment of risks.

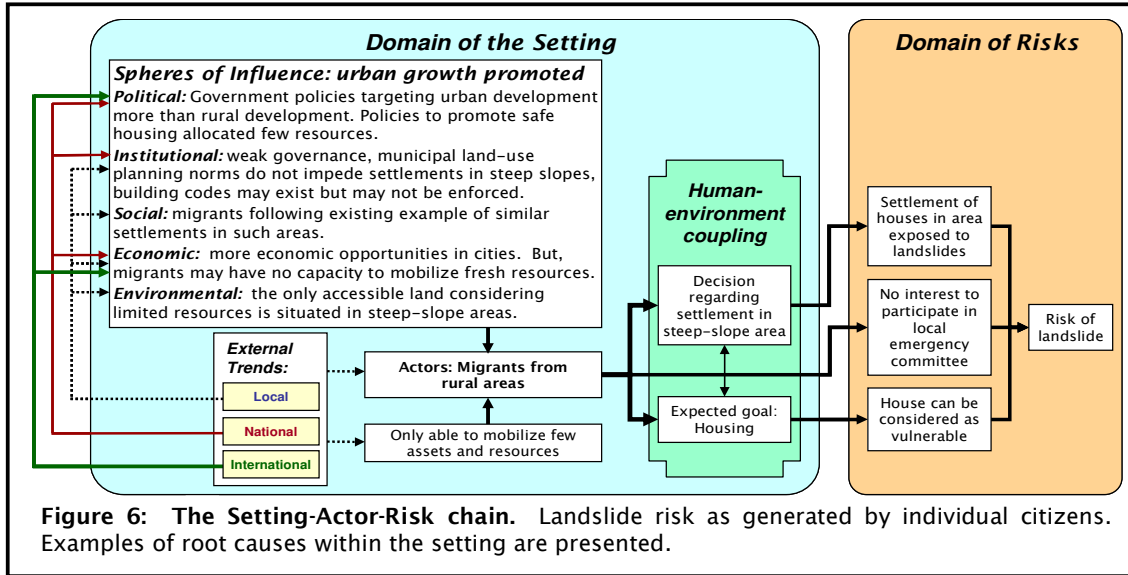
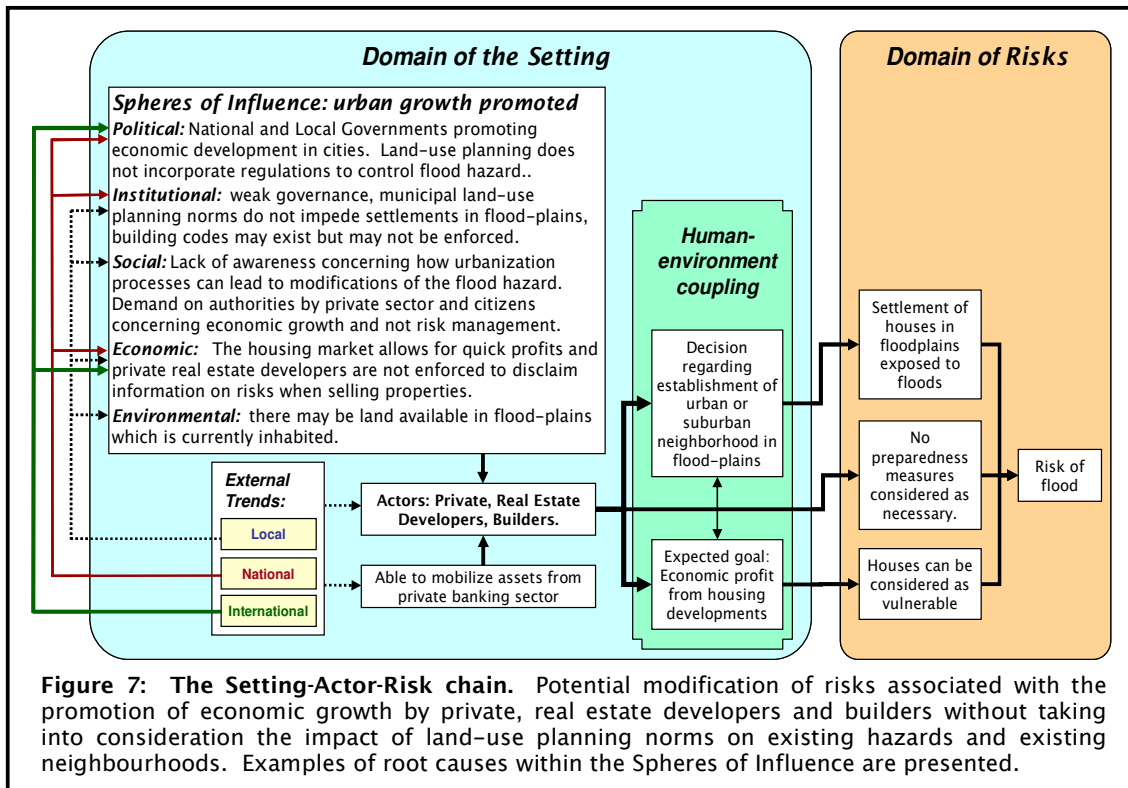


Figure 6 outlines the application of the GIRO framework in the context of potential generation or increase of risks associated with floods. As in the previous example, international trends related to globalization and international trade may promote industrial growth in cities which in turn may increase the demand for housing. At the national and local levels, government administrations may view such trends as positive and thus, allow private, real estate developers to pursue such tasks. Unfortunately, at the local level, land-use planning regulations may not incorporate norms regarding settlements in floodplains or particular constraints in the context of building codes to deal with floods. In addition, such regulations may not contemplate restrictions concerning the modification of river channels. In addition, people may not be aware regarding flood risks when purchasing houses in neighbourhoods established by such private developers and may also not be interested in preparedness



measures.

An important consequence which arises from decade-long urbanization processes related to the transformation of rural areas into urban or industrial areas is the increase in runoff which is channelled into river channels, which then provoke floods in other urban areas downstream, where such floods did not occur before. Bertoni (2004) concluded that there are several factors which increase such urban floods such as the rendering of surfaces impermeable through urbanization processes, the construction of obstacles to the discharge in channels or rivers, and the artificial channelling of creeks.

Integral Risk Management

The GIRO conceptual framework makes explicit reference to two complementary forms of risk management targeting the reduction of disasters: **corrective risk management** targeting existing risks and **prospective risk management** to reduce the possibility of generation of new risks or their increase. The use of these terms was initially introduced by A. Lavell in 1998 (2003) and has been proposed to regional bodies such as the Regional Centre for Disaster Information, CRID; CEPREDENAC (2003) and to the Andean Project targeting disaster reduction in the Andean region, PREDECAN (Lavell, 2003). The GIRO framework which is presented in figure 7 proposes that in order for risk management to be integral, it must target both the actors and the setting simultaneously considering that such a setting plays a major role in inducing actors to decide upon their actions in certain ways (human-environment coupling). As it has been observed in many countries, risk management may be performed both before a disaster at the stage of risks, and after a disaster during the reconstruction process. Similarly one would expect that prospective risk management is carried out to prevent the emergence of additional risks and to ensure that investments remain sustainable to avoid having to incur in costs associated with reconstruction too often.

In relation to the conceptual framework proposed by ISDR, this framework recognizes that disasters are the result of a variety of factors, and incorporates the shortcomings in preparedness explicitly to within the notion of risk. Similarly the proposed framework recognizes the impact of disasters in terms of awareness when creating opportunities to promote and implement measures targeting risk reduction. A main feature of the proposed framework is the introduction of the need not only to identify and assess the risks involved, but also the processes that may generate or increase such risks and makes explicit reference to prospective risk management to inhibit such processes.

Finally, though not explicitly presented, this conceptual framework recognizes the need to promote both an awareness of the risks, as well as the need to target and consolidate a political commitment to facilitate the implementation of measures to control and reduce risks. In addition, as has been raised by various authors, risk management must be a goal that spans all sectors and disciplines that are involved in the framework of sustainable development.

In terms of the people engaged in such processes linked to corrective and prospective risk management, it must be stressed that it is not only the task of scientists and engineers, because in some cases such an approach has led to the strengthening of scientific and technical institutions and to actions limited to the strengthening of capacities associated to disaster-preparedness. It could be stated that the linking of disasters to the hazards which trigger them has been wrongly interpreted by decision-makers as a justification to promote only disaster preparedness and not a more integral approach, targeting preventive measures which should reduce the exposition to hazards and mitigation measures which should reduce vulnerability. In this regard, risk management must be seen as an integral programme which should be carried out with all the people who have a stake in the design and implementation of measures associated with sustainable development.

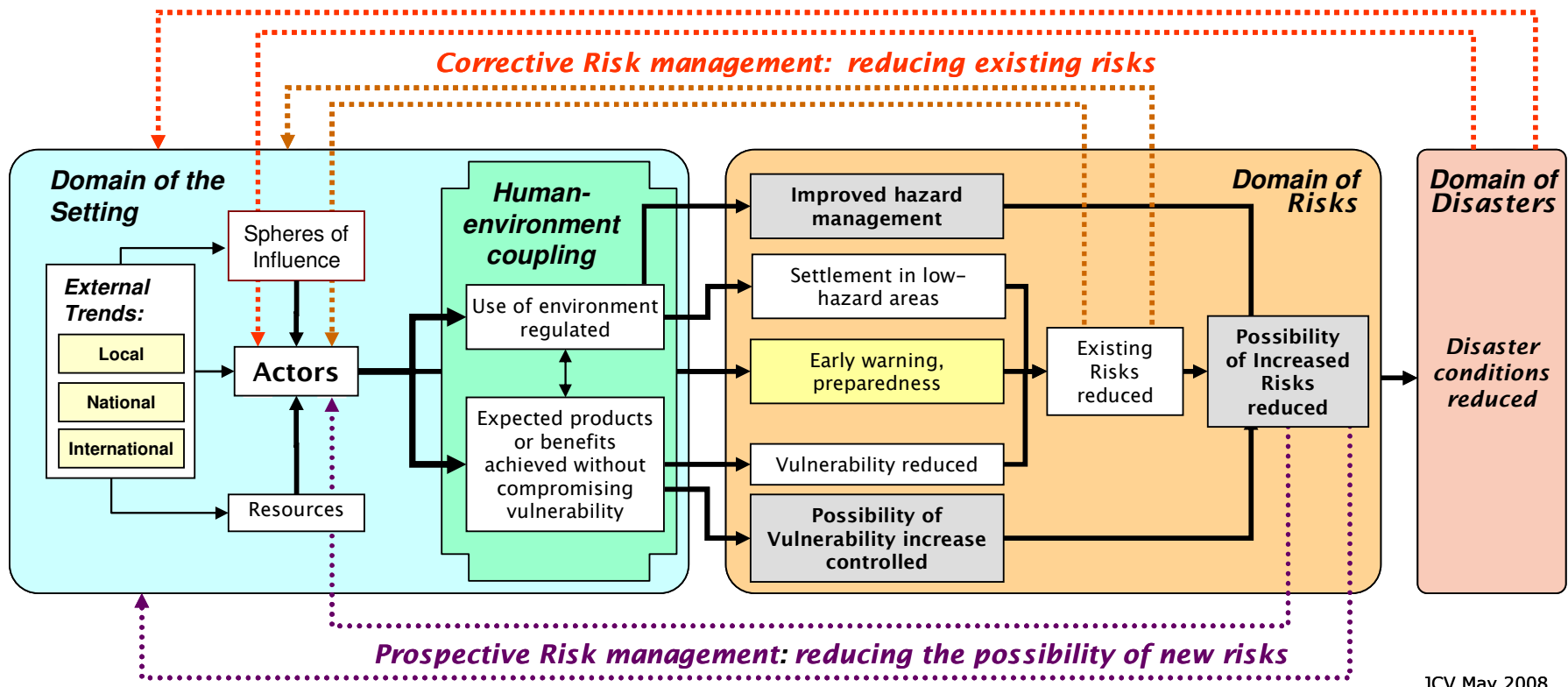


Figure 8: The GIRO Framework

As stated before, corrective risk management includes structural and non-structural measures which should reduce the exposure to hazards and vulnerability, and improve preparedness to strengthen institutions and communities so that they respond efficiently and quickly in case of any event. For example, in the context of flood risk management one can consider measures such as:

- The construction of levees and retention areas within the basins to control future floods and overflows.
- The establishment of early warning systems to minimize loss of human lives and material and economic losses.
- Retrofitting of houses by increasing the level of their floors above the ground.
- In extreme cases, the relocation of communities or segments of such communities which are situated on the banks of rivers to areas located far away from such hazards.

In Central America, Hurricane Mitch led to the implementation of all these types of measures in all countries, as well as the transformation of institutions initially having a limited mandate to focus on disaster response towards institutions capable of coordinating disaster risk management, including preparedness. In this case, as well as in the case of other countries that have experienced disasters, the impacts provoked by such events have led to a change in the paradigm, manifested through the enactment of new legislation that encompasses risk management in addition to disaster response. Table 1 presents information concerning the new legislations devoted to risk management in Central American countries, as well as comments regarding their implementation.

Table 1: Risk Management Legislation in Central American Countries.

Country	New Legislation	Comments
Guatemala	Legislation establishing the National Coordinating Agency for Reduction of Disasters of Natural or Provoked Origin. Decree No. 109-96. December, 1996	The new legislation abolished the old National Emergency Committee which had been established through legislation in 1971. However, the real institutional transition took place as a consequence of the impacts provoked by hurricane Mitch in October and November of the year 1998.
Nicaragua	Legislation establishing the National System for Prevention, Mitigation and Response in case of Disasters. Law No. 227 enacted in the year 2000.	The new legislation replaced the previous legislation which had been published in the Diario Oficial, No. 116, of the 26 of May, 1976. In addition, it established a new institutional framework that came to replace the ad-hoc procedures which had been implemented by the Armed Forces of Nicaragua (Civil Protection) and INETER in case of disasters.
Costa Rica	National Emergency and Risk Prevention Legislation. Law No. 8488 enacted in the year 2005.	The new legislation replaced the former National Law of Emergencies, No 4374, which was established in August, 1969.
El Salvador	Law of Civil Protection, Prevention and Mitigation of Disasters. Decree No. 777 enacted in the year 2005.	The new legislation replaced the former Civil Defence law enacted in 1976, as well as the legislation concerning procedures to declare a state of emergency, which had been enacted in July 1988.
Honduras	Legislation concerning National Contingencies. Decree 9-90-E, 1991.	The new legislation replaced the old Decree-Law No. 33 of March, 1973 and Decree No. 202 which was enacted in March, 1975.

As expected, the acceptance of the integral risk management framework (which includes corrective and prospective views) will have to rely on the unequivocal demonstration regarding how risk reduction will minimize the high costs of reconstruction and how it will lead to enhanced competitiveness in the international arena. Such a demonstration can be made via a comparison of the cost of disasters (which span response, rehabilitation, and reconstruction plus indirect costs associated with lack of production of temporary interruption of business activities) and the costs related to measures associated to risk management.

Corrective Risk Management

The proposed GIRO conceptual framework makes explicit reference to **corrective risk management** as the collection of measures which are implemented to **reduce existing risks**. In this sense, the framework proposes measures which should target both the Domain of the Setting as well as the Actors, as ultimately the decision regarding the implementation of the respective measures resides with such actors. Considering the fact that risks represent the combination of exposition to hazards, vulnerabilities, and deficiencies in preparedness, risk management must target measures to reduce these three components of risks. To this end, it is convenient to introduce the following terminology (Wilches-Chaux, 1993; Villagran, 2001):

Prevention: the set of measures which target the reduction in exposition to hazards, or the modification of some hazards through engineering measures (floods, landslides).

Mitigation: the set of measures which target the reduction in vulnerability.

Preparedness: the set of measures which should enhance capacities in relation to disaster preparedness and coping capacities.

Considering risks as the combination of these components, risk management should begin with the identification and assessment of each of these components independently. If risk can be quantified in such classes as high, medium, and low, then the aim of risk management is to reduce the level of risk from high to medium or from high to low levels, as well as from medium to low levels. As expected, there can be different alternatives regarding how to achieve such a reduction, and the selection of the proper alternative will be based on economic terms, on social criteria (socially accepted), and technical feasibility using the resources allocated to such a task.

Prevention

Preventive measures encompass those measures which are established either to reduce the exposition to the hazard, or in the case of few selected cases, measures which aim to modify the characteristics of the hazard⁴. As suggested in the figure 9, measures should target both the Setting, as well as the Actors.

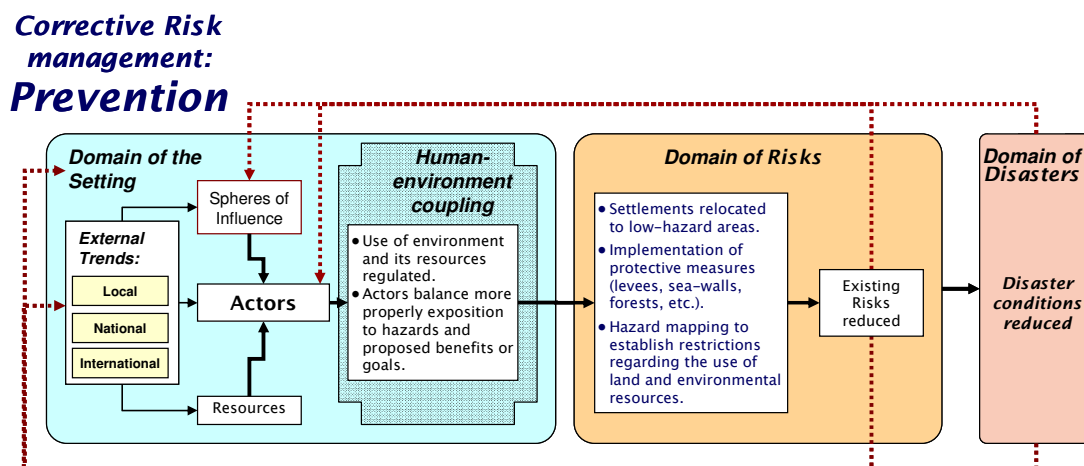


Figure 9: Prevention in the GIRO Framework

For example, in the case of floods preventive measures include the following:

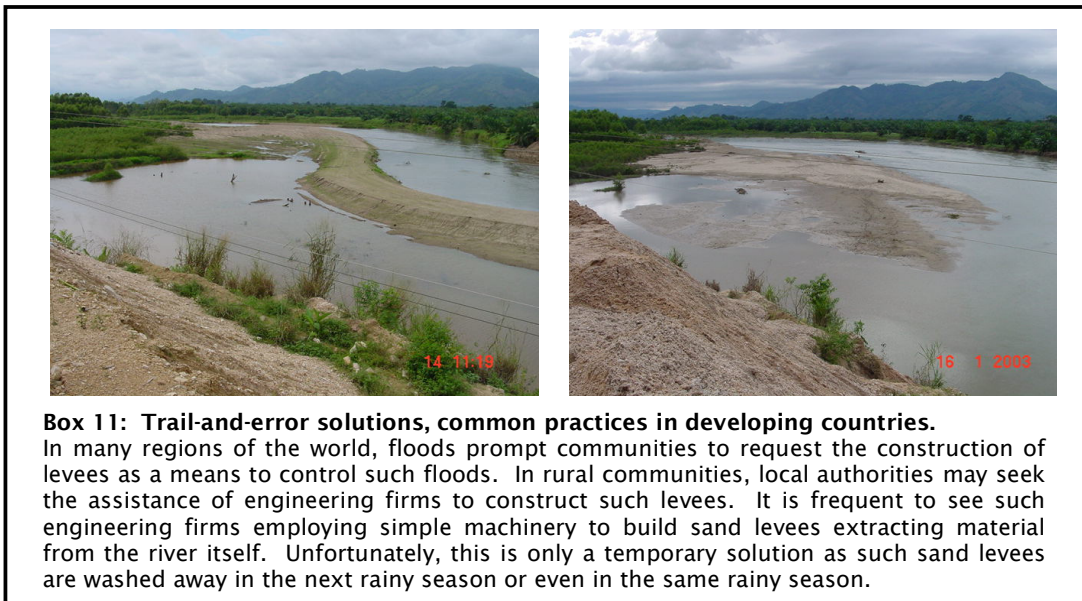
- The construction of levees to control the extent of floods in critical areas such as cities.

⁴ It is important to realize that the way in which the hazard is defined is of extreme relevance in this context.

- The establishment of a set of measures including retention areas and dams to control the discharge of rivers through the temporary storage of water in particular areas, thereby inhibiting the water from a river or a lake to flow into the banks in specific areas.
- The demarcation of flood-plains and regulations concerning their use for particular purposes or goals.

In the case of landslides, preventive measures could include the establishment of terraces and the planting of special plants to re-stabilize a slope prone to landslides, as well as the demarcation of hazardous areas in such slopes, so that the stability of such slopes is not jeopardized as a consequence of improper land-use practices such as the removal of forests for housing or as a source of energy (firewood). Similar measures should also be adopted in the case of tsunamis, volcanic eruptions, and lahars.

In the Domain of the Setting, changes need to be introduced at the political level in terms of policies that focus on preventive measures, accompanied by the allocation of resources to construct such levees and to establish flood-retention areas. However, the design of such measures has to be carried out using precise information concerning the hazard in question and its manifestations. The relevance of making decisions on technical information gathered through a precise hazard assessment stems from the fact that in many developing countries costly improvisations are made, which do not solve the problem altogether.



Box 11: Trail-and-error solutions, common practices in developing countries.

In many regions of the world, floods prompt communities to request the construction of levees as a means to control such floods. In rural communities, local authorities may seek the assistance of engineering firms to construct such levees. It is frequent to see such engineering firms employing simple machinery to build sand levees extracting material from the river itself. Unfortunately, this is only a temporary solution as such sand levees are washed away in the next rainy season or even in the same rainy season.

At the level of individuals, awareness campaigns must be carried out in order to ensure that those individuals become aware of their exposition to the hazards, and the risk they are facing. Similar awareness activities should target institutions of the civil society with the same purpose.

In extreme cases where the exposition to the hazard is very high, the Setting has to be modified so that policies are implemented to confront those cases of communities which are located in high-hazard areas. In particular, such policies should promote networking among agencies at the national level and agencies and the provincial and local levels. These policies should provide guidance to decision-makers at all levels regarding how to deal with the risks faced by such communities.

Mitigation

In contrast to prevention, mitigation measures target the reduction of existing vulnerabilities. In this case, efforts should target the various components of vulnerability (Villagran, 2006) such as the *physical component* dealing with infrastructure; the *economic-income component* which is essential in

relation to livelihoods; the *human-gender component* which makes reference to the differential vulnerability related to vulnerable groups such as children, the elderly, or women; the *administrative component* in the case of businesses or government offices; and the environmental component in relation to the ecosystems and the services provided by the environment, which may be subject to degradation as a consequence of their exposition to a particular type of hazard. Examples of measures associated with mitigation include:

- The modification of existing infrastructure via the elevation of the level of the floor from a lower to a higher one, to be defined in relation to the magnitude of the hazard.
- The retrofitting of existing infrastructure via the exchange of materials which are vulnerable to the contact with water with impermeable materials (plastic for example) and its subsequent waterproofing.

Corrective Risk management: Mitigation

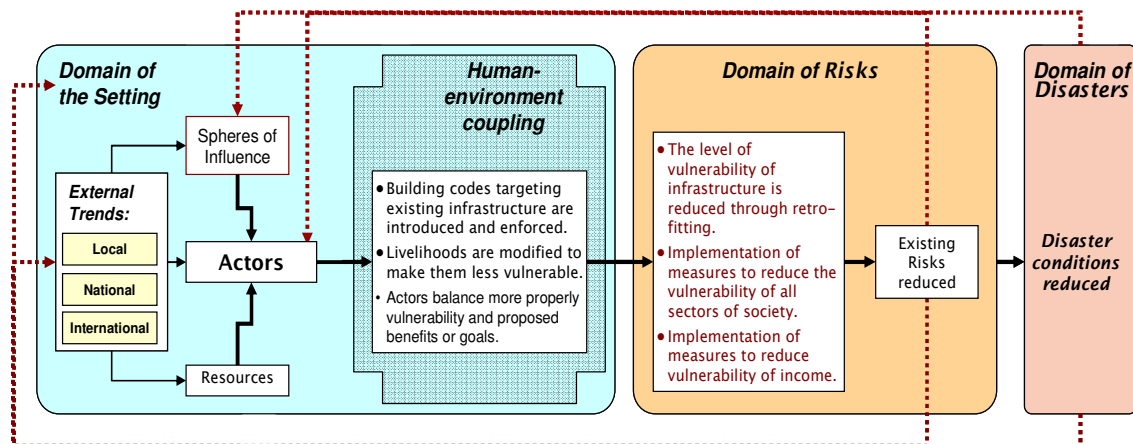


Figure 10: Mitigation in the GIRO Framework

The option whether to relocate an existing infrastructure (a house or a factory) from one location to another should be compared with the alternative option of retrofitting such an infrastructure to reduce its vulnerability. Recalling that actors make decisions based on the assets or resources which they can mobilize, most likely the decision regarding whether to relocate or to retrofit the infrastructure will be related to the cost of the intervention and the amount of assets or resources which can be mobilized for such a purpose. As in the case of prevention, the setting needs to be modified through a variety of measures such as:

- The introduction of policies promoting the modification of building codes, incorporating notions concerning the various types of hazards which may be present in municipal or regional jurisdictions.
- The provision of technical and financial support to municipal administrations so that such building codes are improved, as well as enactment of legislation forcing such administrations to complete this process by a certain date.
- The provision of incentives to individual persons, members of the public and private sector and of the civil society to so that they undertake improvements to infrastructure and to processes and tasks being conducted regularly, so as to bring them up to the standards of the new building codes.

As expected, an awareness campaign needs to target all actors, so that they can undertake the required measures to bring infrastructure, processes, and services up to the standards of the new codes.

Preparedness

The third line of action in the context of corrective risk management focuses on preparedness. As in the cases of prevention and mitigation, preparedness should target both the Setting, as well as the Actors. Examples of preparedness measures include:

- The design and implementation of early warning systems or their improvements should they exist already.
- The strengthening of organizations or committees at all levels dealing with disaster response, in order to carry out such response and rehabilitation activities in a more efficient and timely basis. Such a strengthening should span from the national to the local levels.
- The establishment of Emergency Operation Centres to coordinate in a more efficient fashion both response and rehabilitation activities after a disaster and the respective Standard Operating Procedures.

The elaboration and routine testing of emergency plans through drills and simulations is carried out to promote an awareness regarding such plans and how people should react in case of an event. In addition to these measures associated with the response in case of an event, it is also important to implement measures which may improve the coping capacity of institutions, the private sector, and people affected by such events. Such measures, basically grouped under the term “risk transfer mechanisms”, include:

- The establishment of insurance and micro-insurance programs targeting specific hazards.
- The establishment of catastrophe bonds or emergency funds which may be accessed in case of such disasters.

Corrective Risk management: Preparedness

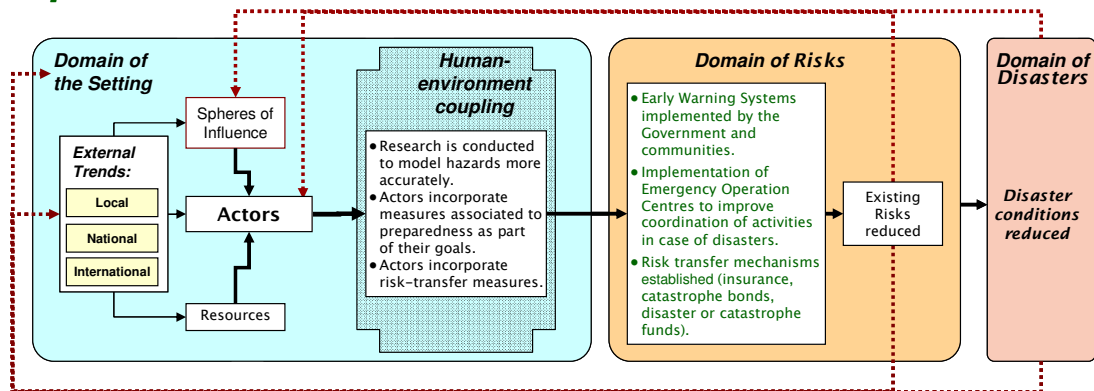


Figure 11: Preparedness in the GIRO Framework

Experiences in developing countries which have faced disasters show that disaster preparedness has been introduced within the Domain of the Setting more easily than prevention or mitigation. As stated in the previous section, Central American nations introduced a variety of measures in the institutional components of the Setting after experiencing the catastrophic impacts provoked by hurricane Mitch. It is important to state that in this context, Agencies for Development from developed nations, the United Nations, the European Union, and international non-government organizations provided not only technical assistance, but guidance and financial resources to ensure that these nations are better prepared to confront the impacts of such hurricanes in the future.

Within the Political Sphere of Influence, governments modified policies to transform former emergency committees into disaster-risk management agencies; and provided fresh funding to retrofit

such agencies with new equipment, resources, and to build their human capacity. At the institutional level, many agencies adopted measures associated with preparedness, and early warning systems of a various kinds have been implemented by such institutions with the support of the international cooperation agencies.

In addition, the media have taken a more proactive role in terms of enhancing awareness of citizens in these countries through regular programs or newspaper articles, and providing more coverage to events and disasters. As a consequence, citizens are now more aware concerning the risks they face, and how to be better prepared to confront such risks.



Box 12: Early Warning and Disaster Preparedness: As a consequence of the catastrophic impacts provoked by hurricane Mitch, many international organizations facilitated the establishment of Community-Operated Early Warning Systems for floods in all countries of Central America. Such systems have been established within the framework of early warning set up by the national institutions in charge of disaster-risk management, but are operated on a daily basis by volunteers who are members of the local emergency committees. In addition to their use in case of floods, such systems allow communities in rural areas to solve social problems which are equally important to such communities.

In general, risk management should include a variety of measures associated with prevention, mitigation, and preparedness. As expected, awareness campaigns need to be carried out targeting the actors so that they accept this new trend in carrying out activities. The Spheres of Influence need to be modified as well in order to establish the proper conditions for the trend to be adopted by the actors. Such modifications include:

- The establishment of new institutions or inter-institutional arrangements as required promoting and carrying out corrective risk management activities.
- The elaboration and enactment of new legislation enforcing risk management practices, as well as the adoption of norms and regulations targeting prevention, mitigation, and preparedness.

- The allocation of new resources to ensure that corrective risk management can be accomplished as expected. Such resources should allow individual actors, as well as actors from the public and private sectors to carry out the required activities to reduce existing risks.

Prospective Risk Management

The proposed GIRO conceptual framework makes explicit reference to **prospective risk management** as the collection of measures which are implemented to reduce the possibility that actors of the private and public sector, as well as individuals citizens create new risks or increase existing risks. As in the case of corrective risk management, the framework proposes measures which should target both the Spheres of Influence within the Domain of the Setting, External Trends, as well as the Actors.

As might be expected, prospective risk management will have to rely mostly on the elaboration and enactment of modern legislation by the government, but recognized by all actors (private and public sectors, civil society and individuals) in a positive way as a strategy to promote the long-term

Prospective Risk management

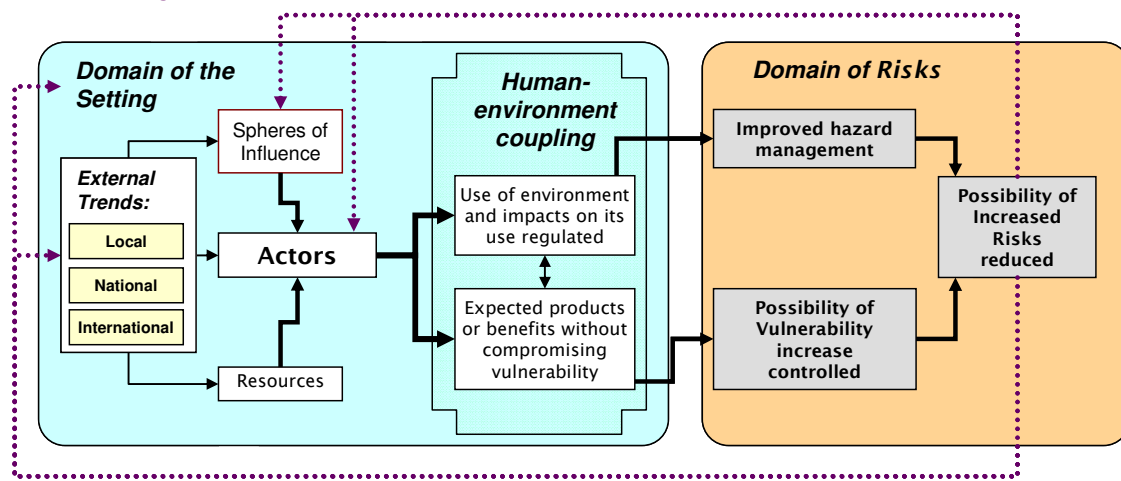


Figure 12: Prospective Risk Management in the GIRO Framework

sustainability of their efforts. Undoubtedly, this is a great challenge in the case of governments and settings that are characterized by short-term visions rather than long-term visions. Similarly such an approach may collide with the economic interests of powerful actors of the private sector concerning land-use practices and the use of natural resources in areas exposed to a high level of hazard. As in the case of corrective risk management, prospective risk management has to begin with an acknowledgement that the starting point in any decision has to be the use of information concerning risks. To this end, prospective risk management should begin with a thorough assessment of risks and of the processes which have led to such risks. Such information will help identify those measures which need to be incorporated into the setting so that all actors can then incorporate them as well.

For example, in the case of prevention, prospective risk management should promote the construction of infrastructure in places where the exposition to the hazard is rather low, and should promote development in such a way that hazards are not increased in any way in the future. In the case of mitigation, the aim should be to establish and enforce processes, services, and infrastructure with low vulnerable standards. In the context of preparedness, coping capacities should be considered from the onset, so that societies face fewer impacts associated with events of different types or magnitudes.

ANNEX 1: Terminology

Undoubtedly, the starting point in the topic of risk management should be a review of the terminology which is employed as part of its conceptual framework. Unfortunately, a literature review reflects the novelty of the risk management paradigm in terms of conceptual frameworks and terminology, an expected outcome considering the fact that the topic is still in its evolutionary process. As a corollary of this evolutionary process one is able to identify a lack of consensus regarding the use of terms and their meanings as well as the emergence of new, broader conceptual frameworks seeking to incorporate various facets of the dynamic processes that are leading to risks and subsequently to disasters.

As an initial example in the context of terminology one may consider the terms **event**, **natural phenomenon** and **hazard**. According to the World Meteorological Organization (WMO, 2008), "*natural hazards are severe and extreme weather and climate events that occur naturally in all parts of the world, although some regions are more vulnerable to certain hazards than others. Natural hazards become natural disasters when people's lives and livelihoods are destroyed.*" As noted, this paragraph includes several concepts. One might conclude that according to WMO there are weather and climate events that occur due to natural causes, some of which can be extreme. These extreme events are called hazards and make reference to the term "disaster" when causing destruction of lives and livelihoods among the population.

The International Strategy for Disaster Reduction defined in its glossary (ISDR, 2008) the term hazard as follows: "*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*". Similarly, ISDR defines the term **natural hazard** as follows: "*natural processes or phenomena occurring in the biosphere that may constitute a damaging event*". As noted, ISDR also recognizes that there are physical events or phenomena, some of which can cause death, injury and other losses. One could then conclude that from the perspective of the ISDR, the term hazard represents potentially adverse events or phenomena. The definition stated in this way allows ISDR to classify hazards in various categories such as **geological** (focusing on earthquakes and volcanic eruptions for example), **hydro-meteorological** (atmospheric, oceanographic and hydrological); **biological** (viruses, harmful algae blooms, bacteria, insects, etc.) and **technological** (explosions, toxic spills, industrial fires, etc.).

In the book entitled "Disasters Are Not Natural" (Maskrey, 1993) G. Romero and A Maskrey proposed the following definition with regard to the term natural phenomenon⁵ "*it relates to all manifestations of nature. It refers to any expression that nature may adopt as a result of its internal workings. Some of them appear regularly and others may appear infrequently and unexpectedly*". This definition allows them to communicate the idea that not all natural phenomena are dangerous, but only those that produce impacts manifested in terms of destruction, damage, injuries or fatalities and in terms of affected people.

UNDRO defined the term hazard as "*the probability of occurrence associated with an extreme event that can cause a failure*". This definition is equivalent to the previous definitions in which the term hazard is associated with an event of extreme nature, which provokes damages, fatalities and impacts human activity.

These paragraphs lead to the conclusion that several experts consider hazards as events which can be harmful to people, institutions, or communities. However, in recent years an alternative view has emerged, replacing the notion of a hazard as an event by a notion which focuses on the probability or possibility regarding the manifestation of such an event. O. D. Cardona defines hazard as "*the probability of occurrence of a potentially damaging natural phenomenon in a specific period of time*

⁵ Translation by the author.

in a given area." (Cardona, 2003, 2007). This change in the definition of hazard representing it as a probability has implications in the context of risk as it leads to the notion of risk as a probability to sustain damage or impacts as a consequence of the triggering event.

In 2003, A. Lavell, (2003) recognized the difficulty associated with the absence of a clear definition or confusion and inconsistency in the use of the word "hazard" to connote actual or potential events in the context of the research program financed by the Inter American Development Bank which targeted the elaboration of indicators of disaster risk and risk management which was coordinated by O. Cardona within the Institute for Environmental Studies at the National University of Colombia based in Manizales.

The connection between hazard and risk is consolidated by incorporating the term vulnerability. ISDR defines vulnerability as *"the conditions determined by physical, social, economic, and environmental factors or processes, which increase the susceptibility of a community to the impact of hazards."*

In 1989, R. Chambers (1989) introduced the notion of vulnerability as a combination of an **internal side** or component associated with the defencelessness or incapacity of people to cope with damaging losses or impacts caused by a disaster and an **external side** related to exposure to shocks and stresses. This combination of exposure and the inability to cope with the impacts proposed by R. Chambers has been adopted by Watts and Bohle (1993), Birkmann (2005) and other experts in the field.

G. Wilches-Chaux (1993) defined vulnerability as⁶ *"...the inability of a community to absorb, through self-adjustments, the effects of a change in its environment, or its inflexibility or inability to adapt to this change..."* The definition stated in this fashion allows Wilches-Chaux to propose the different angles and dimensions of vulnerability: natural, physical, economic, social, political, technical, ideological, cultural, educational, environmental and institutional.

In 1996 Blaikie, Cannon, Davis and Wisner presented a very complete conceptual framework regarding vulnerability as the set of **unsafe conditions** that are generated as a product of **root causes** and **dynamic factors**. In 2004 B. Wisner (Wisner, 2004), defined vulnerability as *"the characteristics of a person or group and their situation that influence their capacity to anticipate, cope with, resist, and recover from the impact of a natural hazard"*. This definition pinpoints vulnerability as a condition exclusively in reference to human beings, not in relation to infrastructure (which may be characterized in terms of unsafe conditions) and economies (which may be characterized as fragile).

In the glossary developed in the context of the program on Indicators of Disaster Risk and Risk Management financed by the IADB vulnerability is defined as⁶ *"the intrinsic predisposition or the physical, economic, social and political susceptibility of a community to be affected or to suffer adverse effects in the case in which a dangerous phenomenon of natural origin, socio-natural or anthropogenic manifests itself"*. (Cardona, 2003).

The World Food Programme of the United Nations (WFP, 2004) defines vulnerability as *the probability of an acute decline in access to food, or consumption, often in reference to some critical value that defines minimum levels of human well being.*

As Birkmann and Wisner (2006) have indicated, the term vulnerability has different meanings and interpretations to different people. K. Thywissen (2005) conducted a review of the literature identifying at least 36 definitions or notions concerning vulnerability, some more or less similar. The author (Villagran, 2006) conducted a comparative analysis of definitions and methodologies for assessing vulnerability, concluding that the different definitions can be grouped into three major groups:

1. *As a particular condition or state of a system before an event triggers a disaster, described in terms of criteria such as susceptibility, limitations, incapacities or deficiencies e.g. the incapacity*

⁶ Translation by the author.

to resist the impact of the event (resistance) and the incapacity to cope with an event (coping capacities);

2. *As a direct consequence of the exposure to a given hazard; and*
3. *As the probability or possibility of an outcome of the system when exposed to an external event associated with a hazard, expressed in terms of potential losses such as fatalities or economic losses, or as the probability of the person or a community reaching or surpassing a certain benchmark such as the poverty gap.*

In 1993 G. Wilchex Chaux (1993) introduced the terms **prevention**, **mitigation**, and **preparedness** with particular connotations in the context of risk management. Prevention focused on the measures related to hazard management. Mitigation covered those measures aiming to reduce vulnerability and preparedness to reduce the negative effects of the disaster. A broader view of the term mitigation has been introduced by A. Maskrey (1993a) linking it with the reduction of the risks of vulnerable elements with respect to a particular hazard and with the notion of reducing the vulnerability of communities through the transformation of relations of productivity that conditions such communities.

However, in the context of Climate Change, the same term **mitigation** is introduced as the set of measures that should be carried out to reduce or minimize the generation of greenhouse gases and other gases that are causing climate change. In this context **adaptation** refers to the set of measures which will have to be adopted by communities to adapt themselves to the modifications introduced by this process of climate change.

As indicated by O. D. Cardona (2001) "*despite advances in the various fields of knowledge, at present there is no conceptual framework that unifies coherently and consistently all the different approaches that have emerged throughout recent decades*". Considering the lack of consensus, readers are encouraged to consult the various glossaries that have been elaborated by several institutions such as:

Terminology: Basic terms of disaster risk reduction of ISDR, available in the following web page: <http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm>

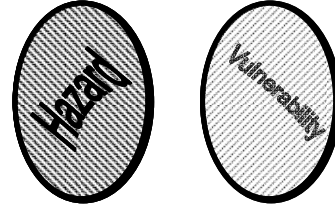
Glossary (in Spanish language) elaborated as part of the Program on Indicators of Disaster Risk and Risk Management sponsored by the IADB and UNC-IDEA, available in the following web page: <http://idea.manizales.unal.edu.co/ProyectosEspeciales/bid2/adminIDEA/CentroDocumentacion/DocDigitales/documentos/01%20Marco%20Conceptual%20BID-IDEA%20FASE%20I.pdf>.

Components of Risk, a Comparative Glossary elaborated by K. Thywissen of UNU-EHS, available in the following web page: <http://www.ehs.unu.edu/category:17?menu=36>

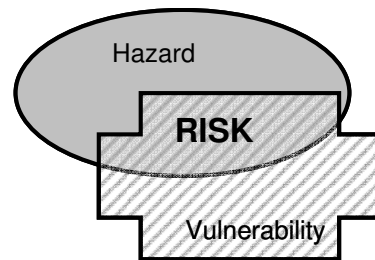
Glossary of Terms and Notions relevant to Risk Management (in Spanish language) elaborated for CEPREDENAC (2003): available in the following web page: <http://www.cepredenac.org/downloads/GLOSARIO.pdf>.

ANNEX 2: Conceptual Frameworks

The most basic risk model proposes risk as the **combination of hazards and vulnerabilities**. Several authors propose that the concepts of hazard and vulnerability are intrinsically linked within the context of risk, indicating that the notion of hazard only makes sense when considered in reference to something vulnerable and that vulnerability only makes sense when it is linked to a hazard (vulnerable with respect to a hazard) (Lavell, 2003; Cardona, 2004). One could make a connection between this notion and the two sides of a coin and its value. One side of the coin represent the hazard, the other side represents vulnerability and together they represent the risk. This concept implies that to talk about risk it is necessary to consider hazards and vulnerabilities simultaneously.



Other researchers conceive the notion of risk as the intersection between hazards and vulnerabilities, but under the notion of risk as the region where a geographical overlap exists between hazards and vulnerabilities. In this case the hazard is conceived as the probability of an event taking place in a certain region of space in a specific period of time. Vulnerability is still regarded as the predisposition of a community to be affected by events and can be characterized again in relation to a spatial extent. This notion implies that it is possible to identify areas where a hazard may be present but no vulnerability, as well as vulnerable areas which are not exposed to the hazard. In these two cases the risk would not exist as one of the two factors is not present.



ISDR Conceptual Framework:

In the book entitled "Living with Risk," ISDR presented a risk management model in terms of hazards and vulnerabilities that is framed in a broader framework which involves different types of measures to target and reduce risks. This conceptual framework recognizes the need for risk management to be considered as an essential element of the broader concept of sustainable development, implying the need to incorporate risk assessment and risk-management measures in various fields such as environmental management, poverty reduction, and financial management.

Based on the assessment of hazards and vulnerabilities, this conceptual framework proposes the use of such information to promote awareness regarding risks, particularly focusing on communities that are exposed to such risks, as well as to promote a political compromise with regards to the implementation of policies, legislation and norms aiming to reduce such risks. The framework proposes that risk management should become a key element in the context of good governance, since the lack of political commitment has been identified as an obstacle towards the implementation of disaster reduction measures. The expectation is that political commitment by the private and public decision-makers and community leaders, based on a better understanding of the concepts of risk reduction, is essential to achieve the required change. Similarly, the framework makes reference to an effective administration and a more appropriate distribution of resources as an indicator of progress and development from the highest levels of authority within a society, along with the understanding and active participation of people affected by disasters.

As a result of political compromise and taking into account information on risks, the conceptual framework promotes the implementation of various measures in the field of economic and social development; measures to protect critical infrastructure and lifelines; measures associated with preparedness in case disasters such as early warning and measures in the field of recovery.

As noted, the conceptual framework suggests that disasters are the result of two factors that make up the risk (hazards and vulnerabilities), therefore it is necessary to promote measures in the field of preparedness and the capacity to be able to handle emergencies that may arise as a result of such disasters. Although the book "Living with Risk" is very extensive, it is recommended as a reference to get deeper grasp of this subject of disasters and risk management.

The Progression of Vulnerability: The Pressure and Release Model

In the mid-90s, Blaikie, Cannon, Davis and Wisner suggested the model entitled the **Progression of Vulnerability** within the conceptual framework known as the Pressure and Release Model (Wisner, 2004). This model focuses on the analysis of the causes and processes that are associated with the generation of vulnerability. This model proposes that vulnerability, represented by a set of conditions of insecurity, results from a combination of root causes and dynamic pressures associated with the inability or lack of institutions, local investment and macro-forces such as population growth, uncontrolled urbanization and other processes associated with these forces. The model also proposes that such dynamic pressures emerge as a result of root causes that have been established over decades or centuries such as limited access to resources or weak bargaining power which emerge as a consequence of the ideologies which have served to establish economic or political systems.

Root causes arise as a consequence of the processes between a given society and the global economy. It is generally assumed that these root causes are very distant in time and space, so that they can be manifested far from the localities where the unsafe conditions take place. The most relevant root causes in the context of vulnerability are of economic, demographic and political origin and in many cases result from the political, social and economic structures which are in place. These root causes affect the distribution of resources among different social groups because they reflect the distribution of power within a society.

Dynamic pressures are processes and activities that propagate the effects of root causes spatially and temporarily into the domain of unsafe conditions. They constitute the most immediate manifestations of contemporary political, social and economic patterns. One can think of capitalism as an example of a root cause which has existed for centuries and neo-liberalism as a dynamic pressure that was implemented a few decades ago. As the authors suggest, dynamic pressures must be considered in the context of each particular hazard. Such pressures may include rapid urbanization as a product of migration from rural to urban areas due to several factors such as wars and other violent conflicts, structural programs to manage public debt, epidemics and certain structural programmes introduced by governments.

Finally, **unsafe conditions** are specific ways in which vulnerability is manifested both in time and space in relation to hazards. Such conditions depend on the initial level of welfare of the people and how such a level varies from one region to another, from one household to another, and from one individual to another. When considering such conditions, one should also include patterns of access to tangible resources (eg cash, food, and housing, inventories of grain or agricultural equipment) and intangible resources (support networks, knowledge about sources of technical or financial assistance and the capacity to operate in cases of crisis among others). An interesting aspect to note regarding this conceptual framework is the focus of the term vulnerability specifically associated with people. People can be vulnerable and live in unsafe conditions. However, one should not use the vulnerability attribute to refer to the susceptibility of physical infrastructure (houses may be unsafe) or the susceptibility of the economy (economies may be fragile). People may be vulnerable because of an inappropriate way of life, because their way of life may not be resilient and because of poverty. Poverty arises as a result of specific relations of exploitation, unequal negotiating power and discrimination within the existing social and economic system.

This conceptual framework models unsafe conditions which are manifested at the local level as a result of the impacts of actions or processes which are carried out at a national and even global level (root causes). As noted, risk arises as the combination of hazard and vulnerability. To release such a pressure it is necessary to modify root causes in order to adjust the dynamic pressures with the goal of reducing unsafe conditions.

Holistic Framework proposed by Cardona and Barbat:

In the year 2000 O. D. Cardona and A. Barbat introduced a more holistic approach regarding the notion of risks. This approach suggests that there are root causes associated with economic, demographic and political factors that give rise to the vulnerability of human settlements. Such causes can be linked to the absence of economic and social development and lead to the incapacity to absorb the impact, weaknesses in institutional management, and lack of capacity to respond in case of a disaster. Three specific factors are mentioned in this context (Cardona, 2001):

- **Physical susceptibility** or **exposure** associated with susceptibility of human settlements to be affected because of their location in areas exposed to hazards and the lack of physical resistance with respect to natural phenomena associated with such hazards.
- **Social fragility** which pinpoints the predisposition that arises due to marginalization and social segregation in human settlements and because of their relative disadvantage in terms of socio-economic factors.
- **Lack of resistance** which is related to limitations in access and inability to mobilize resources by the population of these settlements; their incapacity to respond and absorb the impacts of events that trigger an event of greater proportions.

The combination of hazard and physical susceptibility generate what these authors define as the **Hard Risk**, which manifests itself in terms of damage to physical infrastructure and to the environment in case of a disaster. In contrast, the combination of hazard and the social and economic fragilities and lack of resilience, coping capacities, and recovery (which do not depend on the hazard) is defined as the **Soft Risk**, which manifests itself in case of disasters in terms of the socioeconomic impact. As indicated by Cardona (2001), vulnerability reflects a deficit in terms of development and hence, risk must be conceived in a holistic fashion, covering not only the geological and structural variables, but also economic social, political, cultural or other types of variables.

The Turner Model:

Another model that was introduced in 2003 was the model proposed by Turner et al (2003). This model situates vulnerability in the centre of the framework but is structured in order to incorporate the notions of climate change. The model suggests that vulnerability can be characterized in terms of exposure, sensitivity and resilience, emphasizing the links between environmental and human conditions, coping capacity, response to impacts, adjustments and adaptation as a response mechanism, and the characteristics and components of exposure. To incorporate the notion of climate change, the conceptual framework introduces the impacts on the variability and change in both human and environmental conditions and incorporates the notion of interactions with hazards. In the context of levels, the conceptual framework suggests a link between the global level and the level of the region based on human and environmental influences which take place outside the local level, where vulnerability is manifested.

The BBC Conceptual Framework:

In 2005 Birkmann and Bogardi (Birkmann, 2005; Birkmann, 2006; Birkmann and Wisner, 2006) presented the BBC framework (based on the initials of Birkmann, Bogardi and Cardona), which incorporates the concepts of Chambers and Bohle in relation to vulnerability (exposure and coping capacity), as well as the notion of fragility. As in the case of the Turner et al framework, the BBC framework puts vulnerability as the central element in the scheme risks. The framework incorporates the three spheres of sustainable development (environmental, social, and economic) to the vulnerability. When combined with the hazard, it proposes three types or dimensions of risk: environmental, social and economic risk. The framework also proposes interactions among the three types of risks and proposes that vulnerability should be conceived in an integral and dynamic fashion. The framework incorporates an intervention system as a means to achieve risk reduction via interventions before a disaster ($t = 0$), and after it ($t = 1$) targeting the three dimensions or spheres of development, as well as at the level of the hazard through changes in land use practices for example. The link suggested by this framework between vulnerability and the three spheres of sustainable development emphasizes the need to understand the environment not only from the realm of hazards, but also as an essential basis of life thus specifying the link between nature and society. As the authors comment, in contrast to typical risk management frameworks, the BBC framework thrusts vulnerability as the main element of risk.

Conceptual Framework of UNDP-BCPR for Andean Capital Cities:

Within the scope of the project implemented by UNDP-BCPR supported by DIPECHO entitled "Strengthening Risk Reduction at the Regional Level in Major Cities of the Andean Community" a novel framework was designed to model the processes leading to the generation of risks in settlements situated in steep-slope areas. This conceptual framework, which served as a basis for the design of the GIRO framework, has the goal of characterizing in a comprehensive fashion the scenario of occupation of urban hills in five Andean cities with the aim of:

- Understanding the factors that promote or restrain the establishment and development of informal settlements on hillsides.
- Understanding and comparing the dynamic nature of risks.
- Identifying the determinants of institutional response concerning how issues are addressed, why they are addressed and how in the context of the urban settlements in these steep slopes.
- Assessing the conditions affecting the effectiveness of policies and practices applied in the case of the five Andean cities.
- Defining the conditions of transferability of policies and practices to the context of other cities.

The conceptual framework stems from the Pressure and Release Model which has been implemented by both the Directorate for Prevention and Emergency Response of the Office of the Mayor of Bogota (DPAE) and by the Risk Management Unit of the Municipal Government of La Paz (UGR-GMLP). The framework introduces the notion of a **setting** which influences how activities and processes are conducted within a **nucleus** that includes actors, processes, and geographical areas. The setting is introduced to explain why the actors, processes and areas are operating as they are and how they work. The setting integrates cultural, economic, political, regulatory, institutional and social factors that may promote the occupation of the steep slopes; including variables that explain the possibilities and limitations of interventions: conditions of inequality at regional or national level, insecurity and violence, public perception of problems, public policy, land availability in other areas, technical capabilities, organization and coordination of the agencies, conflicts between municipal administrations, etc. The setting influences the nucleus which represents actors, processes, and areas.

Generated indirectly from the conditions of the setting and directly from the nucleus, the state of risk is characterized in terms of hazard and vulnerability. In this framework, vulnerability represents the current conditions of housing and infrastructure, as well as the quality of their services (which have accelerated the process of erosion of hillsides), but also by environmental practices (i.e. exploitation quarries in nearby areas without considering protective measures), the economic conditions of families, ignorance concerning the territory, weak linkages between local actors, etc.

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