back

2.3. Risk assessment

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

Risk assessments include detailed quantitative and qualitative information and understanding of risk , its physical, social, economic, and environmental factors and consequences. It is a necessary first step for any other disaster reduction measure. Its relevance for planning and development of disaster risk reduction strategies was explicitly addressed during the IDNDR (1989), which stated that:

"In the year 2000, all countries, as part of their plan to achieve sustainable development, should have in place:
a) Comprehensive national assessments of risks from natural hazards, with these assessments taken into account in development plans."

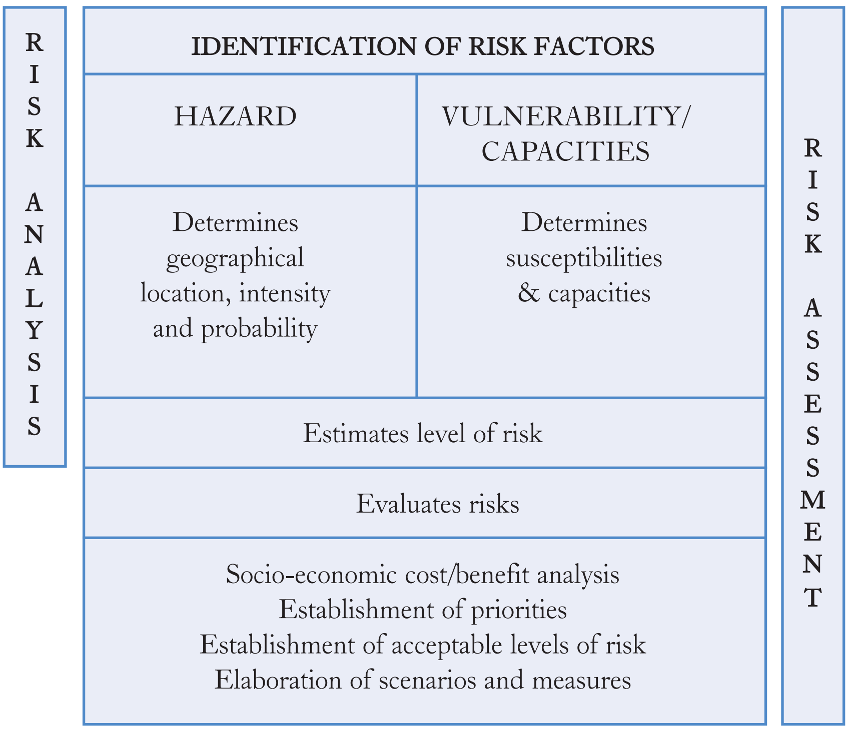
This was reiterated as the first principle, in the Yokohama Strategy and Plan of Action (1994): *"Risk assessment is a required step for the adoption of adequate and successful disaster reduction policies and measures."*

Risk assessment encompasses the systematic use of available information to determine the likelihood of certain events occurring and the magnitude of their possible consequences. As a process, it is generally agreed upon that it includes the following activities:

- Identifying the nature, location, intensity and probability of a threat.
- Determining the existence and degree of vulnerabilities and exposure to the threat.
- Identifying the capacities and resources available.
- Determining acceptable levels of risk.

The analytical phases involved in risk assessment include some of the basic tasks for risk management. The following diagram shows the basic stages undertaken in a risk assessment process.

Stages of risk assessment



The identification of hazards usually constitutes the departing point for the risk assessment process.

Both hazard and vulnerability/capacity assessments utilise formal procedures that include collection of primary data, monitoring, data processing, mapping, and social surveys techniques, among others. In the case of hazard assessment, where usually high technological developments for monitoring and storing data of geological and atmospheric processes are involved, the assessment activities are mostly restricted to a scientific community. On the other hand, vulnerability and capacity assessments make use of more conventional methodologies and techniques, by which the community at risk may also play an active role, such as in community-based mapping.

Beyond these particularities, hazard and vulnerability/capacity assessment follow a set of more or less formal procedures that are generally captured under the concept of risk analysis. Seen as this, risk analysis constitutes a core stage of the whole risk assessment process by means of providing relatively objective and technical information from which levels of risk can be estimated.

The information produced by technical risk analysis allows for the establishment of impartial government policy, resources needed for disaster preparedness, and insurance schemes. But from the estimated levels of risk to the determination of acceptable levels of risk, a different range of value judgements are usually taken into account. Socio-economic cost/benefit analyses usually lead to the establishment of priorities that in turn help to draw levels of acceptable risk. These levels will depend largely on government, community priorities, interests and capacities. It is at this stage, particularly, when the more subjective trade-offs of quantitative and qualitative approaches to risk assessment need to be sorted out.

The distinction between **risk assessment** and **risk perception** has important implications for disaster **risk reduction**. In some cases, as in vulnerability/capacity assessment exercises, risk perception may be formally included in the assessment process, by incorporating people's own ideas and perceptions on the risks they are exposed to. Nevertheless, the wide and increasing use of computer assisted techniques and methodologies – such as those involved in Geographic Information Systems (GIS) – may widen the breach between the information produced by technical risk assessments and the understaning of risk by people.

Therefore, acceptable levels of risk may vary according to the relative contribution of views on objective risk versus perceived risk, at the various individual, community and institutional scales. The table below depicts the main differences between risk assessment and risk perception.

Phase of analysis	Risk assessment processes	Risk perception processes
Risk identification	Event monitoring Statistical inference	Individual intuition Personal awareness
Risk estimation	Magnitude/frequency Economic costs	Personal experience Intangible losses
Risk evaluation	Cost/benefit analysis Community policy	Personality factors Individual action

Adapted from: K. Smith. Environmental hazards, 1997

back

Hazard assessment

The objective of a hazard assessment is to identify the probability of occurrence of a specified hazard, in a specified future time period, as well as its intensity and area of impact. For example, the assessment of flood hazard is extremely important in the design and setting of engineering facilities and in zoning for land use planning. Construction of buildings and residences is often restricted in high flood hazard areas. Flood assessment should be developed for the design and setting of sewage treatment as well as land and buildings having industrial materials of a toxic or dangerous nature, due to the potential spread of contaminants.

Certain hazards have well-established techniques available for their assessment. This is the case for floods, earthquakes and volcanic hazards. Many of the analytical techniques useful for hazard assessment can be applied using medium powered computers and widely available software packages.

On seismic hazards, the dynamic ground shaking and ground movement are the two most important effects considered in the analysis. Dynamic ground shaking is a critical consideration for buildings and construction. The objective of a statistical earthquake hazard assessment is to assess the probability that a particular level of ground motion at a site is reached or exceeded during a specified time interval. An alternative approach is to consider the evaluation of the ground motion produced by the maximum conceivable earthquake in the most unfavourable distance to a specific site. Earthquake hazard assessment in areas of low seismic activity is much more subject to large errors than in areas with high earthquake activity. This is especially the case if the time span of the available data is considerably smaller than the mean return interval of large events, for which the hazard has to be calculated.

In most cases, one is able to characterise the overall activity of a volcano and its potential danger from field observations by mapping the various historical and prehistoric volcanic deposits. These deposits can, in turn, be interpreted in terms of eruptive phenomena, usually by analogy with visually observed eruptions.

Other hazards have less well-defined assessment methodologies. In the future, efforts must continue to increase our understanding and develop methodologies for the assessment of hazards such as heat waves and dust storms; in particular, with regard to the factors which influence their development, movement and decay.

Multi-hazard assessments are difficult to achieve due in part to the different approaches taken by the various disciplines in assessing the specific potential hazards. But multi-hazard assessments are essential, for example, in the case of a tropical storm event. The event cannot be looked at in isolation and should consider the different components that actually represent the risks occurring either separately or all together. These components are flood, landslide, storm surge, tornado and wind. Various hazards will be measured according to different scales, which make comparisons difficult. An earthquake will be quantified based on the amount of energy released (Richter scale) or the amount of damage potentially caused (Modified Mercalli scale), while a heat wave is measured using maximum temperatures and a wind storm using wind velocity.

Even without sophisticated assessment tools, it is possible for local communities to collect hazard information. Such steps are suggested in UNEP's Technical Report N°12, *Hazard Identification and Evaluation in a Local Community*, consisting of basic checklists to identify, and basic approaches to map major hazards in a locality. Various tables invite more detailed

WMO and the IDNDR Scientific and Technical Committee promoted a project to further develop the concept of comprehensive, multi-hazard or joint assessment of natural hazards. It was recognised that society is usually at risk from several different hazards, many of which are not water-related or natural in origin. More importantly, it was also recognised that joint assessment of risk from these various hazards is in its infancy. Recognising these points, the project focused on the most destructive and most widespread natural disasters, namely those of meteorological, hydrological, seismic, and volcanic origin. An example of the development and application of such approach in land-use planning was provided by Switzerland where the composite exposure to risks from floods, landslides and avalanches were considered. The project noted that an increased understanding of the hazard assessment methodologies of each discipline is required, as these methodologies varied from discipline to discipline.

consideration about the nature of impacts and the severity of various consequences of different hazards on affected populations.

Hazard mapping, awareness and public policy

A key dimension of hazard assessment is the presentation of the results and the understanding of the added value by policy makers. Maps can be prepared manually using standard cartographic techniques or with a GIS. Different types of hazards will require different mapping techniques. The importance lies in the easy understanding and use of the information generated.

For example, maps are the standart format for presenting flood hazards. The flood-hazard areas are usually divided according to severity (deep or shallow), type (quiet water or high velocity) or frequency. In the case of volcanic hazards, the zoning of each direct and indirect hazards can be drawn according to the intensity, the extent of the hazard, the frequency of occurrence or in combination. Composite phenomena and hazard maps are recognised as an important tool for joint hazard assessments. These combined hazard assessments need to be presented using a simple classification, such as high, medium and low risk, or no danger.

One of the constraining factors in hazard mapping is not so much the lack of infrastructure but the lack of proper training capabilities. There are many government employees that do not have computer access . Hazard maps are also not as widely used as they could be, were more planners and decision-makers aware of their potential. For example, in Bangladesh, while many different entities are carrying out various projects in risk and hazard mapping and land-use planning, there exists no common focal point for easy access to this information. Moreover, communication is deficient : maps are not shared, and data is collected several times, or mismanaged.

Several initiatives on hazard mapping were developed during the 1990s, as part of IDNDR. One example is the *"Eastern Asia Natural Hazards Mapping Project" (EANHMP),* started in Japan in 1994. The objectives of the project were to enhance awareness on natural hazards, in particular geological hazards among planners and policy makers of national and regional development, as well as general public in a given region, promote scientific studies on geological hazards, and transfer technology on hazard mapping to developing countries through collaborative activities. The Eastern Asia Geological Hazards Map is one of the products already available.

Source: Geological Survey of Japan, AIST, 2002

Vulnerability and capacity assessment

Vulnerability and capacity assessments are an indispensable complement to hazard assessment exercises. Despite the considerable efforts and achievements reflected in improved quality and coverage of scientific data on different hazards, the mapping and assessing of social, economic and environmental vulnerabilities of the population are not equally developed. Some

High risk cholera areas due to polluted surface water (2001)

In South Africa, various institutions are engaged in hazard mapping. While projects are sometimes conducted in isolation and the data is not widely used, there are other examples where the resulting information is beneficial to additional institutions beyond the one which collected it. Most hazard maps are becoming available online and they often function as clickable image maps containing additional information about particular areas. The Agriculture Research Council, the National Disaster Management Centre, the Department of Water Affairs and Forestry, and the Department of Health are all using satellite data to compile hazard maps, which then become part of their much larger geographical information systems. Use of US/NOAA satellite data further enables the generation of locally relevant geo-referenced maps. The National Botanical Institute also embarked on the mapping of degradation patterns for the whole of South Africa. These maps provide valuable information on the state of South Africa's ground cover.

Source: NDMC (http://sandmc.pwv.gov.za/ndmc/cholera/Maps/Nmmp.jpg)

back

aspects of vulnerability/capacity, especially those related to the social nature of these concepts, pose a different range of challenges to risk assessment.

Often there is a huge gap in the understanding and application of vulnerability/capacity assessments between the institutions undertaking these tasks, and the local authorities and communities involved in the exercise.

A great deal of work has been focused on the assessment of the physical aspects of vulnerability. This has been done mainly in relation to more conventional hazardous phenomenon, such as windstorms, earthquakes and floods. A high percentage of the vulnerability mapping developments at an earlier stage is reflecting this trend. This was accentuated by the wide utilisation of GIS techniques for the spatial integration of different variables in the 1980s. The spatial overlapping of hazard zones with infrastructure such as airports, main highways, health facilities and power lines, amongst others, is one of the common exercises, highly focused on in the examination of the physical aspects of vulnerability.

The Organization of American States (OAS) has been one of the pioneers in Latin America in using GIS tools for physical vulnerability assessment, focused on infrastructure and critical facilities. A pilot project launched early in the 1980s on GIS Applications for Natural Hazards Management in Latin America and the Caribbean, implemented more than 200 applications in 20 countries of the region, integrating hazards, natural resources, population and infrastructure data. The fact that it was discovered that all of the main airports in Guatemala are located within high intensity seismic areas, or that 670 kilometers of paved routes in Ecuador were located within a 30 kilometre radius of active volcanos, have been instructive, to say the least.

Several initiatives towards comprehensive risk assessments are currently going on in the Pacific islands states. In the Cook Islands, for example, risk assessments related to tropical cyclones and associated flooding have been undertaken. These include both the technical aspects of hazard mapping, vulnerability assessments of building stock, infrastructure, lifelines and critical facilities, and the social aspects of potential economic losses and impacts on communities. The risk assessment information provided input for community early warning systems for tropical cyclones, *ERWIN*, as well as primary information for reports and technical support materials such as: Cook Islands Building Code; Disaster Management Work Plan; National Disaster Management Plan; Cyclone Response Procedures; Tsunami Response Procedures.

Another good example for this region is provided by Fiji, where in recent years, several comprehensive risk assessment projects have been undertaken. These have always involved the relevant government departments and infrastructure agencies, and include representation from NGOs and the private sector. The participation of international agencies and/or consultants which has ensured that

Community risks in Australia

One of the advantages of GIS techniques is the possibility to carry out multi-hazard analysis. Community Risk in Cairns is the first of a series of multi-hazard case studies by the Australian Geological Survey Organization (AGSO). It considers earthquakes, landslides, floods and cyclones.

A report detailing the hazard history of Cairns, the risk assessment methodology and results has been prepared by several researchers and AGSO, in collaboration with Cairns City Council and ERSIS Australia.

The AGSO Cities Project undertakes research towards the mitigation of the risks posed by a range of geo-hazards to Australian urban communities. Extensive use of GIS has been made to drive analysis and assessment. *Risk-GIS*, as it has been christened in the *Cities Project*, is a fusion of the decision support capabilities of GIS and the philosophy of risk management. An interactive online mapping system for Geoscience Australia's Community Risk in Cairns project is available online as well as an advanced mapping system for experienced GIS users.

Source: http://www.agso.gov.au/pdf/UC0001.pdf

back

Bern – risk maps/hazard maps

Since 1998, the canton of Bern, in Switzerland, has had at its disposal a planning tool which indicates potential risk areas. The maps are designed using computer modelling and GIS. The maps are not expensive and allow a complete overview of the canton based on a uniform set of criteria. The risk areas cover approximately 44 per cent of the territory, mostly in non-residential areas. However, about 8 per cent inhabitants are in potential risk zones.

- **Exposed areas**. These are areas, which could potentially be affected by mud flow, avalanches, stone falls and landslides.
- **Vulnerable assets**. These include habitats, railroads, and all roads serving residential areas.
- **Potential impact zones**. The overlap between the exposed areas and the vulnerable assets.
- **Protection forest**. In this particular case, these are forests that play an important protective role for residential areas and communication networks.

One particular hazard is not modelled: risk related to floods, which cause severe social and economic impacts. The type of impact related to floods depends heavily on flows that are too low to be currently modelled satisfactorily.

Legend: (Original in French)

Potential hazards

- Sector exposed to mud flows and other flash floods
- Sector exposed to avalanches
- Sector exposed to stone falls
- Sector exposed to deep landslides
- Sector exposed to average to deep landslides

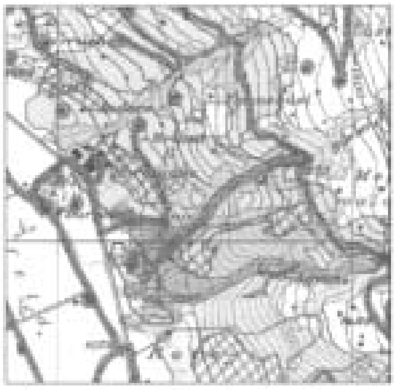
Vulnerable assets

- Residential area
- Main roads
- Access roads
- Railroads

Forest

- Forest with an important protection function
- Forest with a protection function
- Other forests
- Exposed zones represented in a simplified manner

Source: Office des forêts du Canton de Berne, Switzerland, 1999

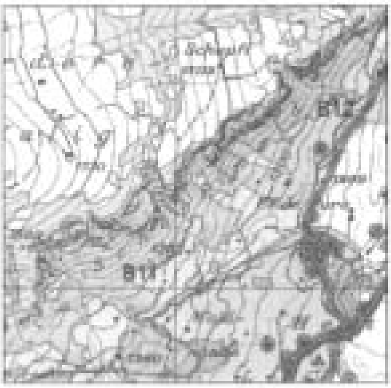


Laves torrentielles et avalanches: zones exposées et biens menacés

Dangers potentiels

Secteur exposé aux laves torrentielles

Secteur exposé aux avalanches



Chutes de pierre, glissements de terrain et dolines: zones exposées et biens menacés

Secteur exposé aux chutes de pierre

Secteur exposé aux glissements de terrain d'une grande profondeur

Secteur exposé aux glissements de terrain d'une profondeur moyenne à grande

Biens menacés

Habitation occupée à l'année

Route cantonale

Accès à une habitation

Ligne de chemin de fer

Dans le canton de Berne, les forêts couvrent environ 1600 kilomètres carrés, dont environ 400 (soit un quart de la superficie totale) ont une fonction directe de protection contre les avalanches, les chutes de pierre, les torrents ou les glissements de terrain.

Forêts

Forêts ayant une fonction protectrice particulièrement importante

Forêts ayant une fonction protectrice (déclivité > 40%)

Autres forêts

Zones exposées représentées de manière simplifiée (contours seulement)

back

up-to-date methodologies and technologies were employed. These risk assessments have also used a multidisciplinary and multi-institutional approach in a proactive manner. Examples of these risk assessments are included in the box below.

Risk assessments undertaken in Fiji have been based on detailed hazard and vulnerability assessments, integrating the scientific geological and meteorological (where applicable) information with information on the built environment (building stock, infrastructure, critical facilities and lifelines) and the natural environment. Modern international methodologies have been employed, including ground surveys, remote sensing and GIS mapping. The results and outputs have had major implications in many practical applications for disaster management, such as in helping to formulate building codes, training of emergency services personnel (for example: Suva Earthquake Risk Scenario Pilot Project, SERMP, for the City of Suva). They have also had regional significance in that these initiatives are being used as the basis of similar studies in other Pacific Island Countries. Examples of these risk assessments are:

- Suva Earthquake Risk Management Scenario Pilot Project (SERMP) Undertaken for the City of Suva (1995-1998) and involved an earthquake and tsunami exercise "SUVEQ 97" (based on SERMP and the devastating 1953 Suva earthquake and associated tsunami), and was included in the activities of the UN IDNDR RADIUS programme (CERA, 1997a, b).
- Taveuni Volcano: Comprehensive study of the potential for an eruption which involved international scientists (consultants) with senior Government officials and infrastructure agencies (Cronin, 1999a, b; Cronin and Kaloumaira, 2000; Cronin and Neall, 2000).
- Flood Mitigation: Comprehensive studies in known flood ravaged areas on the Island of Viti Levu (western, northern and south eastern regions) (Yeo, 2000, 2001).

Methodological challenges

While hazard mapping and physical aspects of vulnerability analysis have been substantially facilitated and improved due to the use of GIS techniques, the inclusion of social, economic and environmental variables into GIS's conceptual models, remains as a major methodological challenge. The need to assign a quantifiable value to the variables analysed into the spatial models used by GIS is not always possible for some social/economic dimensions of vulnerability – for instance, how to quantify the ideological and cultural aspects of vulnerability. Moreover, the diverse scales – individual, family, community, regional – at which different dimensions of socio-economic vulnerability operate, makes the spatial representation through these techniques, very difficult.

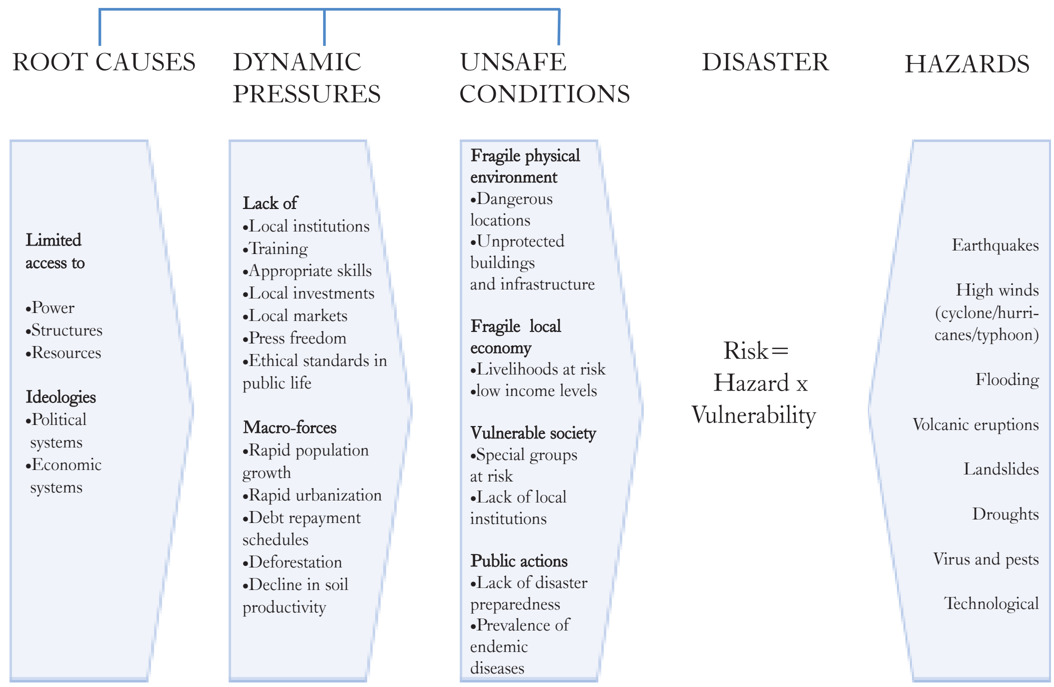
The quality and detail of the information required by the analysis facilitated by GIS is, in many cases, inexistent, especially in LDCs and other developing countries. In general, the quality and availability of statistical data sets limit the information for GIS analysis to low resolution outputs. The use of GIS for vulnerability/capacity analysis is still at an embryonic stage, in comparison with its wide use in hazard mapping. Several research initiatives are aiming to bring solutions to the current methodological constraints, especially the quantification of social aspects of vulnerability. Still, the socio-economic vulnerability assessments rely on more conventional ways, which indeed provide other opportunities and advantages, such as the active involvement of the community at risk in exercises as community based mapping and assessments.

Generally speaking, the physical aspects of vulnerability assessment are tailored from exposure to hazards criteria, providing answers to the questions of what is vulnerable and where is it vulnerable. The attempts to assess socio-economic aspects of vulnerability intend to answer the questions who is vulnerable, and how have they become vulnerable. Attributes of groups and individuals, such as socio-economic class, ethnicity, caste membership, gender, age, physical disability, and religion are amongst the characteristics that have been linked to differential vulnerability to hazards.

The development of models and conceptual frameworks provided a basis for vulnerability analysis in relation to specific hazards. *Pressure and Release*, and *Access* models, presented in the mid 1990s (see diagram), provided a good basis for the analysis and further identification of specific vulnerable conditions. These models linked dynamic processes at different scales, and different access to resources profiles, with vulnerability conditions.

back

THE PROGRESSION OF VULNERABILITY



Adapted from: Blaikie et al., 1994

The validation of proposed models and frameworks for vulnerability analysis have been, in most cases, the information gained by occurrence of the disaster itself. The analysis of the damages experienced in disasters constitutes a major source of information for vulnerability/capacity identification. The damage revealed in disasters provides the empirical evidence of where and for whom potential risks becomes a palpable reality.

As opposed to inductive analysis used in GIS techniques – where the level of risk is induced by integrating layers of information, historical analysis of disaster data provide the information to deduce levels of risk based on past experiences. In addition, historical disaster databases are essential to identify the dynamic aspects involved in vulnerability, providing the criteria to assign relative weights to different dimensions of vulnerability in risk assessment exercises. In this context, the refinement, maintenance and systematic feeding of disaster data sets are vital for risk assessment as a whole. The insurance industry's approach to disaster risk is based on this kind of data. Some of these issues are being addressed by the ISDR Inter-Agency Task Force Working Group 3, on Risk, Vulnerability and Impact Assessment.

Droughts have been proved to be a particularly difficult task for risk assessment, as discussed earlier in this chapter *(see also chapter 5.6, Early Warning Systems)*. Risk assessment tools developed for food security issues provide conceptual inputs as well as primary data, related to vulnerability to droughts. In that regard, the *WFP* and *FAO* work with other UN agencies, national governments, and NGO partners to integrate vulnerability analysis and mapping techniques. Nevertheless, a food security approach is based in a slightly different understanding of risk, where food insecurity is the outcome, and drought is one of the vulnerability factors. The *Global Risk Vulnerability Index*, being produced as part of the *World Vulnerability Report* of UNDP, is engaged in exploring ways to integrate drought data in a comprehensive risk index.

The *Risk Assessment Tools for Diagnosis of Urban Areas against Seismic Disasters, RADIUS*, provides a good example of comprehensive hazard-specific tools that contribute to define

back

ISDR working group on risk, vulnerability and impact assessment (WG3)

Mobilised in 2001 and convened by the office of UNDP's Bureau for Crisis Prevention and Recovery (BCPR) in Geneva, WG3 of teh Inter-agency Task Force on Disaster Reduction consists of over twenty members representing UN agencies, academic institutions, international NGOs and related regional and national bodies world-wide. The role of WG3 has primarily been a forum for dialogue and platform for advocacy, with collaborative activities now underway. Meeting twice annually, WG3 acts as a networking system for members and external participants allowing sharing of information regarding various conceptual models and related methodologies coming out of leading edge work, as well as on the challenges and lessons learned from practical applications in the field.

Playing an advocacy role in keeping with the relevant priorities of ISDR-IATF, WG3 focuses on understanding the needs for effective risk management, particularly from the local and national levels, on small and medium scale disasters and on the socio-economic and environmental risks and associated impact of disasters. Further, WG3 advocates the importance of considering the practical applicability of data, concepts, models and mechanisms for reducing risk as well as the need for continual linking of disaster risk management to development planning and vice versa.
Currently the WG3 is undertaking collective work in key technically-focused areas, including: a) information exchange and documentation; b) indicator, models and data sets for vulnerability indexing; c) tools and best practices for risk, vulnerability at the local and urban level; d) improving disaster impact analysis; and e) an aggregated analysis linking climate and disaster databases.

More information is available under the http://www.unisdr.org/wgroup3.htm.

urban risk scenarios. The IDNDR secretariat launched the RADIUS initiative in 1996. It aimed to promote world-wide activities for reduction of urban seismic risk (see box below).

In the Americas, vulnerability assessment and techniques (VAT) workshops are being held under the auspices of OAS. They provide an opportunity to explore methodological challenges and applicability of risk assessments. The technical information and comments generated by this and similar activities support the hemispheric policy work carried out by the Working Group on Vulnerability Assessments and Indexing (VAI) of the Inter-American Committee for Natural Disaster Reduction, also a member of the ISDR Inter-Agency Task Force.

Participatory vulnerability and capacity assessment methodologies

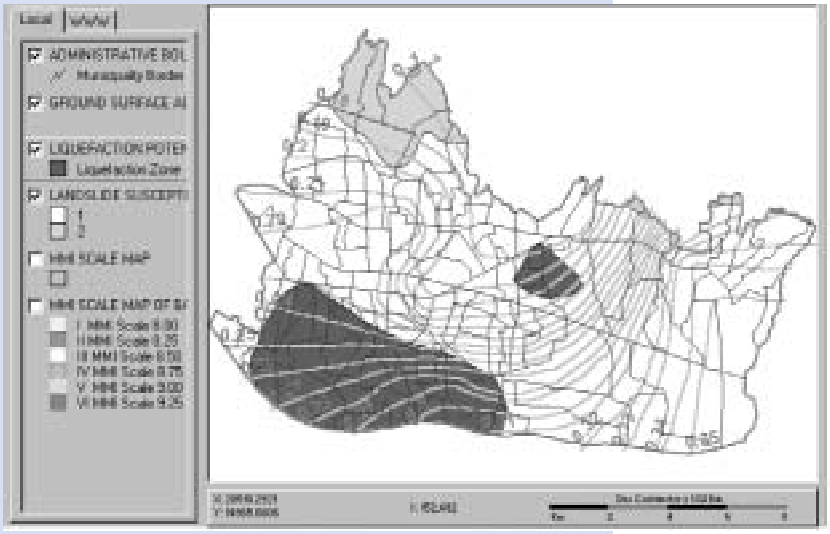
The relationship between vulnerability and capacity has been increasingly expressed in risk assessment methodologies in terms of Vulnerability and Capacities Assessment (VCA). Work has been done to develop, test and validate tools, methodologies and other instruments for factoring in issues related to social inequity, including gender analysis, into risk management at the local level. These aspects include participatory diagnosis, training methods, and a number of analytical frameworks such as the Capabilities and Vulnerabilities Analysis (CVA) which examines peoples strengths and abilities, as well as their susceptibilities, and the Socio-Economic and Gender Analysis (SEAGA), which look at disadvantaged social groups, incorporating

back

The RADIUS Initiative has achieved four main objectives:

- It developed earthquake damage scenarios and actions plans for nine case study cities around the world.
- It produced practical tools for estimation and management of urban seismic risk.
- It raised public awareness of seismic risk among members of society.
- It promoted information exchange for seismic risk mitigation at city level.

The seismic damage scenarios developed for the nine cities describe human loss, damage to buildings and infrastructure, and their effect on urban activities. The following cities participated: Addis Ababa, Ethiopia; Antofagasta, Chile; Bandung, Indonesia; Guayaquil, Ecuador; Izmir, Turkey; Skopje, Macedonia; Tashkent, Uzbekistan; Tijuana Mexico; and Zigong, China. The action plans propose new priorities for urban planning and for improvement of existing urban structures and emergency activities. The experiences of these nine cities were incorporated into a practical manual for damage estimation and guidelines for RADIUS-type projects, applicable to cities anywhere. With the tools, cities can conduct similar projects to estimate earthquake damage, and to prepare a risk management plan on their own. In addition, a comparative study was conducted to develop greater understanding of various aspects contributing to seismic risk, identify solutions and share risk management practices. Over 70 cities worldwide participated in this study on “Understanding Seismic Risk around the World.” More than 30 cities joined RADIUS as associate cities.



Their reports and the developed tools are available on the RADIUS web site http://www.geohaz.org/radius, that functioned as an interactive medium to exchange experiences and information with RADIUS participants and concerned people worldwide.

A recent evaluation of RADIUS found that significant progress has been made in the management of the earthquake risk in RADIUS cities. There has been an important increase of public awareness about the need to reduce urban risk, and new risk management programmes have begun since the project’s completion. According to the analysis, the cities believe that RADIUS contributed significantly to the progress achieved in each city. In several RADIUS cities, new risk management organizations have been created, or existing ones have been restructured, to promote, monitor, and report the implementation of the recommendations produced by the project.

Source:ISDR, Kenji Okazaki, UNCRD

back

them into the development process as effective change agents, rather than only as beneficiaries. *IFRC* has been very proactive in promoting a vulnerability/capacity approach.

VCA is as a key tool used by IFRC for risk analysis. More than 40 exercises have been undertaken by National Red Cross and Red Crescent Societies. Among these is that which was done in Palestine in 2000, which was deemed a success, and enjoyed maximum participation from a wide cross-section of actors. Based on the realisation that this tool is not solely for disaster preparedness; and was more geared at overall capacity building, an interdisciplinary approach (involving health, organizational development, and related programmes within the Red Cross/Red Crescent, and other partners) has been adopted. This has formed the basis for exercises, which will be implemented in 2002 in five North African countries, Mongolia, and other areas in East Asia. The lessons from this new approach will be used in carrying out other exercises in 2003. In order to further develop the mastery of this tool, a Training of Trainers workshop has been developed by IFRC. IFRC published a guide, *Vulnerability and Capacity Assessment*, in 1999 and recently, in collaboration with UNICEF, a report called *A Participatory Action Research Study of Vulnerabilities and Capacities of the Palestine Society in Disaster Preparedness*.

The work carried out by *Ecociudad*, a Peruvian NGO, provides another example of vulnerability/capacity mapping, where communities have had active participation (see Box next page). This local NGO working with environmental management issues related to disaster risk reduction, has supported community based risk-mapping in Caquetá, a quarter of Lima, Peru, and one of the more threatening landscapes found in the neighborhood of Lima, Peru (www.unchs.org/rdmu/).

In 2001, Emergency Management Australia (EMA), under the Government's Attorney-General's Department, in conjunction with a number of related international and national agencies, released the findings of a study on the assessment of personal and community resilience and vulnerability. The need for such an undertaking followed a series of events in Victoria, Australia, the most significant being the January 1997 wild land fires in the Shire of Yarra Ranges on the outskirts of Melbourne, and the June 1998 floods in the Shire of East Gippland. The study outlines exceptionally comprehensive and operationally-oriented guidelines on the concepts and processes of vulnerability and resilience for practical application in community risk assessment. The

Contextual aspects	Analysis of current and predicted demographics. Recent hazard events; economic conditions; political structures and issues; geophysical location; environmental condition; access/distribution of information and traditional knowledge; community involvement; organizations and management capacity; linkages with other regional/national bodies; critical infrastructures and systems
Highly vulnerable social groups	Infants/Children; frail elderly; economically disadvantaged; intellectually, psychologically and physically disabled; single parent families; new immigrants and visitors; socially/physically isolated; seriously ill; poorly sheltered.
Identifying basic social needs/values	Sustaining life; physical and mental well-being; safety and security; home/shelter; food and water; sanitary facilities; social links; information; sustain livelihoods; maintain social values/ethics.
Increasing capacities/reducing vulnerability	Positive economic and social trends; access to productive livelihoods; sound family and social structures; good governance; established networks regionally/nationally; participatory community structures and management; suitable physical and service infrastructures; local plans and arrangements; reserve financial and material resources; shared community values/goals; environmental resilience.
Practical assessment methods	Constructive frameworks; data sources include: local experts, focus groups; census data; surveys questionnaires; outreach programmes; historical records; maps; environmental profiles.

back

Ecociudad - participatory risk-assessment in Peru

Lima is situated along the boundary of two tectonic plates, making it highly prone to earthquakes. An ever-present risk of fires, landslides and flash flooding result in death and destruction every year. These inner-urban risks have been increasing both in their frequency and severity as a result of uncontrolled urban growth from the rapid increase in migration. The experience of Ecociudad highlighted a number of high-risk concerns in the local community:

- Houses located on the banks of a river are exposed to the threat of collapse in the event of a flood or landslide.
- Human settlements are situated in numerous areas prone to landslides and subject to periodic earth tremors.
- Informal markets and more established commercial centres are densely crowded and highly vulnerable to fire.

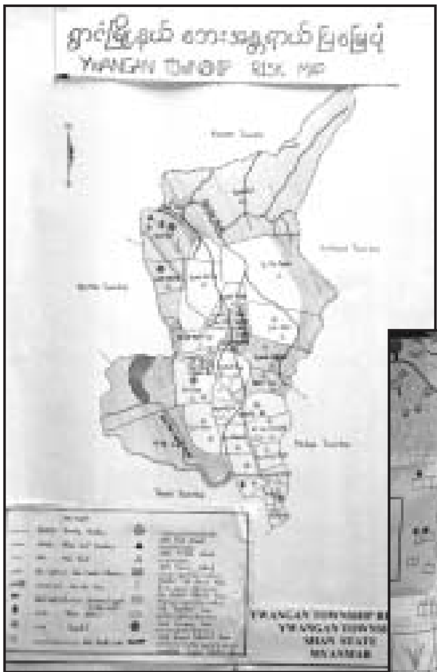
Community meetings were then convened to map the threats, vulnerabilities and capacities based on participation of the inhabitants and their local knowledge. This process has led to the establishment of volunteer brigades specialized in emergency rescue, and the settlements located along the river are currently being relocated by a neighborhood committee working in collaboration with local and central government authorities.

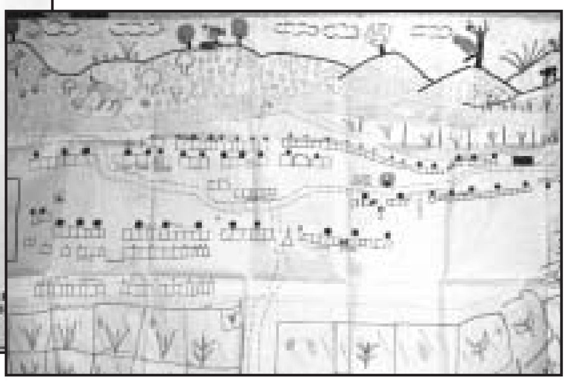
chart below reflects how these guidelines are directed towards ascertaining a high resolution in community risk assessment.

Objective information ascertained from risk analysis has been improved, especially in the identification and monitoring activities involved in hazard assessment. However, some phases in risk assessment remain weak. In particular, incorporating people's risk perceptions, and the socio-economic and environmental contexts where they live, is essential in the identification of risk scenarios. New trends in hazards and vulnerability also challenge the procedures and conventional methodologies, and call for a truly integrated, comprehensive and very dynamic risk assessment.

Preparing risk maps - community tools that build awareness and invite participation.

The winners of the ISDR risk map contest for children and communities in 2001 was the Shree Bal Bikash Secondary School in Kathmandu District, Nepal. Children from Piura, Peru, won the second prize. Many interesting examples were received. These efforts show how risk assessments prepared by people working together can become powerful educational tools to raise the level of public awareness about disaster risks that they all share.





back

Future challenges and priorities

The notions of hazard, vulnerability and capacity form the basis for an effective strategy of risk reduction and the operational basis for a culture of prevention.

The following challenges and priorities are critical areas of concern for the whole disaster reduction enterprise. These are:

- Risk assessments for decision making.
- Terminology, data and methodology.
- Higher visibility and priority to reduce vulnerability and strengthen capacities.
- Addressing new trends in hazard and vulnerability.

Risk assessments for decision making

An overall challenge is to review and document how risk assessments have contributed to modify risk and how they are being utilised in the decision making process.

Terminology, data and methodologies

Data is the primary input for identifying trends in hazards, vulnerability, as well as feeding the risk assessments and disaster impact analysis. For many countries, data relevant for risk analysis are unavailable, or their quality and accuracy do not reflect a comprehensive picture of the situation at hand. There is a need to work towards the standardisation and systemisation of all issues related to the accuracy/technical soundness, political neutrality, methodologies and processes related to the collection, analysis, storage, maintenance and dissemination of data.

In terms of methodologies, there are many different conceptual models attempting to examine the same things. Still, one of the major issues, is how hazards, vulnerability and risk assessments can actually be used, in practice, to reduce risk. Mechanisms of integration are needed so that issues and proposed remedial initiatives are not fragmentary when presented to decision-makers.

Higher visibility and higher priority to reduce vulnerabilities and strengthen capacities

Reducing vulnerability to risk still falls mainly under the responsibility of the public authorities. Data regarding disaster impact, especially concerning small and medium scale disasters and of the social and environmental considerations, is still lacking. Political authorities usually see economic considerations as highly influential in their decision making. Without the quantitative measurement on a realistic and all encompassing picture of risk, it is difficult for political decision-makers to acknowledge and factor in these considerations into their legislative mechanisms and into development planning efforts. Following this, fiscal commitments need be specified in national budgets.

The acknowledgement of capacity, as a key factor in the disaster risk formula, needs to be followed by the further enhancement of a conceptual framework to assess this factor. The incorporation of vulnerability and capacity into tools such as risk indexes, along with clear targets or benchmarks and indicators, will engage the work towards highlighting disaster risk efforts. The Global Risk Vulnerability Index under development by UNDP, as well as the framework to monitor progress on risk reduction, being developed by ISDR, are good examples of current efforts towards that objective.

Addressing new trends in hazards and vulnerability

At this point, recognition and in depth analysis of the changing nature of hazards and vulnerabilities is needed. The influence of ecological imbalances such as climate change is affecting the frequency and intensity of hazardous natural phenomenon. Additionally, environmental degradation is exacerbating the impact of natural hazards. Risk assessments need to reflect the dynamic and complex scenarios to properly feed into disaster risk reduction strategies. Multi-hazards and comprehensive vulnerability/capacity assessments that take into account the changing patterns in disaster risk are departing points for raising risk awareness at all scales. Conventional ways to identify, monitor, evaluate, cope and recover from risks are currently challenged with emergent new trends in hazards and vulnerability.

The emergent trends in hazards and vulnerability described in this chapter accounts for a major and new source of uncertainties to the overall assessment process of disaster risk. These changes affect not only the formal procedures of risk assessment in place, but the prevailing patterns of risk perception too. Particular knowledge or experience capitalised by communities and people, by means of long exposure to classical sources of hazards, have now been challenged by complex and new forms of danger. The repercussions of environmental degradation on current vulnerability and hazard patterns and the increasing exposure to technological hazards, as well as new forms of unprecedented hazards, raise a different range of concerns. An integrated and effective process of risk assessment needs to engage these challenges to truly provide the foundation for disaster risk reduction in the 21st century.