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Disaster Risk Assessment: Methods and tools

This chapter reviews and gives examples of methods and tools that can be used to assess hazards, vulnerability, capacity and disaster risk. It then examines current practice in these areas in Ethiopia. It is emphasized, however, that there is no point carrying out such assessments if they do not lead to action. Depending on the situation, action might take the form of prevention, preparedness, mitigation, emergency response or recovery, rehabilitation and reconstruction. Finally, various approaches to early warning are reviewed and described.

Hazard assessment

A natural or human-made hazard is a process or event that can put a group of people and/or their livelihood assets (human, natural, physical, social and financial resources) into danger if precautionary measures are not taken.

Hazards trigger disasters when they occur in a vulnerable environment - otherwise the hazard phenomenon remains a threat. The objective of hazard assessment is to identify the probability of occurrence of a specific hazard in a specific future time period, as well as its intensity and area of impact.

For example, the assessment of flood hazards is extremely important in the design of engineering facilities and in zoning for land use. Construction of buildings and residences is often restricted in high flood hazard areas. Flood assessments should be developed for the design of sewerage treatment facilities, as well as for sites having industrial materials of a toxic or dangerous nature. 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 assessments can be accomplished using standard computers and widely available software packages. Even without sophisticated assessment tools, it is possible for local communities to collect hazard information.

While hazard mapping has been improved by the wider use of geographic information systems (GIS), the inclusion of social, economic and environmental variables into GIS models remains a major challenge. The need to assign quantifiable values to the variables analyzed in the spatial models used by GIS is not always possible for social and economic dimensions of vulnerability. Moreover, the diverse scales at which different dimensions of socio-economic vulnerability operate make spatial representation very difficult. In addition, the quality and detail of the data required for GIS analyses are, in many cases, non-existent, especially in LDCs. On the other hand, well-conceived low-tech approaches can be a very good alternative to GIS-based techniques. The use of GIS for vulnerability/capacity analysis is still at an embryonic stage in comparison with its wider use in hazard mapping. Several research initiatives are aiming to solve these current methodological constraints, especially those dealing with quantifying social aspects of vulnerability.

Features of disaster related assessments

Factors for successful assessments include the following:

- Effective early warning systems and monitoring for identified hazards should be in place. Contingency planning need also be done for each type of hazard identified.
- Baseline data on socio-economic, socio-cultural and demographic conditions of populations, livelihood systems, historical trends of hazards and disasters, vulnerability and capacity of areas and populations as well as livelihoods for each identified hazards, migration patterns (normal/abnormal), inventory of natural resources and infrastructures need to be collected, analyzed and documented.
- All baseline and early warning data should contain both quantitative and qualitative information aggregated at national level as well as disaggregated at local/micro level and classified by age and gender.
- Community perceptions of risk, disaster, hazard, vulnerability, capacity and wealth status of various community groups should also be documented at the lowest level possible.
- Assessments should combine secondary and primary data collection using various methods. Triangulation of information, sources, and methods at all levels (from national all the way down to community) should be done.

Risk reduction can be externally and 'expert' driven or it can be community-based. Total reliance on either approach, to the exclusion of the other, is a risky strategy in itself! Such approaches run the risk of being overly academic and difficult to apply practically or of being practical without having a sound theoretical basis. The approach demands that people in at-risk communities are actively engaged in the identification, assessment, treatment, monitoring and evaluation of disaster risks in order to reduce their vulnerabilities and enhance their capacities. This means that local people are at the centre of decision-making and implementation of disaster risk management activities.

Any information gathered in the field should be cross-checked, where possible, with secondary data sources: government, publications of other local and international NGOs (INGOs), the Red Cross/Crescent Movement, geological surveys, meteorological data, health records, famine early warning systems (FEWS), International Crisis Group publications, newspapers and academic journals, and others. The involvement of the most vulnerable is paramount and the support of the least vulnerable is necessary. Before any action is taken we should ensure that the assessment has been grounded in the locality; what works in Indonesia does not necessarily work in Ethiopia.

Remote sensing techniques in natural hazard assessments

Remote sensing refers to the process of recording information from sensors mounted either on aircraft or satellites. The technique is applicable to natural hazards management because nearly all geologic, hydrologic and atmospheric phenomena are recurring events or processes that leave evidence of their previous occurrence. Revealing the location of previous occurrences and/or distinguishing the conditions under which they are likely to occur make it possible to identify areas of potential exposure to natural hazards so that timely and effective disaster risk reduction measures can be taken.

Aerial remote sensing is useful in natural hazard management for focusing on priority areas, verifying small-scale data interpretations and providing information about features that are too small for detection by satellite imagery. Among the available airborne systems, the most useful for natural hazard assessments and integrated development planning are aerial photography, airborne radar and thermal infrared (IR) scanners.

Remote sensing from satellites has become increasingly important since the successful launch of Landsat 1 in 1972. It provides the synoptic view required by the broad scale of integrated development planning studies. Given the range of tools available for aerial and satellite remote sensing, their applications vary according to the advantages and limitations of each. Aerial and space remote sensing provide valuable tools for any natural hazard-related vulnerability assessments and studies. They must be combined with ground-collected data but the use of remote sensing methods should minimize the need for ground data, therefore saving time and being relatively inexpensive per unit of data. The combination of remotely-sensed and ground-collected data can then provide the basis for the assessment. GIS, remote sensing and satellite image products in assessments of the major natural hazards in Ethiopia (floods, drought/desertification and earthquake) are briefly discussed in the following paragraphs.

Floods

The most obvious evidence of a major flood potential, outside of historical evidence, is identification of flood plains or flood-prone areas, which are generally recognizable on remote sensing imagery. The most valuable application of remote sensing to flood hazard assessments, then, is in the mapping of areas susceptible to flooding. Satellite sensor coverage of a planning study area is the practical tool for flood plain definition because of cost and time factors. Such mapping may permit the delineation of potentially flood-prone areas where the defined flood level exceeds an acceptable degree of loss. When no floods have occurred during the period of the sensor operation, indirect indicators of flood susceptibility may be used to determine such levels.

But cloud cover or heavy haze will conceal large parts of tropical humid ecosystems from satellite imagery. In some instances heavy tropical vegetation masks many of the geomorphic features so obvious in drier climates. In this case the use of available radar imagery from space or previously acquired from an aircraft survey is desirable. Radar imagery can satisfactorily penetrate the cloudy sky and define many flood plain features. Moisture on the ground noticeably affects the radar return and together with the textural variations emphasized by the sensor makes radar a suitable alternative for flood and flood plain mapping.

Desertification and drought

Both space-borne and airborne remote sensing provide valuable tools for evaluating areas subject to desertification. Film transparencies, photographs and digital data can be used to locate, assess and monitor the deterioration of natural conditions in a given area. Information about these conditions can be obtained from direct measurements or inferred from indicators. Large-scale aerial photography provides considerable detail for desertification studies. Radar sensors and IR scanners may be used to monitor soil moisture and other desertification indicators. However, acquisition of this type of data is costly and time-consuming. The use of satellite imagery is recommended during the first stages of a detailed desertification study, since it offers an overview of the entire region.

Indication of potential drought events and conditions can also be predicted with a fair amount of certainty using other specialized satellite imageries that depict information on rainfall estimates (RFE images), vegetation conditions (Normalized Difference Vegetation Index (NDVI) images) and seasonal water sufficiency for crops (Water Requirements Satisfaction Index (WRSI) images). RFE images are useful in detecting hydrological droughts, NDVI imagery is relevant for indicating possibility of drought in pastoral areas and WRSI images are useful for agricultural droughts. For all natural-hazard-related studies, the data from aerial and space remote sensing must be combined with data collected on the ground: together, these can provide the basis for good assessments.

Components of hazard assessment

Hazard assessment is a matter of identifying, profiling, ranking or measuring and mapping hazards.

Hazard identification: A good starting point is to simply list all the potential hazards, natural or human-made, that are likely to occur in an area within a given time-frame. This can be accomplished at community or even household level using a variety of PRA techniques:

- semi-structured interviews
- group hazard identification technique
- transect walks with key informants

- community mapping of topography, houses, land use, etc
- historical profiling
- seasonal calendars.

Social and gender assessment should be an integral part of all these techniques.

In parts of Ethiopia the hazards identified might read something like: floods, drought, malaria, HIV/AIDS and conflict. This assessment should be grounded in the locality. Local sources can be checked against national and, more importantly, regional statistics.

Example 1 – A group technique for hazard identification

Hazard identification can be undertaken by a group of people representative of the community. The selection of the group should take gender, age and vulnerability into consideration. The group members should have a commitment to the safety of their community.

This is a quick method to identify what hazards exist in a particular area. Using this technique the pitfalls of 'groupthink' can be avoided. Groupthink is a phenomenon that can occur in highly cohesive groups - to minimize conflict, the members of the group concur and restrict their thinking to the norms of the group. No-one wishes to be seen as out of place. This can limit the range of ideas and views that the group could otherwise generate.

Each person in the group should be asked to write down the five hazards (in their area) that most concern them. Each person should then say what he or she has written down and answers should be recorded on a blackboard, whiteboard or large sheet of paper. Duplications should be recorded by placing an 'x' beside that hazard. If very similar hazards are mentioned, group members should refine what they mean and if necessary group similar hazards together to keep the number manageable. Suggestions must not be belittled, but recorded uncritically. When you have a full list of hazards, select the five that have been selected by the most people. These are the five local hazards that you will now go on to profile and rank.

The group identification technique has several benefits:

- It allows everyone to have their say and avoids some of the problems of groupthink. If everyone is allowed to contribute, the likelihood of developing a meaningful list of hazards is greater.
- It encourages interaction between people who may not know each other very well.
- It demonstrates to the group that people have different views concerning hazards.
- It increases members' commitment to the overall risk assessment because they have been involved from the start of the process.

Hazard profiling and ranking (describing and measuring): Once we have a complete list of potential hazards in a locality, each hazard can be described and measured according to certain characteristics, such as:

- causes
- direct impact (at this stage the immediate impact on the environment rather than the longer - term impact on people's lives)
- intensity
- frequency

- seasonality
- location
- history and trends
- predictability and controllability.

You can work with the community group and develop a table, like the one in Example 2, for each of the five hazards identified. Example 2 describes and measures the flood hazard in a particular area. If HIV/AIDS and drought have also been identified as hazards then a table should be developed for these hazards as well. For each characteristic, the hazard is rated in terms of its seriousness: high, medium or low.

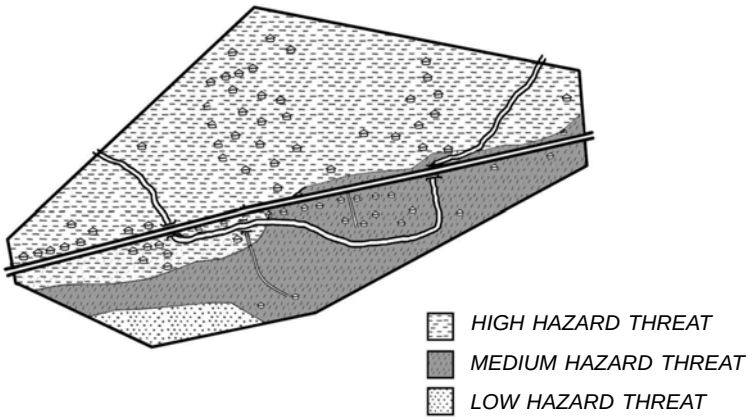
At the end of the process, we have the community's priority ranking of the main hazards in their area. Assuming that flood is one of the five most important hazards identified, we will look at the process of describing and measuring the flood hazard. The same process would be repeated for the other four hazards that came out of the identification phase.

Example 2 - Hazard ranking, scoring and mapping **Hazard Name:** ***(e.g. Floods)***	
Causes	de-forestation poor land use policies large refugee camp established 4-years ago with huge fuel wood demands men's seasonal migration has resulted in neglect of river bank maintenance seasonal tropical rains
Direct impact (of the hazard on the local environment)	flooding makes the road to the market impassable cultivated land becomes water-logged inhabited areas are subjected to flooding
Criteria for ranking	**RANKING ORDER IS LOW (1), MEDIUM (2) OR HIGH (3)**
1. Intensity	1. *Not severe* 2. *Severe* 3. *Very severe*
2. Seasonality	1. *During long rains* 2. *During long and short rains* 3. *During long and short rains and flash floods at other times of year*
3. Frequency	1. *Last very severe floods in 1997 and 1981 so approx every 15 years* 2. *Every two years* 3. *Twice a year in both rainy seasons*
4. Location	1. *Approx 30 metres either side of river* 2. *Within the one metre contour above river level on either side of river (up to 100 metres)* 3. *Extensively alongside river up to 5 metres contour line above river height*
5. History and trends	1. *Repeating cyclically* 2. *Has Increased since the refugee camp was established* 3. *Increasing since refugee camp was established and the pace of increase is going up*

The table above is summarized and scored in the table below. Based on the criteria, the hazards can be classified as low (score 1), medium (score 2) or high (score 3). Total the scores and divide by the number of criteria on which you were able to score the hazard. In this example:

Floods		
CRITERIA	**SCORE**	**REMARKS**
Intensity	**2**	Severe
Seasonality	**2**	During long and short rains
Frequency	**3**	Twice a year in both rainy seasons
Location	**3**	Extensively alongside river up to 5 metres contour line above river height
History and trends	**2**	Has increased since refugee camp was established
TOTAL	**12 / 5 = 2.4**	**Between medium and high classification**

Hazard mapping: The flood hazard can then be mapped with high, medium and low hazard locations within the community assigned different shading to show their comparative threat (see example). Hazard mapping is most useful when conducted at local level. It can be, and where possible should be, complemented by technical studies but if these contradict local knowledge priority should be given to the latter. Ideally you should use a map but if maps are not available you can use a drawing of the locality instead of a map.



Survey methods and RAP/PRA techniques to assess hazards: There are also non-GIS methods (ground-level hazard assessment tools) that can be used to identify main hazards for a given community. The methods include, among others:

- trend/historical analysis of hazards
- desk/literature review of the occurrence, frequency and magnitude of various hazards in a country/community

- studies on various communities about their perception and experience about hazards using PRA, RRA or PPA
- community historical profile, historical visualization, seasonal calendar, hazard/risk mapping, transect walk, ranking and scoring matrix, and problem tree analysis are also additional tools that can be used at lower/community level.

Summary of potential methods/tools to assess hazards

Drought: GIS applications and satellite image analysis, remote sensing, historical trend analysis and mapping of drought-prone areas and identification of areas at risk (chronically moisture stressed areas).

Flood: GIS applications and satellite image analysis, remote sensing, historical trend analysis and mapping of flood-prone areas and identification of areas at risk.

Conflict: Community historical profile, historical visualization, seasonal calendar, hazard/risk mapping, transect walk, ranking and scoring matrix, problem trees, conflict timeline, problem/solution analysis.

HIV/AIDS: Knowledge attitude practice (KAP) surveys, demographic and health surveys (DHS), PRA techniques, community historical profile, historical visualization.

Malaria: KAP surveys, DHS, PRA techniques, community historical profile, historical visualization, seasonal calendar, hazard/risk mapping, transect walk, ranking and scoring matrix, problem trees.

Vulnerability and capacity assessment

In recent years, there has been an apparent concentration of efforts by both academics and practitioners to understand the complex nature of social vulnerability and capacity. In certain respects, this has been in response to the perceived imbalance of focus of attention on physical vulnerabilities and a neglect of analysis of the social, economic and political factors that so often drive vulnerability. The increased attention to the social dimensions of risk assessment is contributing to a better identification of specific vulnerable groups or individuals, as well as an improved analysis of the socio-economic conditions that create vulnerability.

A broad consensus has also emerged within the disaster and development communities that it is essential to consider an assessment of vulnerability in parallel to a measurement of capacity in all sectors. The use of the concept of capacity emerged in response to the negativity of the term vulnerability – to speak of people as being vulnerable was to treat them as passive victims and ignore the many capacities, resources and assets people possess to resist, cope with and recover from disaster shocks they experience.

This distinction between vulnerability and capacity has been criticized by certain authors as being unnecessary, since the term 'vulnerability' is often used as a composite expression to describe both negative as well as positive elements. However, capacity and vulnerability cannot always be considered as two ends of a spectrum. Some capacities are not the opposite of vulnerabilities and certain low-level vulnerability characteristics do not figure on the higher scale of the capacities.

Capacity and vulnerability

For the sake of clarity, we propose to include all the resources and capabilities of communities under the term 'capacity' and to restrict the term 'vulnerability' to factors that contribute to putting people at risk.

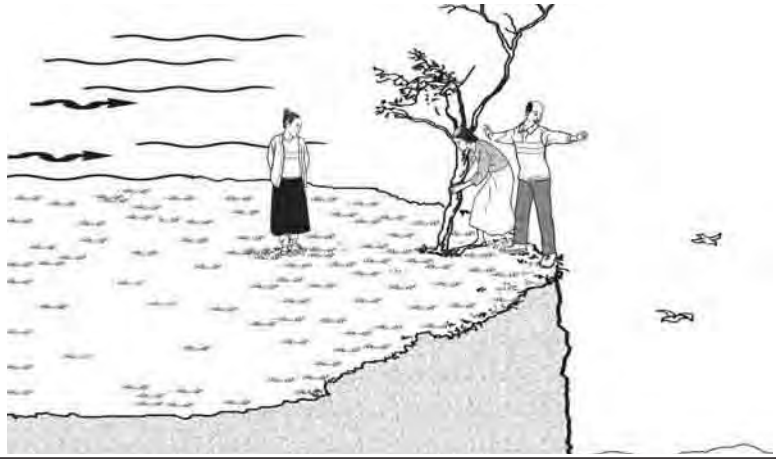
Vulnerability can be defined as the exposure of areas, populations, institutions and livelihoods to the likelihood of damage by any type of hazard. Communities living in hazard-prone areas may be made susceptible to negative impacts of the hazard by conditions determined by physical factors, such as locations and nature of buildings, weak social organization, limited economic opportunities, political processes and other factors within the local environment. From a livelihood perspective, vulnerability refers to the probability that livelihood stress will occur – with more stress or a higher probability implying increased vulnerability. This focus of the livelihoods approach – how resources can be managed in a sustainable manner to increase the mean levels of wellbeing – is consistent with the notion of vulnerability as a forward-looking state.

Capacity is the ability of vulnerable areas, populations, institutions and livelihoods to resist and recover from the negative impacts of hazards. Disasters can happen in any society, but often have greater impact on poor communities because their members have less or no capacity to prevent, respond to and recover from disasters. Capacities refer to material, attitudinal, cultural and spiritual strengths that exist within the community, which can be used to mitigate, prepare for and cope with damaging effects of hazards or to recover from a disaster. Capacities are those positive conditions and resources which increase the ability of a community to deal with hazards and risks.

Not all people, or different segments of the population in a community, are equally vulnerable. Vulnerability can vary according to sex, age, wealth, settlement pattern, place of work, and other factors.

Vulnerability: Example 1

Imagine three people standing near a steep cliff. Two of them are standing on the very edge of the cliff but one of them, having previous knowledge of wind accidents, is holding onto a tree. The third person is standing well away from the edge. If a strong wind suddenly blows, the two people who are at the edge of the cliff are obviously more exposed to the risk of falling than the one far away from the edge. Even among the two who are standing at the edge, the one holding a tree has better protection. This is an example how the same hazard (strong wind) can affect different people differently. The man on the edge is most vulnerable to disaster and is most likely to fall when the wind blows. The woman standing near the edge is also vulnerable but as she is holding on to the tree she has some capacity to resist. The woman standing back from the cliff is least vulnerable to the hazard and least likely to experience the disaster.

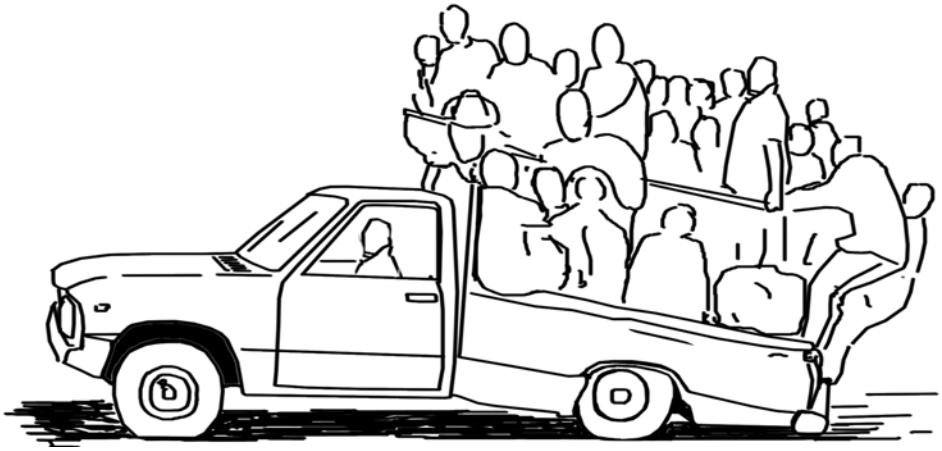


Vulnerability: Example 2

Imagine a pick-up truck with the driver sitting in the cab wearing a seat belt and another 20 men and women squeezed into the back. The truck is in bad mechanical condition and the roads are poor. There is a chance that the pick-up may have an accident: the brakes may fail and the truck may veer off the road and hit a tree. The collision with the tree is the hazard.

The driver in the front and the people in the back face the same hazard event. However, the people in the back are more vulnerable. They will probably be thrown out and could be crushed by the vehicle. The driver has a seat belt on and the cab all around him; he has more capacity to resist the affects of the hazard.

The lesson: it is not sufficient to just look at hazards. We must also look at vulnerability to these hazards and capacity to resist the effects. Only then we can analyze real risk.



Both the driver and the passengers in the back face the same hazards but the risk is different!

A diverse range of vulnerability and capacity assessment tools have been developed and field tested, mainly by NGOs and community-based organizations, with a particular emphasis on participatory and people-oriented approaches. Indeed, the influence of social development methodologies, such as PRA techniques, is very much evident in vulnerability and capacity assessment (VCA). Examples include:

- IFRC's VCA toolkit which has been used for assessing both the capacities and vulnerabilities of the communities in which the Red Cross/Crescent works, as well as the organizational capacities and vulnerabilities of their member National Societies
- OXFAM's Participatory Capacities and Vulnerabilities Assessment (PCVA) tool
- Action Aid's Participatory Vulnerability Analysis (PVA)
- CARE's Household Livelihood Security Assessment toolkit
- Save the Children UK's (SC UK) Household Economy Approach (HEA) assessment guidelines and tools.

Socio-economic vulnerability assessments rely on more conventional methods, which provide other opportunities and advantages, such as the active involvement of the communities at-risk in mapping and assessment exercises. The physical aspects of vulnerability assessment answer the questions: what is vulnerable and where is it vulnerable? Socio-economic aspects of vulnerability 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 among the characteristics that differentiate vulnerability to hazards.

As opposed to the inductive analysis used in GIS techniques – where level of risk is induced by integrating layers of information – a historical analysis of disaster data provides 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 datasets are vital for vulnerability assessment as a whole.

However, despite this growing recognition of the importance and potential benefits of VCA, the methodologies and standard practices are not systematically factored into the main risk assessment process. One reason is that the data concerning the different assessment methodologies have not been compiled, compared and analyzed. Another reason is the lack of knowledge of their relative accuracy, effectiveness and quality. These important constraints can only be addressed by comparative analysis, interdisciplinary research and, above all, the sharing of knowledge, learning and experience between the communities of actors involved in VCA.

Purpose of VCA

The primary purpose of an overall vulnerability and capacity analysis is its use as a diagnostic tool to provide analytical data to support better informed decisions on the planning and implementation of risk reduction measures. An effective VCA will contribute to greater understanding of the nature and level of risks that vulnerable people face: where these risks come from; who will be the worst affected; what means are available at all levels to reduce the risks; and what initiatives can be undertaken to reduce the vulnerability and strengthen the capacities of people at risk. VCA tools are used to identify and measure levels of risk for use in decision making on ways to achieve safe conditions. In addition, VCA has many uses beyond the risk/disaster context; assessments can provide vital data to communities and governments that contribute valuable assistance in social planning and resource allocation.

The objective of a social VCA is to identify specific vulnerable groups/individuals, based on key social characteristics such as gender, age, health status, disability, ethnicity and so forth. The process also includes an analysis of patterns of density, livelihood security and occupational activities that increase the vulnerability of certain households and communities. Capacity assessment aims at identifying a wide diversity of resources: community coping strategies, local leadership and institutions, existing social capital which may contribute to risk reduction efforts, skills, labour, community facilities, preparedness stocks, a local evacuation plan, and so on. An additional and often overlooked aspect of participatory risk assessment is the local perception of risk which can play a key role in determining risk and community prioritization of mitigation measures.

Scale of VCA

Vulnerability, by its nature, is always 'area specific'. While hazards may be mapped at an international, regional or national scale, vulnerabilities are localized. VCAs have therefore to be confined to a specific community, village or town and may not be easily applicable in the context of the complexities of a large metropolitan area or a nation, unless it is a tiny state such as a small island country. The principle is that the smaller the scale of concern, the more accurate and the greater the value of the exercise. Where there is a demand for large-scale VCA, this requires the problem to be disaggregated to small measurable units, recognizing that vulnerability is best assessed at small-scale, localized levels where subtle variables can be identified and measured.

Participatory approach

It is important to emphasize that the process of VCA may be of equal long-term importance as the tools that are adopted. The process is one of participatory partnership and active long-term engagement with communities in defining their problems and opportunities. It is also a therapeutic process of self-analysis and

self-discovery by a community of its latent strengths that will build collective self-confidence. The participation of vulnerable groups in the planning, implementation and analysis components is an essential feature of any VCA. Active participation will provide more reliable and qualitative understanding of the vulnerabilities and capacities of the groups concerned. Communities generally understand local realities and contexts better than outsiders. If at-risk groups are involved in all stages of the VCA process, a stronger foundation will be created for the development of sustainable programmes for risk reduction. Participatory techniques for data collection and analysis, such as PRA and RRA, are therefore considered to be appropriate tools for conducting a VCA. In this regard, VCA is both a process and an assessment tool.

Tools and methods used to conduct VCA

The tools used for participatory data gathering rely heavily on PRA and RRA techniques to identify vulnerable areas, populations and their livelihoods and capacities. Potentially useful tools and approaches include the following, although users need to select the most relevant from this list for their specific situation:

- secondary data review (Civil Society Index (CSI), KAP, other survey results, GIS analysis results, early warning information and other relevant baseline data)
- consensus panels
- semi-structured interviews (group interview, focus group discussion, individual interview, key-informant interview)
- story telling and drawings
- using drawing to elicit verbal information from the artist's audience
- direct observation and transect walks
- spatial, hazard/risk and capacity/resource/social mapping
- wealth ranking
- role plays
- institutional and social network analysis, capacity analysis of people's organization
- daily time-use charts and seasonal calendars
- historic profiles, event calendar, and historical visualization
- livelihood/coping strategies analysis
- gender analysis
- problem trees, ranking/scoring matrix
- conflict timeline analysis
- problem/solution matrix
- livelihood analysis

- household economy approach
- triangulation of tools, sources and information.

In this section we are trying to make a link between impacts of hazards on lives and livelihoods and peoples vulnerability and capacity so that we can address vulnerabilities and enhance capacities.

Hazards tend to have multiple impacts and the magnitude of the impact is related to the specific vulnerability of a locality, a household or an individual and their capacity. In the previous section we have identified hazards, profiled them and ranked them. The vulnerability, and conversely the capacity, of an individual, a household or a locality are to be found in the broad context of all their assets as identified in the livelihoods framework. This framework looks at a person's wellbeing in terms of the totality of their assets – human, physical, social, political, financial and natural.

DFID's definition of sustainable livelihoods is commonly used: *"A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from shocks and stresses and maintain and enhance its capabilities and assets both now and in the future, whilst not undermining the natural resource base."*

The next step is to assess vulnerability and capacity in relation to each hazard. If many hazards have been identified and time is an issue, one possibility is to select two or three of the hazards falling into the 'high' category (scored 3). However, at a minimum two vulnerability analyses should be conducted for comparative purposes. As for hazard assessment, the vulnerability assessment should be conducted as close to the local level as possible and in practice should be conducted in localities, preferably by local residents themselves.

Vulnerability/capacity classification (adapted from the livelihoods framework)

As we try to make a link between impacts of hazards on lives and livelihoods and people's vulnerability and capacity, we will use the same flooding example (Example 2, above) that we used when doing the hazard assessment. We have identified three major impacts of flooding in the locality:

1. Flooding makes the road to the market impassable
2. Cultivated land becomes water logged
3. Inhabited areas are subjected to flooding.

In this example we will look at the first impact, *flooding makes the road to market impassable.* We are now using it for illustrative purposes to demonstrate how an adaptation of the livelihoods framework can feed into vulnerability and capacity assessment.

Example 2 (continued)

Assessing vulnerability / capacity: The hazard is flooding. The major impact being measured is the impassable road
Classification system is: 1 = Capacity evident, low level vulnerability 2 = Some capacity, medium level vulnerability 3 = Little capacity, high level vulnerability 4 = No capacity, extreme level vulnerability

Human Assets: 1. Because of seasonal male migration looking for work there is a shortage of male labour available in the village to maintain the culverts and ditches 2. Because of the male migration there is little male labour available 3. Because of the male migration there is no male labour available 4. Because of the male migration and women tied up looking after children and those with HIV/AIDS there is no male or female labour available
Physical Assets: 1. The road passes through some low lying ground at one specific point but this can be bridged. 2. The road passes through low lying ground at a number of points most of which can be bridged. 3. Many parts of the road are on low lying ground. Bridging is extremely difficult 4. Most of the road is below the river level and prone to flooding. Bridging impossible
Social Assets: 1. Only a small number of people within the community are prepared to take responsibility for repair and maintenance of the road. 2. Only a small number of people within the community are prepared to take responsibility for repairing the road but nobody takes responsibility for maintaining it. 3. It is not clear who within the community who responsible for the repair and maintenance of the road. 4. There is no sense of responsibility within the community for the repair and maintenance of the road
Political Assets: 1. There is some influence with the National Roads Authority. 2. There is limited influence with the National Roads Authority 3. There is contact but no real influence with the National Roads Authority 4. No one in the village has contact or influence with the National Roads Authority
Financial: 1. There is money within the community to pay for road repair and maintenance. 2. There is some money within the community for roads 3. There is limited money within the community for roads. 4. There is no money within the community to pay for road repairs or maintenance
Natural: 1. Cutting of trees for firewood for the refugee camp has stopped. However trees cut have resulted in the floods causing some additional damage to the road. 2. Some cutting of trees continues causing some further additional damage. 3. Widespread cutting of trees causing serious damage to the road. 4. Complete deforestation of the hillside has cause major flooding damage to the road.

So, 1 represents a score where some capacity is evident and there are low levels of vulnerability and 4 represents a score where no capacity is evident and there are extreme levels of vulnerability.

Assessing vulnerability: The hazard is flooding. The major impact being measured is the impassable road		
CRITERIA	**SCORE**	**REMARKS**
Human Assets	3	Because of the male migration there is no male labour available
Physical Assets	4	Most of the road is below the river level and prone to flooding. Bridging impossible
Social Assets	4	No sense of responsibility within the community for the repair and maintenance of the road
Political Assets	3	There is contact but no real influence with the National Roads Authority
Financial Assets	4	No money within the community to pay for road repairs or maintenance
Natural Assets	3	Widespread cutting of trees causing serious damage to the road.
TOTAL	**21/6=3.5**	**Little or no capacity + high to extreme level vulnerability**

Vulnerability assessment highlights the different ways in which localities, households and individuals will be affected by the same hazard. Mapping that vulnerability gives a pictorial representation of the situation and can assist in prioritizing those areas which will need help first in the event of a disaster; this in turn is of enormous importance in terms of contingency planning. The ability to prioritize will help in the effective and efficient use of scarce resources by focusing them where they are most needed. Local resources and capacities should always be taken into account when conducting the vulnerability assessment.

Summary of potential methods/tools to assess vulnerability

Drought-induced disaster: wealth ranking, seasonal calendar, historical visualization, risk mapping, ranking and scoring matrix, transect walk, social mapping, livelihood/coping strategies analysis, satellite images such as RFE, NDVI and WRSI.

Flood-induced disaster: wealth ranking, seasonal calendar, historical visualization, risk mapping, ranking and scoring matrix, transect walk, social mapping, livelihood/coping strategies analysis.

Conflict-induced disaster: wealth ranking, seasonal calendar, historical visualization, risk mapping, ranking and scoring matrix, transect walk, social mapping, livelihood/coping strategies analysis.

HIV/AIDS-induced disaster: wealth ranking, seasonal calendar, historical visualization, risk mapping, ranking and scoring matrix, transect walk, social mapping, livelihood/coping strategies analysis, HIV/AIDS prevalence studies, clinical data.

Malaria-induced disaster: wealth ranking, seasonal calendar, historical visualization, risk mapping, ranking and scoring matrix, transect walk, social mapping, livelihood/coping strategies analysis, malaria prevalence surveys, clinical information.

Summary of potential methods/tools to assess capacity

Drought-induced disaster: HEA, SLA, EFSA, EcoSec Assessment, CSI, PRA/RRA

Flood-induced disaster: HEA, SLA, EFSA, EcoSec Assessment, CSI, PRA/RRA

Conflict-induced disaster: HEA, SLA, EFSA, CSI, PRA/RRA, conflict impact assessment

HIV/AIDS-induced disaster: CSI, DHS, KAP Surveys, PRA/RRA, etc

Malaria-induced disaster: CSI, DHS, KAP Surveys, PRA/RRA, seasonal calendar, community capacity/resource mapping

The effectiveness and relevance of the tools will differ according to the local context and hazard concerned.

Who should undertake VCA?

A recurring constraint to the implementation of VCAs is the observation of government officials and international NGOs that they do not have sufficient trained staff to undertake assessments or to analyze them. This lack of qualified assessors has seriously hampered the development of social vulnerability and capacity assessment over the last decade. A possible solution to this constraint is to seek to 'de-professionalize' the assessment process through the use of skilled and experienced persons who can be found in most communities. These can include community leaders, local teachers, agricultural extensionists, religious leaders, midwives and civil society groups. However, community involvement does not remove the need for expertise and leadership: experienced professionals will need to train local assessors and develop good assessment checklists as well as templates for assessment. Clearly, a critical challenge for many organizations active in VCA is the availability of these experienced assessors and how to de-professionalize the assessment process.

Who can use VCA data?

In principle, all stakeholders involved in the risk assessments and risk reduction processes can make use of the data obtained from a vulnerability and capacity assessment. These include:

- development/disaster planners and managers
- emergency management staff
- communities at-risk
- professional groups: engineers, geologists, architects, sociologists
- economists
- NGO staff
- political leaders
- academic bodies

- private sector actors.

However, in practice VCA data is not always made readily available, often because of political implications for local or national authorities or because of the organizational interests of those who carry out the assessments. It is essential, however, to be totally transparent in the management of the risk assessment process; those at risk need to be made aware of risk information.

Linking VCA and livelihoods

The level of vulnerability of a household or individual is determined by how weak or strong their livelihoods are, what occupational activities they are engaged in, how good their access is to a range of assets that provide the basis for their livelihood strategy and how useful their social capital and different institutions are in providing social protection.

Although the key components of the livelihoods approach are present in vulnerability and capacity assessment practice, the sustainable livelihood terminology and approach is not yet very widely integrated in the context of community risk assessment.

In investigating capacities within a VCA, particular emphasis is needed to establish the threats to sustainable livelihoods, as well as the converse - the security of livelihoods. This requires identification, measurement and understanding of the 'coping value' of the five categories of 'capital':

- human (skills, knowledge, etc)
- social (networks, institutions and supporting mechanisms)
- physical (infrastructure, technology, equipment, etc)
- financial (savings and credit)
- natural (natural resources including land and water).

The links between the VCA process and the assessment tools need to identify and measure these five forms of capital.

Integrating VCA with other assessments

As the above point on livelihoods highlights, the social dimension of VCA does not exist in a vacuum. Ideally it needs to be integrated with other risk assessment processes:

Integration of VCA with physical, economic and environmental assessment: VCA has been particularly used to assess social factors of vulnerability, but it can be usefully extended to cover all key sectors. Social VCA is only one element in the overall process of vulnerability assessment that needs to include a wider range of concerns such as:

- physical (buildings, infrastructure, critical facilities)

- economic (livelihoods, economic assets, businesses, commercial and industrial sectors)
- environmental (forestry, agriculture, livestock, fisheries, ecosystems).

A multi- and inter-disciplinary approach is therefore essential in order to merge social, technical, economic and environmental data. When integrating data from different sectors, close attention has to be given to the accuracy and consistency of data as they are often collected by assessment teams using different survey techniques.

Integration of VCA with multiple threats assessment: In societies faced with multiple threats to lives and livelihoods (such as HIV/AIDS, conflict and climate change), VCA has to become a fully integrated process that addresses all threats. These threats are often interrelated, for example HIV/AIDS leading to reduced resilience to the threat of drought. This suggests that only an integrated approach dealing in a comprehensive manner with multiple risks to human security will be able to provide adequate protection to lives and livelihoods.

Integration between pre-disaster VCA with post-disaster damage and needs assessment: In too many instances, different groups conduct pre- and post-disaster assessments. This artificial separation is unfortunate and wastes vital knowledge and effort. There are major benefits in the full integration of VCA undertaken pre-disaster with post-disaster damage and needs assessments. Clearly the assessments of damage and social needs after disaster represent a far more accurate measurement of vulnerability and resources than any predictive assessment. In addition, the data from VCA concerning risks as well as resources collected before a disaster can be of decisive value in the conduct of an effective disaster relief operation. However, it is essential for damage and needs assessment data to be used with caution and discretion in relation to the assessment of vulnerability of affected regions of a given country: both pre- and post-disaster assessments need to be under integrated management.

Connecting VCA to disaster risk reduction strategies and planning

From a disaster management perspective, VCA needs to become part of the disaster planning process. In theory, a VCA contributes essential data for action planning that leads into the implementation of risk reduction measures. When VCA is conducted without the expectation of disaster planning or the creation of safety measures it raises local expectations that cannot be fulfilled, with consequent long-term community damage.

Disaster risk assessment

> ***Disaster risk*** *is the likelihood of vulnerable areas, populations and livelihoods to suffer from the negative impacts of hazards depending on their capacity to resist.*

A more uniform and widely used definition of disaster risk is the probability of harmful consequences or expected losses (deaths, injuries, damage to property and livelihoods, disruption of economic activities and environmental destruction) resulting from interactions between natural and human-induced hazards, vulnerabilities and capacities. In other words, disaster risk can be seen as a function of hazard, vulnerability and capacity and can be expressed as a mathematical relationship:

DISASTER RISK = (HAZARD x VULNERABILITY) / CAPACITY

Disaster risk assessment is a methodology to determine the nature and extent of risk by analyzing potential hazards and evaluating existing conditions of vulnerability and capacity 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 understanding of risk, its physical, social, economic and environmental factors and consequences. It is a necessary first step for any serious consideration of disaster reduction strategies. 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 generally includes:

- identifying the nature, location, intensity and probability of a threat
- determining the existence and degree of vulnerabilities and exposure to those threats
- identifying the capacities and resources available to address or manage threats
- determining acceptable levels of risk.

The identification of hazards is usually the starting point for a systematic assessment of risk.

Both hazard and vulnerability/capacity assessments utilize formal procedures that include collection of primary data, monitoring of hazard and vulnerability factors, data processing, mapping and social survey techniques. 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 the ideas and perceptions of communities on the risks they are exposed to.

The increasing use of computer-assisted techniques, such as GIS, may widen the breach between the information produced by technical risk assessments and the understanding of risk by communities. Therefore, acceptable levels of risk may vary according to the relative views on objective risk versus perceived risk.

In the case of hazard assessment, where technical means are often employed for monitoring and storing data of geological and atmospheric conditions, the assessment activities typically involve scientific specialists. By contrast, vulnerability/capacity assessments make use of methods such as community-based mapping techniques in which the at-risk community should also play an active role.

Beyond these particularities, hazard and vulnerability/capacity assessments follow a set of procedures that are generally conveyed by the concept of risk analysis. Risk analysis constitutes a core element of the whole risk assessment process of providing relatively objective and technical information from which levels of risk can be projected. The information produced by technical risk analysis allows for the determination of impartial government policy, resources needed for disaster preparedness and insurance schemes. In proceeding from the estimated levels of risk to the establishment of acceptable levels of risk, a different range of value judgments is usually taken into account. Socio-economic cost/benefit analyses can highlight priorities that help calculate acceptable levels of risk. These will depend largely on combined government and community priorities, interests and capacities, ideally advanced through dialogue.

Managing risk is a matter of reducing the frequency of an event happening or reducing vulnerability to its impact. The flip-side of reducing vulnerability is increasing capacity. The previous two sections have given us the essential elements to classify and map risk and thus prioritize and take action.

Risk classification

In Example 1, we classified the hazard of flooding in the following matrix and came up with a ranking of 2.4. For key to shading see maps on page 120-122:

Matrix for classifying hazard

Number	Level	Shading
1	Low	
2	Medium	
3	High	

We identified the road to market as being a major impact of the flooding and we assessed the vulnerability of the households in the locality to that impact using a livelihoods type framework and came up with a ranking of 3.5

Matrix for classifying vulnerability / capacity

Number	Level	Shading
1	Low	
2	Medium	
3	High	
4	Extreme	

Risk is a function of hazard and vulnerability/capacity so the matrix for assessing risk will combine both as in the tables below: 1 is low risk and 12 high risk.

VULNERABILITY/CAPACITY	HAZARD		
	1	**2**	**3**
1	1	2	3
2	2	4	6
3	3	6	9
4	4	8	12

RISK		
NUMBER	**LEVEL**	**SHADING**
1, 2	Low	
3-5	Medium	
6-8,	High	
9-12	Extreme	

In Example 2, where the vulnerability/capacity of households to the major impact of the road becoming inaccessible is assessed we could fill in the risk matrix by multiplying the hazard and vulnerability/capacity classifications together to give a value between 1 and 12 as follows:

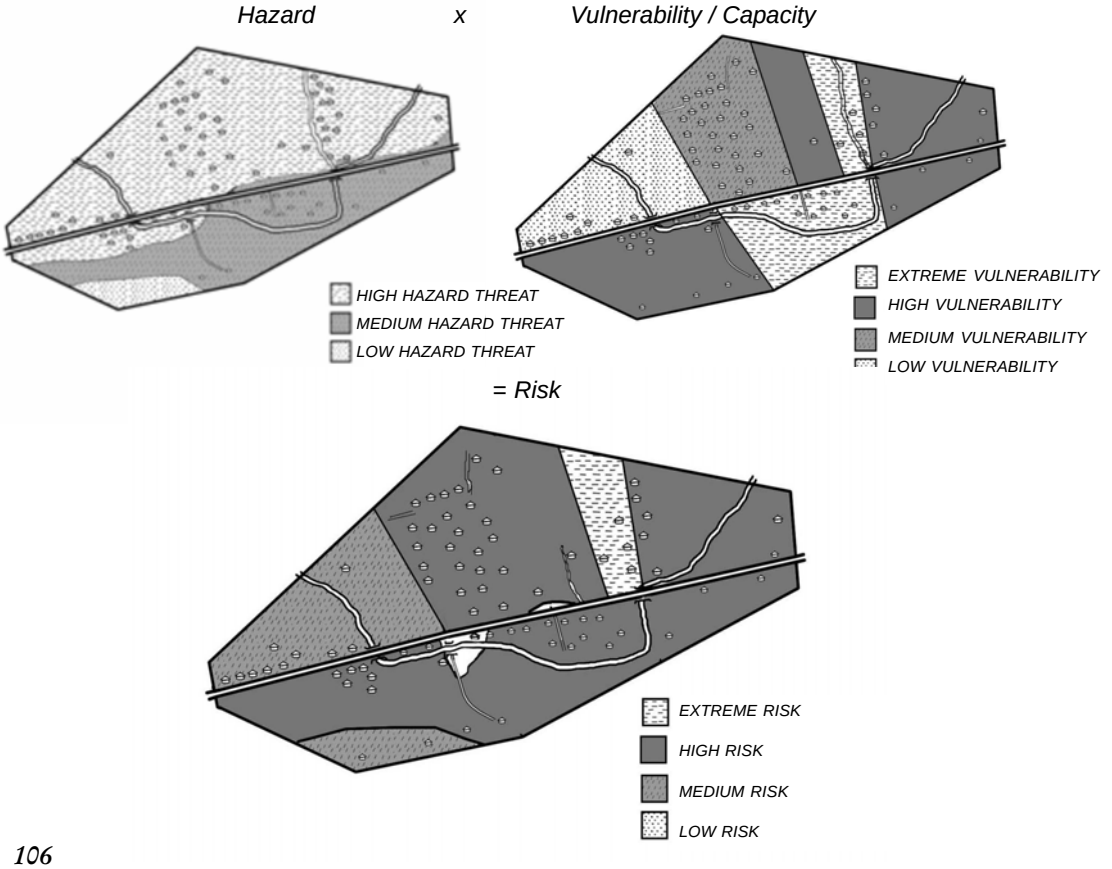
Risk classification Example 2

Hazard classification Flooding Between 1 & 3	**Vulnerability / capacity classification** (to major impact of flooding – impassable road to market) Between 1 & 4	**Risk classification** R = H x V/C Between 1 & 12 R = Risk H = Hazard V = Vulnerability C = Capacity	**Shading** (8.4 is high risk, tending towards extreme)
2.4	**3.5**	**8.4**	

If another major impact of the flooding was poor crop yields we would do a separate vulnerability classification for its impact and derive a risk classification for that impact too.

Risk mapping

The three maps below represent hazard, vulnerability/capacity and risk – the first two show hazard and vulnerability/capacity, respectively and the third is the risk map, combining the previous two.



There are important points to highlight here:

Firstly, there is a great difference between the areas of the community identified as threatened by the hazard (in this case flooding), and the areas considered to be at risk of disaster from flooding (high risk). The high risk areas are those where a high hazard level coincides with a high vulnerability/low capacity level, but there is a considerable area of low vulnerability in the high hazard level area that is only considered to be at medium risk of disaster from flooding. Capacity may be greater here (alternative sources of income or food, less reliance on the road to the market).

Secondly, the reason for doing a number of vulnerability analyses for a number of impacts of a hazard is to be able to compare the final risk values. If a number of major hazards have been identified, again it is advisable to look at vulnerability in relation to at least two hazards. It may be that the hazard identified as being the most imminent is not associated with the highest level of risk, while the second hazard is associated with higher risk due to the nature of the vulnerability to that specific hazard. This distinction is important and not always appreciated. We often find confusion between hazard and risk maps; the former are sometimes used as if they were the latter.

As a result of this risk assessment and mapping process, we now have a clearer idea of what might happen, where, and who are likely to be those most affected. We have a deeper understanding of where hazards occur and what people's vulnerabilities are to their impacts. With this information we are in a position to move on and take action based on the assessment.

Perception by communities about hazard, vulnerability/ capacity and disaster risk

This section arose from discussions held during the writeshop involving community representatives from Adami Tulla (Zeway zone) and Arero (Borana zone).

Hazard identification

The community went through an individual followed by a group process of hazard identification. Initially six main hazards were identified as follows:

- drought
- wildfire
- malaria
- HIV/AIDS
- flood
- conflict.

Due to time constraints and for the purposes of the exercise these were then reduced to three as follows:

DROUGHT FLOOD CONFLICT

Impact

The community was asked to spend time discussing how these three hazards actually affected people's lives in villages in rural Ethiopia. The community perception of impact ran along the following lines:

Drought: Little pasture; death of livestock – cattle, goats, sheep; reduced income; reduced livestock prices; increased cost of other food items; food shortage; displacement of people; hunger; death of people.

Flood: Families displaced; houses washed away; household goods destroyed or lost; stored cereals destroyed or lost; arable land flooded, erosion of soil; schools and clinics flooded and closed; bridges and roads damaged; forests damaged; road to market impassable; malaria outbreak (more marshy land, more mosquitoes); outbreak of other waterborne diseases; death of people and animals.

Conflict: Displacement of people; livestock stolen or killed; roads closed, restricted movement; loss of property; family breakdown; abduction of girls and women; the old, the young and women become targets when the men go to fight; death and killing.

Community action

The next step in the process was to focus on what the community does about these hazards - before they happen, when they are happening and after they have happened:

Drought

Before:

- locating alternative areas for livestock grazing – although this can lead to conflict
- separation of herds with some migrating to utilize other grazing areas
- managed and organized grazing pattern so land is not over-grazed
- hay making
- reserve grain for dry season.

During:

- migrate to where there is grass and water
- seek support from government and other external bodies
- graze on pastures saved for drought
- cut trees and sell charcoal
- rent land to those with money
- sell-off livestock though price may not be good
- seek opportunities to sell casual labour outside the district.

After:

- displaced people return home, repossess rented land, use rental income and help from neighbours (loan of plough, oxen, etc) to restart farming
- get children back to school
- community meet, discuss situation and agree to donate start-up livestock to those worst affected
- temporary loan of milking cows to those worst affected
- start to plant more drought-resistant crops: cassava, false bananas
- use water more carefully: e.g. use of old plastic sacks when starting off nursery plants. (Sack is filled with soil and three holes are punctured in each side. Seeds are planted in the holes. Water is fed through the top of the sack. The young plants start to grow out through the holes when they are transplanted).

Flood

Before:

- divert water to flow away from houses and crops
- engage in soil conservation activities (contours)
- move away from flood-prone areas
- close and protect wells to prevent flood destruction
- construct ponds to capture flood waters and minimize speed of flood water
- save money
- save cereals for emergency
- save donated aid for emergency
- save hay to feed animals during flood.

During:

- build mounds around houses to divert water flow
- move to temporary shelter on higher ground
- move animals to higher ground
- request emergency relief from government and NGOs
- able bodied seek casual labouring opportunities in town (subsequent increased HIV risk).

After:

- return to own village, rehabilitate, reconstruct
- start planting on areas where water has receded
- look at pattern of flooding and review diversion methods
- build houses on land that didn't flood.

Conflict

Before:

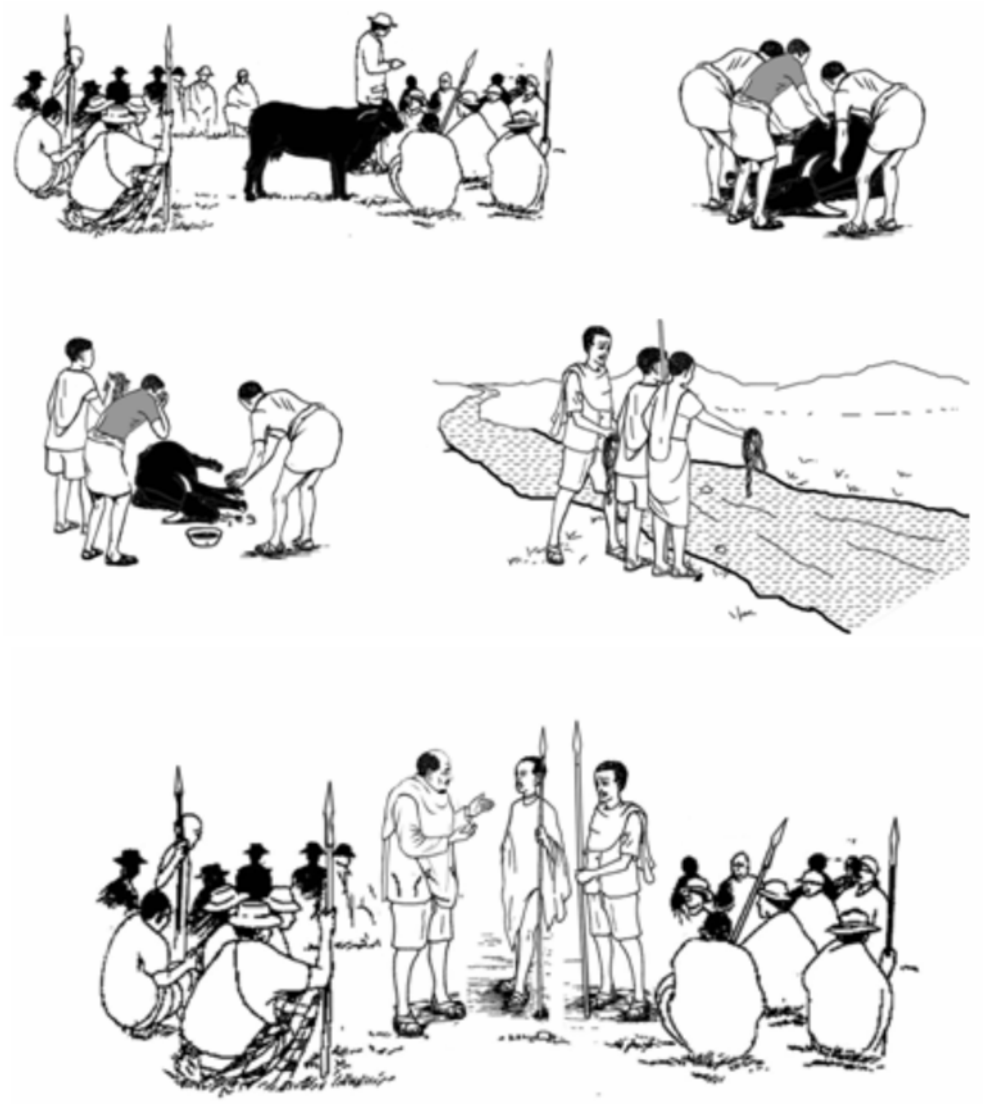
- look at causes of conflict
- meet with conflict-prone clan and establish permanent peace
- elders from conflict-prone clans meet and discuss a rota for use of scarce pasture and water resources
- in border conflicts, elders meet and reach agreement on the siting of the border.

During:

- look-out system to provide early warning of attack
- men move out of village to intercept raiders and prevent fighting in the village to protect women, children and the elderly. Men with guns to the front, men with spears behind, old men, women and children stay in the village or relocate to safer temporary shelter
- move livestock to safer location
- report conflict to government. They may step in and get the army to stop the actual fighting, but root causes will not be addressed by the army.

After:

- elders meet at the site of the conflict, bring spears and lay them down, sacrifice a bull and reach agreement on source of conflict (water, grazing, border)
- elders are responsible for selling the new agreement to the young men (the fighters) use of bull's blood in ceremonial ritual. Blood is smeared on faces; blood is cleaned from faces; meat is eaten together. The intestines of the bull, representing the deep seated source of the conflict, are thrown in the river and they float away.



The community representatives then discussed what more could be done to lessen the impact of these hazards by the community themselves and by outsiders.

Drought

Community:

- community should diversify sources of livelihood: subsistence and market-oriented
- establish scheme where community contribute money to buy reserve cereals for use during drought
- community should be open to new thinking, e.g. on forest preservation and soil erosion.

Government / NGOs / others:

- quick and effective emergency response
- education on impact of hazard
- support for long-term rehabilitation post-drought
- support for preparedness and mitigation measures
- practical education and training on important life skills:
  - family planning
  - credit schemes
  - HIV/AIDS
  - potable water
- agricultural training
  - water harvesting
  - irrigation
  - animal health.

Flooding

Community:

- community should use preparedness and mitigation techniques
- grow plants that help prevent soil erosion.

Government / NGOs / others

- information and forecasts on rainfall patterns passed to rural communities (early warning)
- divert much needed water from floods to farms
- programme of dam construction
- rehabilitate infrastructure post-flood: roads, bridges, schools
- get internally displaced persons back home as soon as possible
- help restock worst affected farmers
- provide start-up seeds and tools
- provide education and training on floods.

Conflict

Community:

- become more open to learning about causes and impact of conflict
- regular meeting with neighbouring clans
- good communication between the elders, who make agreements, and the young men, who do the fighting.

Government / NGOs / others:

- provide education on conflict and its impact
- government should not only stop the immediate fighting but address root causes.

Usefulness of this book for communities

> "If the book is not translated I will leave it on the shelf and it will not be opened. Maybe in years to come my children may read it as they are now being taught English at school."
> *Quote from a community member*

Current practice in Ethiopia

A great deal of effort has been invested by the DPPA, the MoARD, World Food Program (WFP) and FAO in vulnerability assessments focusing on food and crop production. The risk of drought relative to other hazards dictates that limited resources should be directed towards management of this, the prevailing hazard. The FDRE's efforts to mitigate drought hazards should not be underestimated and should be applauded and encouraged as an example of responsible governance. UNICEF, DPPA, WFP and MoH have become more active in recent years through the EOS in hazard, risk and vulnerability monitoring. In general, however, systems remain influenced by a 'food first' bias and there is much work yet to be done. The existing disaster management system is not structured to assess or address adequately the full range of hazards – rural and urban - that pose real risks to the population.

In Ethiopia, there is an abundance of institutions engaged in disaster early warning, baseline information and food security surveillance activities. A recent review of assessments currently undertaken in Ethiopia found out that there are about 33 different types of assessments throughout the country. Governmental bodies engaged in early warning, surveillance and baseline data information systems include the DPPA (ENCU, monthly monitoring, bi-annual crop and food needs assessments, and SERA/EPSP), the Central Statistics Agency (agriculture, population & housing; demographics & health), the Welfare Monitoring Unit (MoFED), and various line ministries such as NMA, MoA, MoH, MoWR, and Ethiopian Agricultural Research Organization (EARO) - LEWS.

Various non-government agencies are also involved directly or indirectly in vulnerability assessments. These agencies include FEWS-NET, WFP Vulnerability Assessment Mapping Unit, FAO – Crop and Food Supply Assessment Section, UN-OCHA, UNICEF Emergency Unit, NGOs like CARE-Ethiopia – Food Information System, WVI – Monthly and Biannual Assessments, SC-UK - Nutritional Surveillance Program and Household Food Economy Analysis, and JEOP – Nutrition Surveillance Unit.

DPPA-led multi-agency and multi-sectoral emergency assessments

The Early Warning Working Group (EWWG), consisting of most of the above mentioned government and non-government agencies, is the main body that deals with assessment methodologies and conducting of seasonal and emergency disaster-impact assessments. This DPPA-led multi-agency and multi-sectoral group uses various checklist-based assessment methods to identify disaster-affected areas and vulnerable groups. Although primary and secondary information of quantitative and qualitative nature are collected and analyzed to come up with estimates of vulnerable populations and their needs, the approach is basically characterized as the process of convergence of evidences, triangulation of various information sources as well as negotiation and judgement-based classification of the impact of a specific hazard. Recently, the HEA is being adopted and practiced as a better methodology for emergency vulnerability assessments.

Various sectoral task forces were also formed some few years back in order to systematically coordinate and conduct sector-specific assessments. The task forces cover: agricultural and livestock, water and environmental sanitation, food security, and health and nutrition, respectively, chaired by MoA, MoWR, DPPA/EWD, and MoH. These task forces have members from various relevant government and non-government agencies. They have been developing assessment guidelines and checklists for vulnerability assessments and estimation of emergency food and non-food needs of populations affected by various hazards. They have also been doing contingency planning for better preparedness for anticipated hazards using sector-specific methods, tools and standard contingency planning guidelines. During the contingency planning exercises, hazards/risks are identified and profiled and vulnerability assessment is done using various early warning, climate prediction and weather forecast information and results from situation analysis.

Challenges and priorities

The notions of hazard, vulnerability and capacity are the foundation for an effective strategy of risk reduction and the operational basis for a culture of prevention. While identification and monitoring activities related to hazard assessments have been improved, some aspects of the overall risk assessment process 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 an integrated and comprehensive risk assessment. Recognition and analysis of the changing nature of hazards and

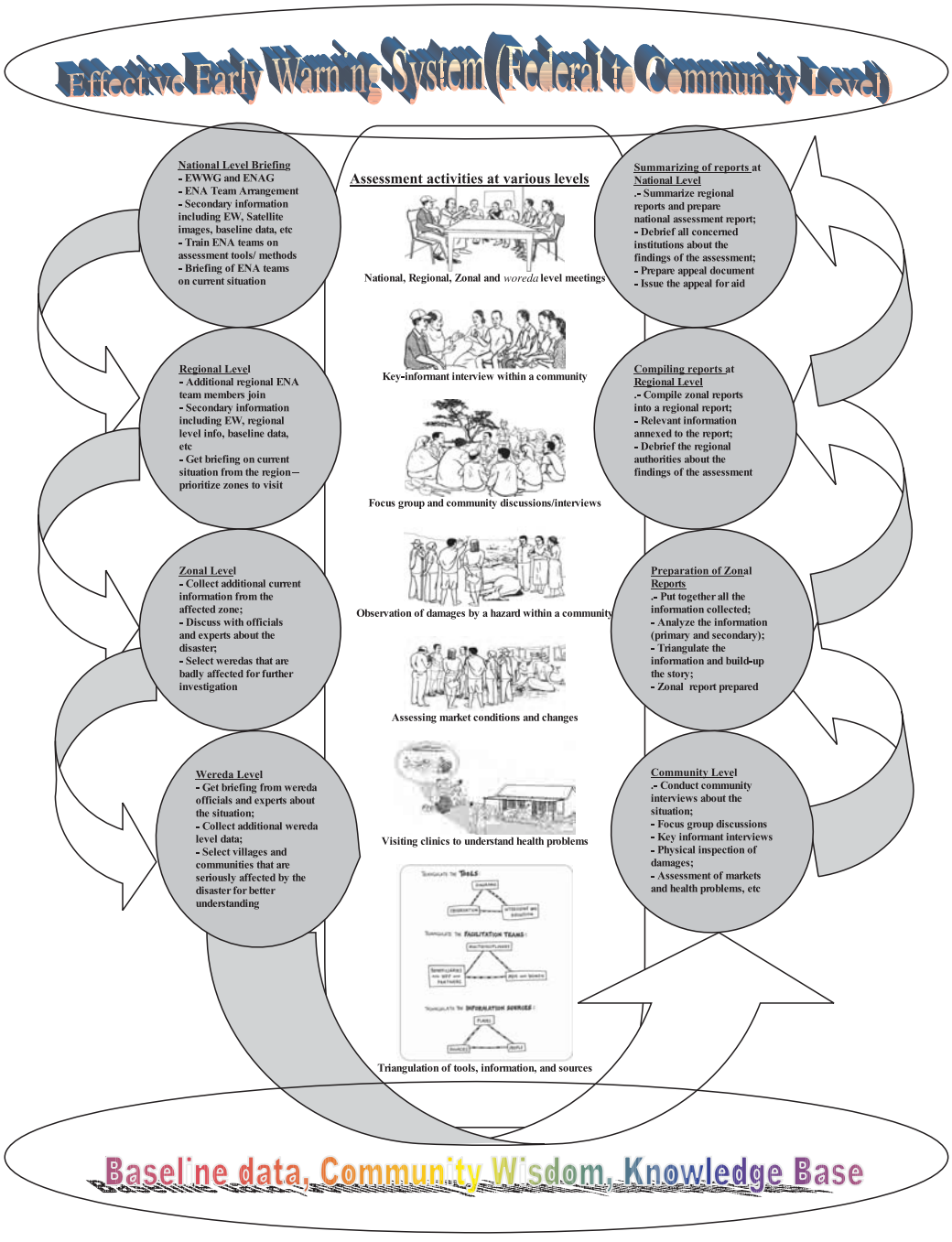
vulnerabilities is needed. The influence of ecological imbalances, such as climate change, is affecting the frequency and intensity of hazardous natural phenomenon. Additionally, environmental degradation is exacerbating the impact of natural hazards.

Risk assessments need to reflect the dynamic and complex scenarios to properly feed into disaster risk reduction strategies. Multiple hazards and comprehensive vulnerability/capacity assessments that take account of the changing patterns in disaster risk are starting points for raising risk awareness. The emergent trends in hazards and vulnerability described in this chapter pose major challenges to the overall risk assessment process. These changes affect not only the formal procedures of risk assessment in place, but also the prevailing patterns of risk perception.

Community knowledge of hazards has 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 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.

Ethiopian DPPA-led multi-agency and multi-sectoral emergency needs assessment process

Linking hazard, vulnerability, capacity and disaster risk assessments



Outcome of assessment

See also Chapter 5 on Strategies

All this analysis is meaningless if it does not lead to action. Depending on the result of the assessment, the action may focus on prevention, mitigation, preparedness, emergency response if the disaster has just happened, or recovery, rehabilitation and reconstruction if the disaster happened a number of weeks or months ago. The likelihood is that the action taken will involve some combination of these strategies.

Following the flooding example, a strategy might be employed that combines prevention, mitigation and preparedness. The log-frame below is one way that the risk - analysed earlier - can be translated into action. This tool captures the measures we want to introduce and indicates timeframes and responsibilities.

A simple log-frame outlining action to be taken can be constructed:

Approach	Activity	Who	When	How	Verification
Prevention (advocacy in this example)	Lobbying local authority to provide alternative road to market that does not pass through the flood prone river water shed	NGO staff and representative of village	As soon as possible	Arranging meetings and preparing statement that includes recommend-ations	Change in policies
Mitigation	Construction of earth bunds and gabion cages	Consultant engineer, local authorities and village committee	Next dry season	Cash for work programmes	Site visits and check against plans
	Watershed protection	As above	Over next three years	Cash for work	Site visits and check against plans
	Public health programme	NGO medical staff, village committee, school teachers	Over next two years	Village workshops, distribute mosquito nets	Reduction in water borne diseases and malaria
Preparedn ess	Establish community based EWS Identify high ground for flood shelter	NGO staff and village committees NGO staff and community	Over next year Over next year	Sensitisation and helping with communicat-ions Study history and trends of floods to ensure that ground is sufficiently high	Check that both monitoring and communicat-ion is being done Site visits and check against plans

Early warning systems in Ethiopia

What is an early warning system?

An early warning system is a programme established to monitor and warn communities and the country at large of the threat of a hazard ahead of time. The system is based on providing timely and appropriate information geared towards preventive steps to be taken by communities, government and other agencies to reduce disaster risks. Early warning system may be indigenous or conventional.

Indigenous early warning practices in Ethiopia

Local communities in Ethiopia have their own indigenous knowledge systems with regard to hazards such as drought, conflict and disease epidemics. This knowledge is based on long years of observation of the natural and social environment within which they live. We can say that, insofar as the observations of the communities are telltale signs leading to prediction and possible warning for the communities, they form part of their early warning systems.

> ***Ayantu, uuchu* and donkey's ears**
>
> Among the Borana, there were specialists (*ayantu*) who can read stars and their patterns and predict drought or onset of rains. The *ayantu* warn the community about impending drought and people prepare accordingly, for example by moving to places with permanent water sources. Others (*uuchu*) are apparently able to read entrails of slaughtered animals and warn the community of the various hazards such as drought, floods, conflicts and epidemics.
>
> Among the East Harareghe farmers, they claim to know rain is imminent from observing the ears of a donkey. Continuous wind from the northwest to the east is also understood in this area to be a sure sign of the onset of rain. Similarly, dogs howling at night are associated with the death of a key figure in society, just as seasonal migration of birds will serve as a sign of onset and/or cessation of rain in some parts of Ethiopia.

Conventional early warning systems in Ethiopia

In Ethiopia, contemporary early warning systems (EWS) were introduced in 1976, after the famine of 1974/5 that claimed the lives of many rural inhabitants in the northern part of the country. Since its inception, Ethiopia's EWS has been monitoring and reporting on a monthly and seasonal basis on drought hazard status using indicators such as crops, livestock, vegetation, rainfall, livelihoods and disaster area assessment. The EWS in Ethiopia does not warn about rapid onset disasters like floods, epidemics, earthquake, and conflict, an omission, which forms one of its biggest weaknesses.

In terms of its operations, EWS operates at *woreda*, zonal, regional and national levels. The data collected is analysed to provide timely warning for preventive and responsive measures in a multi-sectoral manner. EWS is an important component of national policy on disaster prevention and management. The following forms the core of its basic functions:

- identify areas of surplus and deficit food production
- provide estimates of prospective beneficiaries of food shortages and the

quantity, type and duration of assistance required
- detect the likelihood of disasters as early as possible and provide warning so that the necessary preparedness measures may be taken
- conduct disaster area assessment and identify causes, extent and effects of disaster and advise on development activities for mitigation of disaster.

This information is produced in form of reports at different periods: monthly bulletins, seasonal reports, synoptic reports, disaster area assessment reports, nutritional status reports and special 'flash' reports. The information is useful to the communities, government, NGOs, donor organisations, research institutions and universities.

Monitoring of key indicators in early warning

The conventional Ethiopian EWS monitor rainfall, vegetation, crops, livestock, food security, livelihoods and disaster area assessment.

Rainfall monitoring: Since Ethiopia depends on rain-fed agriculture, it is important to monitor amount, distribution and pattern of rainfall. The purpose of this agro-metrological monitoring in early warning is to make a timely assessment of forthcoming harvests; the food security situation of the country is directly related to the rainfall situation. Rainfall is monitored on a daily basis through rainfall stations in various parts of the country. High-density rain gauge and satellite data is analysed by the National Metrological Services Agency who then warn the communities and the country about possible drought in the country.

Crop monitoring: The EWS monitors crop conditions on a monthly basis at the level of agro-ecological zones within the *woreda*. Crop condition is monitored throughout the main growing periods. However, in areas where perennial crops are important, monitoring will be a continuous activity throughout the year, as is done for livestock condition. The three main dimensions in the process of crop monitoring are:
- assessing the current crop conditions as compared to normal
- identifying the reasons for poor crop performance
- evaluating the impact of the current situations on food security in the area.

The purpose of crop monitoring is for early warning of possible food insecurity. The factors affecting crop production will be assessed and appropriate measures. such as provision of seeds and fertilisers, put in place.

Qualitative crop monitoring: Qualitative crop data are collected through the regular monitoring system. The EWS relies on qualitative data because it believes that such data are relatively easy and cost-effective to collect and interpret. This data is collected on a monthly basis at the level of agro-ecological zones.

A number of procedures are used to analyse qualitative crop data. These include:
- individual crop ratings

- qualitative explanations or reasons for changes in crop ratings
- subjective weights
- analysis of causality.

Rating is the simple comparison between the current and normal crop conditions.

For crop monitoring, qualitative ratings are used for assessing:

- planted area
- crop yield prospects
- crop production prospects
- supplies and utilization of farm inputs.

The production of any crop is a function of two variables: area planted and yield per hectare. The production rating of any one crop can be calculated as the arithmetic mean of the area rating and yield rating; production rating is equal to half of the sum of area and yield ratings.

Vegetation monitoring: Vegetation includes crops, pasture and all other types of plants. The objective of vegetation monitoring in the context of EWS is to provide an indication of the general crop and pasture conditions allowing prediction of final production.

NDVI can be used to monitor the vegetation situation in a given region or country. At present several EWS in Africa use NDVI data to make qualitative assessment to determine the progress of the current growing season by comparing with past years. Using crop and pasture field reports, together with NDVI images and baseline crop information, can help to come up with a better qualitative assessment results.

Livestock monitoring: In pastoral and heavily livestock-dependent areas, there is a direct relationship between the numbers, quality and price of animals and the food security status of their owners. The basic techniques for monitoring livestock related variables are similar to those employed for crop monitoring.

The EWS receives information for each of the main five classes of domestic animals in Ethiopia: shoats (sheep and goat), cattle, equines, camels and chickens. For regular reporting the information is summarized in an index that runs from 1 to 5, which describe the current situations of livestock as compared to normal. The indices for number, quality and price of each animal type/class are collected from *woreda* level experts.

Price and market monitoring: Price and market monitoring is an important activity of the EWS. Price monitoring can help the system to observe price trends over a period of time and also to make conclusions by analysing the 'terms of trade' (see below) for selected crop and livestock prices.

Price is a signal that warns traders, consumers and policy makers about food availability on the market. It is also a signal that highlights whether certain groups in society are better or worse-off in relation to the other (for example, pastoralists versus settled farmers).

Assessing supply and demand conditions: The EWS collects qualitative data on market supply conditions by way of 'market supply ratings'. These ratings are combined with price ratings to identify whether changes in price are attributed to changing supply or demand conditions. Qualitative data is based on the impressions of *woreda* officials who are able to compare current conditions with past normal conditions.

Supplies of a given commodity are rated according to the scale shown below. Note that the same ranking applies to price rating.

Qualitative rating of market conditions

Scale	Market supplies rating compared to normal
1	Much above normal
2	Above normal
3	About normal
4	Below normal
5	Much below normal

The ratings are given for each of the main food commodities and livestock.

What is 'terms of trade'?

Terms of trade (ToT) is a special kind of index, which compares the price of one commodity with another commodity. Terms of trade is commonly used in international trade where, for example, export prices in Ethiopia are compared with import prices from its trading partners. The conclusion from a ToT analysis is often stated as 'favourable' or 'unfavourable'; 'more favourable' or 'less favourable'; and 'improving; or 'deteriorating'

In the context of international trade, if export prices are generally higher than import prices, then the ToT is said to be favourable to Ethiopia, and if export prices are generally lower than import prices, then the ToT is said to be unfavourable to Ethiopia.

The general formula for calculating terms of trade is:

$$\text{ToT} = \text{Unit Price of Commodity}_X \div \text{Unit Price of Commodity}_Y$$

Terms of trade is commonly expressed in a form of ratio.

Study the following worked example:

Let Commodity X be	Maize
Let Commodity Y be	Goat
Let Unit Price of Maize be	Birr 150 per quintal
Let Unit Price of Goat be	Birr 75 per head

What is the terms of trade for maize?

ToTm = 150 ÷ 75 = 2

Local food security monitoring

Local food security monitoring (LFSM) can be defined as the process of monitoring the food security situation of a community focusing on vulnerable households. The monitoring system involves tapping EWS information, focusing on proxy indicators that are determinants for the livelihood of the community: for example the crop and livestock performance in agro-pastoral areas and the pasture, water, livestock and epidemic diseases in pastoral areas.

The objective of LFSM is to provide:

- timely and accurate warning
- the needs arising from emergencies
- appropriate emergency response
- quick resource mobilization.

The main processes used to achieve this are:

- collect and evaluate of all food security information on regular basis
- qualitative and quantitative analysis of these information,
- assessment in areas where food assistance is requested
- dispatch of field assessment teams to disaster areas
- publish monthly, seasonal and disaster area assessment reports
- update/revise estimates of relief requirements
- appeal for assistance to relevant government authorities and international community where necessary.

Tools for LFSM

There are three basic processes for LFSM:

- grass-roots eligibility assessment and needs estimation, conducted at the *woreda* and sub-*woreda* level by local officials
- secondary data monitoring: office-based analysis of field data provided by the *woreda* early warning committees and information from other sources such as CSA and satellites
- field assessment missions: seasonal or one-off visits to selected areas of the country.

The purpose of secondary data monitoring and field assessment missions in EWS is to assess requests for relief assistance that are generated at the grass-roots level, give guidance on emergency interventions and identify areas where field assessment mission might be needed.

There are five main tools for secondary data monitoring:

Current vulnerability rating: This index represents a single view of the overall status of food security variables in a monitoring unit. All food security variables

can be categorized as income and price. The income variables that are relevant to monitoring current vulnerability in the rural community include:

- income and food from own-farm crop production
- livestock income and food from own animals
- waged labour income
- income from petty trading and petty commodity production
- other income from remittances, loans and food from hunting and gathering.

Chronic vulnerability rating: The chronic vulnerability rating (CVR) allows us to identify areas that suffer from underlying or chronic poverty. This is especially important for answering the question: is relief assistance the appropriate response, or would it be better to address the root causes of poverty? There are three basic methods for calculating the CVR:

- *direct measurement*: using quantitative data on average food consumption and estimates of food requirements at household level
- *qualitative ratings*: uses *woreda*-level data and a subjective definition of 'hunger' to provide a CVR classification
- *proxy approaches*: direct measurement is usually not practical because data on actual food consumption is not available. The proxy approach uses variables that are strongly related to food consumption.

Monitoring outcome indicators: Outcome indicators are a measure of the gravity of current food shortages. There are two types of signs or outcomes showing that food problems have already arisen: *physical signs* - the health and nutrition status of people, and *behavioural signs* - unusual behaviour that shows that people are suffering food shortages.

Eligibility matrix: Information on the current and chronic vulnerability ratings and outcome indicators can be combined to provide an eligibility matrix. The eligibility matrix expresses the policy options for a particular population group. It indicates the type of response that is required, the type of problem that has occurred and whether there is a need for further field assessment or not.

Assessing relief responses: We also need to know whether emergency responses have adequately dealt with the problems. To do this we compare the actual deliveries of relief food assistance with the requirements.

Strengths of LFSM

The output of the LFSM will be an estimate of the relative change in food access for each monitoring unit over time, compared to long-term 'normal' conditions. This measure can be updated on a monthly basis, as new data becomes available. Generally, the model has the following strengths:

- the process and outputs are simple to interpret
- allows computerized analysis

- uses both qualitative and quantitative data interchangeably
- helps to evaluate changes in the current food security situation on a monthly basis
- helps to identify areas affected by the current shock events.

Limitations of LFSM

Limitations of LFSM include:

- too much information is required for the analysis
- in the absence of a computer it is not easy to do the analysis manually
- the model cannot predict future changes in food security
- the model does not attempt to estimate absolute declines in food consumption levels or provide direct estimates of food aid needs
- the results of the model are extremely sensitive to both the quality of the data and the assumptions that are made, which means that it is likely to create large errors
- it is costly in terms of manpower and logistical arrangements
- since all information analysis takes time, various undesirable symptoms of food or health related stress could happen to the already vulnerable households.

National Food Security Monitoring

National Food Security Monitoring (NFSM) is concerned with changes and patterns in the total national supply and demand for food. Policy-makers need to know if the country is in surplus or in deficit. If Ethiopia is in deficit, will there be a need for large-scale imports through food assistance? If it is in surplus, how large is the exportable surplus? We also want to know about the trends in national supplies: Is Ethiopia becoming more self-sufficient? Do national food supplies meet the minimum dietary requirements?

NFSM cannot tell us about local food problems and requirements. But it helps to answer the following policy related questions:

- how much food assistance should be imported or locally purchased this year?
- is Ethiopia self-sufficient this year, or will it be self-sufficient next year?
- on average, how much food do Ethiopians consume and how does this compare to their requirements?
- are food assistance pledges and deliveries sufficient to meet requirements and are they behind schedule?

Under the enhanced EWS, staff of the federal-level EWS assemble and analyse the NFSM information, co-ordinated by the Early Warning Department (EWD). The EWD does not undertake surveys for data collection for the NFSM. It relies entirely on data collected by other institutions.

The development, implementation and running of the system requires the active participation of several agencies including:

- MoA - crop and livestock production data, information on norms for seed use and post harvest losses
- CSA – crop and livestock production data, population data
- MEDAC – trade data
- The Customs Authority – trade data
- EFSR – stock data
- EGTE – stock data
- DPPC Logistics Department, Aid Programmes Co-ordination Department and Information Technology Centre - logistics information on deliveries, pledges and distributions
- NGOs – stock delivery and food assistance distribution data.

The EWD takes responsibility for handling and maintaining all the relevant databases. Data is collected from the relevant institutions on a monthly basis. Institutional structures must been maintained to allow quick and efficient information sharing. The EWWG is the basic forum for regular information sharing.

The results of the NFSM are available to users of the EWS. The main users of the NFSM are the communities, federal food and economic policy-planners, donor and UN agencies and food assistance-oriented NGOs.

Disaster area impact assessment

Disaster area impact assessment is a special kind of field assessment carried out in response to unexpected and catastrophic events or rapid on-set disasters. These types of disasters, by definition, give little or no time for early warning.

When unexpected disaster occurs, the role of early warning is limited. There is no time to monitor indicators, conduct household or community interviews. There is even little time to form and launch assessment teams. Therefore, when it comes to disaster assessment, the early warning system in Ethiopia focuses on:

- assessing the extent of damage on property
- estimating the number of people effected by the disaster
- determining the type and level of relief assistance required
- fund raising
- implementing the relief assistance operation
- co-operating in the planning of normalising situations after the disaster (e.g. how to resettle the population).

Livelihood analysis based on household economy approach

As discussed in the above topics, the existing early warning system does not provide estimates of the affected population; it helps us only to identify areas affected by different types of shocks or hazards. Emergency needs are estimated on consensus basis during the seasonal assessment periods with the respective regions. Therefore, in order to address its shortcomings that hinder estimation of emergency needs, it is trying to integrate its regular monitoring with the current initiative of livelihood analysis based on household economy approach.

What is a livelihood zone?

A livelihood zone (LZ) is a geographical entity that can be used for the analysis of spatial data, where the object of interest is human outcomes: how are people affected by risk, shocks, and trends in climate or economic processes? In mapping terms, an LZ is a collection of (not necessarily contiguous) small administrative units – the smallest possible – that are roughly homogeneous in the basic agricultural, geo-physical, socio-economic and cultural attributes.

The core assumption is that in any one LZ, people will share roughly the same socio-economic and cultural characteristics and that their way of life, or livelihood, is similar. We do not assume that within a LZ all people are the same. Even within a small space there can be huge disparities in income, consumption and health status. However, the basic assumption is that in traditional areas, people living nearby to one another with frequent interactions develop similar methods for making the most of their natural and economic environment. They are also rocked by the same kinds of risks and hazards. If it can be shown that the assumption is correct then collecting and analysing data at the LZ level will improve the effectiveness of predictions of any of the variables that are closely related to livelihood, such as income level and exposure to shocks. This assumption can be tested using familiar survey and statistical inference methods.

The purpose of livelihood zones

The primary purpose of collecting and analysing datasets according to LZ is to increase the statistical efficiency of sampling. Whereas in large administrative areas, populations may be highly heterogeneous, in units that are defined according to some prior information on livelihoods, there will be more homogeneity. Hence, stratified random samples (on any livelihood-related variables) will be more efficient. In other words, better quality data can be collected at the same cost as random sampling over an administrative unit. Similarly, models of risk impact, household food security or poverty, developed for a relatively homogenous area, are likely to be more accurate than those run over diverse spatial units.

Of course, a given community may be very homogenous in some parameters and highly heterogeneous in others. For a multiple-dimension stratification to work there must be some correlation between the variables under consideration. In particular, there must be a connection between the physical variables (such as land suitability) and the socio-economic ones (what people do, how much they get or consume).

If this assumption is true, then the applications are huge. Traditional administrative unit-based sampling methods can be replaced by LZ-based methods if these are more efficient. They will be more efficient if the LZ is more homogeneous in key parameters than the administrative unit. (The LZ-based sample estimates can still be aggregated to the large administrative units, satisfying the usual reporting requirements). The efficiency gains are both for conventional household surveys and for community and expert knowledge-based data collection systems.

The approach is only really applicable for traditional rural communities that rely on a rather limited range of natural resource-based income generating activities. The correlation between physical environment and economic outcomes breaks down when populations are highly diversified, and depend on economic activities that are not natural resource-based. But this generalisation fits much of the population of the Horn of Africa.

Potential applications of LZ stratification are for:

- rapid disaster impact assessments
- rapid and participatory food security assessments
- crop and livestock production surveys
- socio-economic surveys, including income and expenditure surveys
- emergency need assessments in the main sectors (food, agriculture, water/sanitation and health)
- environmental impact assessment.

Early warning system and HIV/AIDS

The following are indicators for HIV/AIDS. The prevalence of these indicators in an area or among a community serve as an early warning signal for the community to take action:

- increased HIV/AIDS-related diseases like TB and other opportunistic infections. HIV/AIDS presents itself in the form of some of these ailments as the body's immune systems have been weakened
- increased prostitution and sexual promiscuity. In areas where there are many commercial sex workers, the prevalence of HIV/AIDS is high and may serve as a signal to the community
- traditional practices like cuts, abduction and marital rape. In communities where these practices are prevalent, they may escalate the spread of HIV/AIDS

- unchecked movement of people such as truck drivers. People may transmit HIV/AIDS through travelling and truck drivers are prone to this
- large number of unmarried people or breakdown of marriages. Divorced persons and unmarried ones could see themselves as available and free for multiple and 'laissez-faire' sex.

These signs can be communicated as warning through the following channels:

Use of public campaigns: Civic and political leaders within the community may tell the community members about the dangers of HIV/AIDS and what the community needs to do to mitigate the disaster.

Community dialogue: The community members may speak with one another on the subject and educate its members.

Use of community drama, songs, and poetry: Here members of the society use popular culture to talk about the subject and warn people about the effect of HIV/AIDS to the community.

Faith-based organizations: These organizations are respected and society tends to listen to them. Faith based organizations may warn people, especially appealing to their moral values.

Use of media: Popular radio programmes in local languages can be used to discuss the subject, educate people and warn them of the dangers. Other media like print and television may also be used.

Civic education: Civil society may serve as a good starting point to educate people on the subject of HIV/AIDS.

Early warning system and conflict

Conflict is a human-made hazard. There are early signs that may be observed before violent conflict erupts in a community, including:

- distress migration of families away from a place in anticipation of conflict. The movement of women, children, and elderly persons can be an indicator of conflict. The reason for distress migration is to move to safer ground, as these categories of the community are most vulnerable
- children from different communities cease to play with each other
- children are withdrawn from schools, especially where schools are headed by a member of a conflicting community and where individuals fear lack of neutrality and fairness
- people abandon farming, especially if they fear for their lives or they suspect the crop will be abandoned anyway
- people stop going to market and refuse to buy items from one another. There could be pockets of conflict among women in the market
- price of animals drop. This is in situations where many people would wish

to sell and convert their livestock to cash in case conflict escalates
- people send animals to relatives far way
- people are always armed for any eventualities.

These early warning can be communicated by:
- elders meeting and discussing the problem and cautioning people about conflict
- religious leaders being brought in to resolve conflict through mediation
- women coming between warring communities with the object of stopping the war. The case of *sinqe*, the use of a special stick in resolving conflict among the Arsi Oromo, is pertinent.

Early warning system and malaria

Early warning signals that can be observed with regards to malaria are as follows:
- swampy conditions act as breeding sites for mosquitoes
- increased population of mosquitoes
- long rains and presence of floods
- unavailability of drugs and mosquito
- nutritionally weak people who lack the necessary immunity to withstand the exposure to the malaria hazard.

These can be communicated through education, mass campaigns and use of the media.

Early warning system and flood

Early warning signals that can be observed with regards to flood are as follows:
- metrological information
- clouds at a distance for some days
- changes in settlement
- people clearing waterways
- continuous rain
- rising level of rivers
- extreme rain
- frequency and intensity of rain
- the song of some birds indicates the coming of rain
- wind direction and strong whirling wind.

People exchange information in various ways. Usually people travelling from one place exchange information about potential floods. People also often congregate in the village to listen to a radio for information and to exchange their own news.

Procedures followed for regular monthly early warning information management system in Ethiopia

Role of the community:

- provide early warning information about performance indicators on rainfall, crop, livestock, water, pasture, health, market, unusual behavioural responses, etc to development agents through focus group discussion, interviews with key informants methods through the development agents.

Role of development agents:

- consolidate early warning information reported by communities from each peasant association
- report consolidated information to *woredas*
- provide feedback to communities.

Woreda:

- after receiving early warning information from development agents, consolidate it to show the *woreda* picture in each agro-ecological zone and submit them to the *woreda* early warning committee
- include secondary data reported by health, water, agriculture, education and other relevant sectors at *woreda* level to substantiate the information reported by development agents
- identify areas and number of affected population that requires appropriate response and close monitoring
- if affected areas and population are within the capacity of communities and *woreda*, initiate appropriate response at both levels to address needs
- if the level of shock is beyond the communities and *woreda* capacity, report the situation to zonal office for initiating appropriate response with the other early warning information
- provide feedback to DAs

Zone:

- consolidate information reported by *woredas* within the zone and submit to zonal early warning committee to substantiate with other secondary information obtained from all relevant sectors in the zone
- identify areas and groups that require appropriate response and close monitoring
- if the affected areas and population are within the capacity of zone, initiate appropriate response to address the needs
- if the level of shock is beyond the zonal capacity, report the situation to regional office for initiating appropriate response with the other early warning information
- provide feedback to development agents.

Region:

- consolidate information reported by zones within the region and submit to regional early waning committee to substantiate with other secondary information obtained from all relevant sectors in the region
- identify areas and groups that require appropriate response and close monitoring
- if the affected areas and population are within the capacity of region, initiate appropriate response to address the needs
- if the level of shock is beyond the region capacity, report the situation to federal office for initiating appropriate response with the other early warning information
- provide feedback to development agents.

Federal:

- consolidate information reported by regions and substantiate with other secondary information obtained from all relevant sectors at federal level
- identify areas and groups that require appropriate response and close monitoring
- if the affected areas and groups are under the federal capacity, initiate appropriate response to address the needs
- if the level of shock is beyond federal level capacity, report the situation to higher level decision-makers for appropriate response
- provide feedback to development agents.

REGULAR MONTHLY EARLY WARNING INFORMATION MANAGEMENT SYSTEM