

2

Key concepts of disaster risk reduction and management

Almost everyday we witness disasters from around the world through newspaper stories or television news reports. In Ethiopia, people are sometimes confronted with situations or events that so severely disrupt their normal lives that it becomes difficult or even impossible for them to cope on their own. When the impacts of such an event overwhelm the ability of the affected community to cope using locally available resources, the situation is said to be a **disaster**. If the community is able to cope then the event is regarded as a **hazard**.

According to the Ethiopian Disaster Preparedness and Prevention Commission (DPPC) a disaster is “an event in which a society or a community undergoes acute deprivation of food and other necessities due to natural and man-made calamities to such extent that the normal functioning of the society or the community is disrupted and that it cannot subsist without outside interventions” (NPDPM, 1993). For example, in July 2006 South Omo and Dirre Dawa experienced widespread flooding which led to loss of life, livestock and crops and destruction of homesteads and transport infrastructure. The situation was declared a disaster and the Federal Government responded with emergency relief assistance.

Disasters are consequences of the way societies structure themselves, economically and socially; the way that societies and states interact; and the ways that relationships between decision-makers are sustained. Disasters operate as brakes on economic and human development at both the household level (when livestock, crops, homes and tools are destroyed) and at the national level (when roads, bridges, hospitals, schools and other facilities are damaged).

Types of disasters

In the disaster management literature, disasters are classified on the basis of type of hazard and rapidity of onset: natural or human-made, rapid or slow onset. But while the hazard triggering a disaster may be natural, it is the human condition which dictates its progression to a disaster.

Hazard: concept and definition

Hazards are potentially dangerous or damaging events such as drought, flood, windstorm, earthquake, or volcanic eruption in natural or human-made environments that negatively affect lives, property or activities.

In the case of Ethiopia, various events or situations occur from time to time that pose a danger to human lives and disrupt livelihoods. These events are caused by either natural processes or are the result of human activities; both are referred to as hazards. Drought, for example, is a hazard. It poses a danger to people, livestock and crops. When a community is unable to cope with the consequences of a hazard using its own resources the situation deteriorates into a disaster.

Types of hazard

Hazards can be broadly classified as natural or human-made. However, hazards can also be single, sequential or combined in their origin and effects and each hazard is uniquely characterized by its location, intensity and probability of occurrence.

Natural hazards: Natural hazards have their origin in natural processes over which people have little or no control. People can, however, avoid or at least minimize the impact of natural hazards upon the built environment; they can stop such events from resulting in disasters. Natural hazards can be classified as geological, hydro-meteorological or biological.

ORIGIN	PHENOMENA/ EXAMPLES
Geological hazards	earthquakes tsunamis (also called tidal waves) volcanic activity mass earth movements, e.g. landslides, rockslides subsidence, surface collapse, geological fault activity
Hydro-meteorological hazards	floods, debris and mudflows tropical cyclones, storms surges, thunderstorms, hailstorms, rain and windstorms, blizzards and other severe storms drought desertification bush or wildfires heat waves sand or dust storms permafrost snow avalanches
Biological hazards	outbreaks of epidemic diseases plant or animal contagion extensive infestations

Human-made hazards: These are the consequences of human activities which may cause loss of life or injury, damage to property, social and economical disruption or environmental degradation. Examples of human-made hazards include:

Technological hazards arising from industrial accidents, dangerous procedures and infrastructure failures. Technological hazards could lead to industrial pollution through leakage of nuclear or toxic wastes, dam failures causing floods, industrial accidents causing fires, explosions and leakages, among others.

Environmental degradation is partly due to processes induced by human behaviour and activities in a way (sometimes combined with natural hazards) that damages the natural resource base or adversely alters natural processes or ecosystems.

Potential effects are varied and may contribute to an increase in vulnerability and also to increased frequency and intensity of natural hazards. Some examples of these processes are: land degradation, deforestation, desertification, bush/wildfires, land, water and air pollution, climate change and ozone depletion.

Conflict is a type of human-made hazard highly relevant in the Ethiopian context.

Vulnerability: concept and definition

Vulnerability is the degree to which individuals, households, communities or geographical areas are likely to be affected by disaster when hazardous events occur.

Communities living in hazard-prone areas may be made susceptible to negative impacts of the hazard by conditions determined by physical factors (such as location, nature of buildings), weak social organization, limited economic opportunities, political processes and other factors within the local environment. These conditions are referred to as **vulnerability**.

The magnitude of each disaster - measured in number of deaths, amount of damage or cost - increases with increasing level of vulnerability.

Factors contributing to vulnerability

Disasters are consequences of hazards impacting on the vulnerable conditions of people and their livelihoods. They involve both the extent and type of vulnerabilities and the manner in which society deals with the hazard in terms of prevention, mitigation and preparedness.

If people can be made less vulnerable or non-vulnerable, then a hazard may still occur but need not produce a disaster. From this approach, it is apparent that reducing disaster is possible not only by modifying the hazard but also by reducing vulnerability. However, most of the efforts of those concerned with disasters are focused either on reducing the impact of the hazard itself (sometimes in very expensive and inappropriate ways) or on reducing a rather narrow aspects of vulnerability, such as social protection through certain forms of technological preparedness. The major determinants that make people vulnerable - the social, economic, political, environmental and ecological factors which determine the level of resilience of people's livelihoods - and their ability to withstand and prepare for hazards, are rarely tackled. The basic determinants of vulnerability are discussed below.

Political factors: Political will is fundamental for disaster risk reduction. A set of deep-rooted socio-economic elements - which include denial of human rights or lack of access to power structures, education and employment opportunities, land tenure, resources, basic services and information - together create and maintain extreme levels of susceptibility to the impact of hazards.

Economic factors: Levels of vulnerability are highly dependent upon the economic status of individuals, communities and nations. The poor are in general far more vulnerable than economically better off sectors of society. Poverty has the single most important influence. This relates both to proportionally higher losses when a disaster strikes as well as to lower capacity to recover.

Economic factors of vulnerability includes levels of individual, community and national economic reserves, levels of debt and degree of access to credit and loans, as well as insurance. An economy lacking in diversity is generally more vulnerable. Similarly, inadequate access to critical and basic socio-economic infrastructure, including communication networks, utilities and supplies and transportation facilities, increase people's exposure to risk. Lack of access to basic services, such as water, force people to use unsafe sources for cooking and drinking and place them at risk from disease and epidemics. People without access to electricity or alternative fuel sources are forced to cut down trees for firewood, which in turn leads to environmental degradation and can increase the danger of flooding.

Economic status of the population relates not only to the degree of losses in terms of lives, property and infrastructure but also the capacity to cope with and recover from adverse effects. Virtually all studies show that the wealthiest sector of the population either survives the impact of a hazard without suffering any adverse effects or are able to recover quickly. Poverty and lack of access to land forces people to build temporary, unsafe dwellings in crowded, dangerous locations. Poverty explains why drought claims poor subsistence farmers as victims but rarely the wealthy and why, more often than not, famine is the result of lack of purchasing power rather than absence of food. Vulnerability is not just poverty, but the poor tend to be the most vulnerable.

Physical factors: Physical aspects of vulnerability include the effect of location and susceptibilities of the built environment. It may be exposure to hazards, living in harmful ways or being in the wrong place at the wrong time. Physical vulnerability refers to the susceptibility of individuals, households and communities to the physical environment in which they find themselves. It relates to aspects such as access to suitable land, land use planning, housing design, building standards, materials used for building houses, accessibility to emergency services and other related aspects. Physical vulnerability also relates to remotely located settlements, as well as to lack of access to services, infrastructure and information.

Social factors: Social factors of vulnerability are linked to the level of wellbeing of individuals, communities and society. It includes aspects related to level of literacy and education, the existence of peace and security, access to basic human rights, systems of governance, social equity, positive traditional values, knowledge structures, customs and ideological beliefs and overall organizational systems. These all contribute to social wellbeing with physical, mental and psychological health being critical aspects.

A lack of awareness and access to information can also result in increased levels of vulnerability. Disasters can happen because vulnerable people simply do not know how to heed early warnings, get out of harm's way or take proactive measures. In addition, individuals and communities may not know where to turn to for assistance when disasters strike.

Some groups are more vulnerable than others: those less privileged in class and cast structures, ethnic minorities, the very young, very old and other disadvantaged and marginalized segments of the population. Women's role in households (the responsibility for domestic life, essential shelter and basic needs) make them more likely to be even more burdened and especially vulnerable in times of disaster.

Social factors of vulnerability are characterized by increased criminal activity; higher incidence of HIV/AIDS; high rates of children dropping out of school; declining age of prison population; declining public health; deteriorating public infrastructure; and migration of skilled professionals. These are all symptoms of negative social processes which result in increased social vulnerability.

Ecological factors: Many disasters are either caused or exacerbated by environmental degradation. Deforestation leads to rapid rain runoff, which contributes to flooding. The creation of drought conditions and the relative severity and length of time the drought lasts is mainly a natural phenomenon. But drought conditions may be exacerbated by poor cropping patterns, overgrazing, the stripping of topsoil, poor conservation techniques, depletion of both surface and sub-surface water supplies and unchecked urbanization.

The key aspects of environmental factors of vulnerability can be summarized as:

- the extent of natural resource depletion
- the state of resource degradation
- loss of resilience of the ecological system
- loss of biodiversity
- exposure to toxic and hazardous pollutants.

Capacity: concept and definition

Capacity is another key concept in disaster risk reduction for which there is no universal definition. **Capacity.**

Capacity can be employed to prevent hazards: for example, traditional leadership can be used to negotiate with neighbours and avoid resource conflict. Capacity can also be used to mitigate impact of hazard events; in some cases community granaries are used to store surplus grains during bumper harvests. The stored grains are then used to avert food shortage during drought.

Disasters can happen in any society but often have greater impact on poor communities because they have little 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 recovery from a disaster. Capacities are those positive conditions or resources which increase the ability of a community to deal with hazards.

Coping capacity is the manner in which people and organizations use existing resources to achieve various beneficial ends during unusual, abnormal and adverse conditions of a hazard event or process. The strengthening of coping capacities usually builds resilience to withstand the effect of hazards.

Coping capacity is also the ability of a system, community or society potentially exposed to hazards to adapt or change in order to reach and maintain an acceptable level of functioning and structure. This is determined by the degree to which the social system is capable of organizing itself to increase its capacity for learning from past disasters for better future protection and to improve risk reduction measures.

Risk: concept and definition

When crossing a road there is a risk of being injured by a car. When flying, there is a risk of death if the plane crashes. During floods there is a risk of displacement of people, interruption of businesses, loss of property and risk of death. We all live with risk of personal harm, property loss, environmental damage and business interruption. Risk is part of our everyday lives.

Different people and disciplines define risk differently. Some define risk as the possibility of meeting danger or of suffering harm or loss. Others define risk as the expected losses when a hazard event occurs, including lives lost, persons injured, property damaged and economic activities or livelihoods disrupted. Still others define risk statistically as the probability that a negative event or condition will affect an individual in a given time and space.

Risk can be related directly to the concept of disaster, given that it includes the total losses and damage that can be suffered after a hazard progresses into a disaster: dead and injured people, damaged property and interruption of activities. A more universal and widely used definition of **risk** is the probability of harmful consequences or expected losses resulting from interactions between natural or human-made hazards, vulnerable conditions and lack of capacity.

This book uses the risk concept as summarized by 'risk formula', which will be explained later in this chapter (see Disaster Risk Reduction Frameworks).

Disaster risk reduction

Disaster risk reduction emphasizes a new global thinking in the management of disasters and disaster risk. **Disaster risk reduction** can be seen as the systematic development and application of policies, strategies and practices to minimize vulnerabilities and disaster risks throughout a society; to avoid (prevention) or to limit (mitigation and preparedness) adverse impacts of hazards within the broad context of sustainable development

Disaster reduction strategies include, first and foremost, disaster risk assessments combining hazard, vulnerability and capacity assessments and strengthening of institutional capacities and operational abilities. The assessment of the vulnerability of critical facilities, social and economic infrastructure, the use of effective early warning systems and the application of many different types of scientific strategy and technical and other skilled abilities are essential features of disaster risk reduction.

Disaster risk management

Disaster risk management can be defined as the range of activities designed to maintain control over disasters and emergency situations and to provide a framework for helping at-risk persons to avoid or recover from the impact of the disaster. It can be further defined as the body of policy and administrative decisions and operational activities that are appropriate to the various stages of a disaster at all levels.

Disaster risk management is a continuous and integrated multi-sectoral and multidisciplinary process of planning and implementation of measures aimed at preventing or reducing the risk of disasters; mitigating the severity or consequences of disasters; emergency preparedness; and rapid and effective response to disasters and post-disaster recovery and rehabilitation. Disaster management entails the integration of a multitude of activities and functions in order to safeguard lives and property against possible hazards. It further focuses on the reduction of risk and vulnerability in communities most at risk to a particular hazard.

Disaster history and approaches in Ethiopia

Disasters have been experienced throughout history. In modern times, Ethiopia has experienced disasters triggered by both natural processes and human activities. The famine of 1984 is one of the worst cases of disaster in Ethiopian history and probably the whole of Africa. Most recently, in July 2006, the southern and eastern region of the country experienced one of the worst flooding events in living memory.

Reflecting predominant thinking in other parts of the world, in the past the national approach to disaster management in Ethiopia has been characterized by reactive, top-down, event-focused approaches with emphasis on short-term activities to contain disaster events through emergency responses.

Reactive responses to hazard

In this approach, the hazard event triggers relief efforts aimed at minimizing suffering of the affected population and recovery measures aimed at restoring the community to the pre-disaster condition. But restoration of communities to pre-disaster conditions is seldom achieved. Even if it is achieved, there is no evidence to show that affected communities cope better with subsequent disasters. The emphasis is on short-term activities to contain the disaster event. They focus on dramatic and threatening aspects to the exclusion of other, less spectacular, effects. For example, besides threat of starvation during drought, affected populations also face risk of disease epidemics and children dropping out of school. In most cases, however, food aid is the main emphasis of relief efforts.

There is a clear relationship between the overall development approach and the style of disaster management adopted in a country. The top-down development approach, adopted in the past, influenced the way the country responded to disasters. There is also evidence that development projects designed without adequate consultation with target communities contribute to increased vulnerability.

Treating disaster as caused mainly by natural occurrences

This takes as its starting point the assumption that disasters are characteristics of natural hazards; disasters are perceived to be irrevocably caused by the impact of natural hazards on people and their activities. Disaster is perceived as an accident; as an unforeseen consequence of unpredictable and uncertain natural forces; as an inevitable occurrence; as emergency events over which we have no control. 'Outside experts' consider communities 'victims' and 'beneficiaries' of assistance.

Alternative approaches to disaster management

Both the international community and national actors in Ethiopia have learnt the limitation of short-term relief-oriented responses to disaster since the famine of 1984. Underlying causes of disasters are increasingly being focused on in an effort to seek long-term solutions. This is being pursued to break the 'vicious cycle' - recurrent disasters find communities in the same or even worse-off susceptible conditions and therefore cause even more damage.

The shift in approach has evolved together with the emergence of participatory development approaches. As various agencies started seeing the advantage of involving communities in identification and implementation of development projects for sustainability, this influenced how agencies respond to disasters.

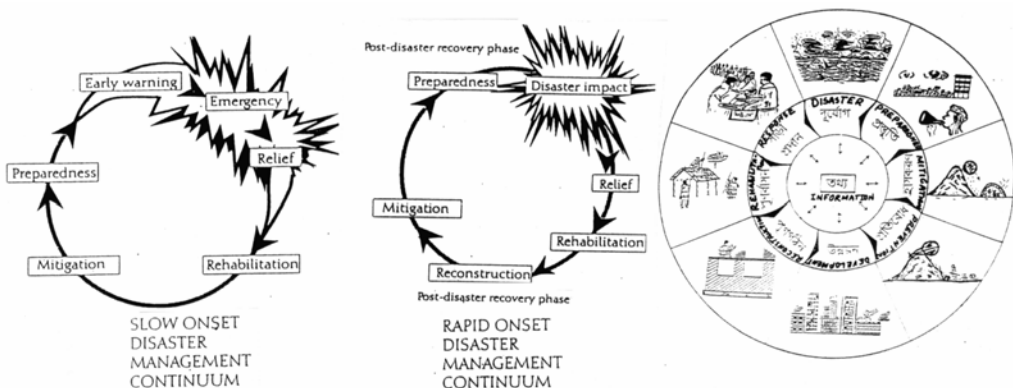
Disaster management models

Disaster management covers a broad range of interventions undertaken before, during and after a disaster to prevent or minimize loss of life and property, minimize human suffering and hasten recovery. The way national governments and their development partners respond to disaster events or situations have been based on how underlying causes have been understood.

In the past, disasters were looked at as being caused by the hazard event itself and the response was geared towards responding to events as they happen. As disaster events became more frequent and the magnitude of resulting losses escalated, it became clear that effective strategies to manage negative impacts of disaster needed to look beyond the hazard itself. Alternative approaches that looked at what made people susceptible to hazard events emerged. Five frameworks, or models, have been used by different agencies at different times to manage disasters and these are discussed below. The various agencies working in Ethiopia may have used - or are still using - one or a combination of these frameworks.

Disaster Management Continuum Model

This model focuses on the disaster event and emergency response. The underlying assumption is that disasters are inevitable, the sequence of events is cyclical and interventions fit into various phases. This model has been used to design interventions around different phases of the 'disaster cycle'.



The Continuum Model prescribes a sequential series of actions to gain control over disaster events. Although cyclical or closed-loop, when used in the field of management the model indicates integration of feedback and learning into the system. Common interpretations of the disaster management cycle focus more on activities immediately before and after the onset of the disaster event.

The main shortcoming of this model is to treat disaster as inevitable. And yet, if hazard and vulnerabilities are managed well, disaster situations can be avoided.

The model is reflective of the traditional approach to disaster management and activities are planned around the disaster-triggering hazard. Allocation of human, material and technical resources is in emergency response, disaster preparedness and structural mitigation.

In Ethiopia prior to 1984, government and non-governmental agencies have used this model where physical projects for preparedness and mitigation were designed and implemented in different sectors by outside 'experts' in development units. During disasters, development projects were suspended and humanitarian staff hired to manage relief operations, followed by externally-driven recovery projects. Communities have been treated as helpless victims of events beyond their control and their own existing capacities often undermined. In most cases the communities lacked skills to sustain the projects after donors pulled out.

Pre-during-post Disaster Model

This is similar to the previous model in that it looks at disaster management interventions in terms of what can be done in phases. The intervention activities revolve around the hazard. However, unlike the Continuum Model, it assumes that there is a clear beginning and end to disasters, and that activities for preparedness, mitigation and recovery should fit in pre-, during and post-disaster phases, respectively.

The way some development agencies have responded to disasters in Ethiopia in the past fits this model. For example, in drought-triggered disasters agencies started relief operations only when cases of starvations were highlighted in the press. Immediately after rainfall resumed the relief operations were stopped on the assumption that the disaster was over, yet time was required for local food production to resume.

Contract-Expand Model

This is a disaster management model used by communities in South Africa. It is so called because it assumes that disaster intervention measures (prevention, mitigation, response and recovery) can be carried out simultaneously in a disaster-prone community. However, the relative weighting of each component 'contracts' or 'expands' depending on the relationship between the hazard and the

vulnerability of the community. This model emerged as an alternative to the Continuum Model and aimed at linking relief and development efforts.

This model assumes that:

- disasters occur when a hazard exceeds a community's capacity to manage it (i.e. when its vulnerability has increased)
- all components of disaster reduction can be carried out concurrently, but with different emphases
- the relative weighting of the activities depends on the relationship between the hazard and the vulnerability of the community at-risk and the technical or operational mandate of the organizations involved.

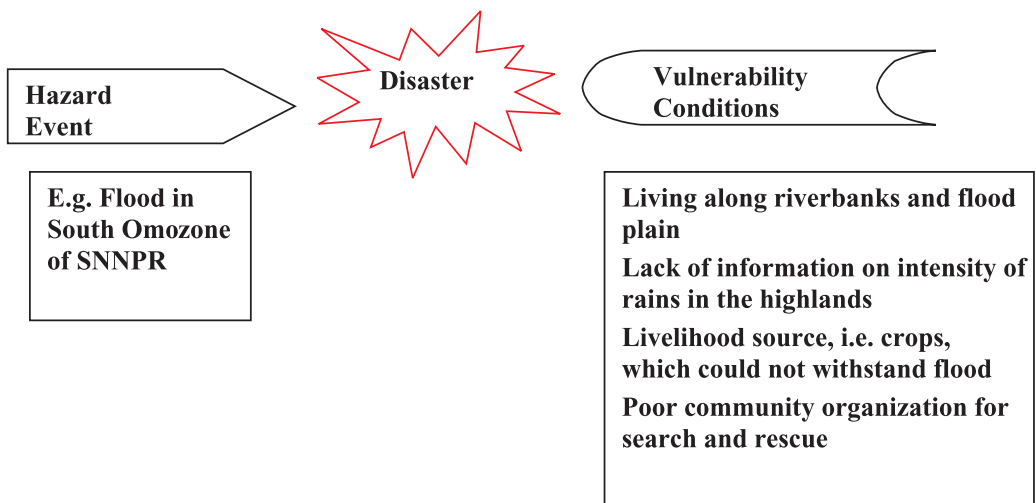
In the last five years, most international non-governmental development agencies in Ethiopia have started linking their relief and development efforts. The communities in disaster-prone areas are increasingly being viewed as having some capacity on which development effort should build. The development and humanitarian departments of most of the development agencies are also collaborating more than ever before as their complementary roles are becoming clearly understood. Relief work is also being viewed as a necessary, albeit only temporary, measure and is being targeted at vulnerable groups as opposed to blanket coverage. This is continued on a small scale, even after disaster emergencies are over, alongside development interventions.

Like the Continuum Model, the Contract and Expand Model also views disaster as inevitable and is its main shortcoming. It is also externally driven as development agencies determine how to scale-down different interventions on

the basis of their own assessments. These assessments tend not to give due consideration to underlying causes of vulnerability but mainly focus on establishing who is vulnerable and quantifying their number to determine the scale of interventions.

The Crunch and Release Model

This model shows that vulnerability (pressure), which is rooted in socio-economic and political processes, has to be addressed (released) for disaster risk reduction. It shows that a disaster happens only if a hazard meets conditions which make people and non-human elements susceptible to negative impacts of the hazard.



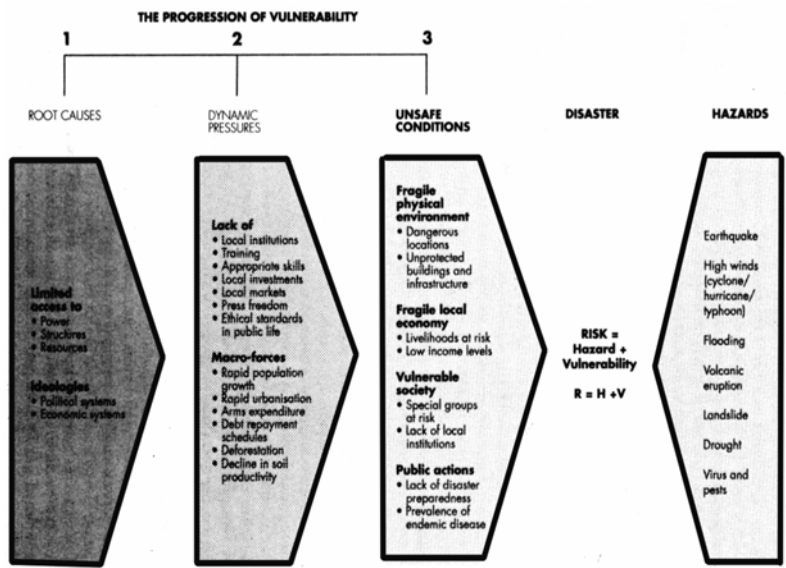
Hazard events in a given area may affect different categories of people differently on the basis of their gender, age or economic class. Besides affecting people, hazards also affects various non-human components of the environment on which people’s lives rely. These are called ‘elements’ and those that are susceptible to negative impact of a hazard as ‘**elements at risk**’. These elements includes service-providing facilities, such as schools and hospitals, as well as houses, social groups and networks, assets such as crops and livestock and the natural environment.

In the Crunch Model the elements at risk are assessed to establish the causes of their susceptibility to hazard impacts. The outcome of the assessment will give a picture of what pushes people to unsafe conditions that make them susceptible to a disaster. These ‘push factors’ are classified into ‘root causes’ and ‘dynamic pressure’ which would be released to make the vulnerable community resilient. The progression of vulnerability that pushes people into unsafe locations is used to explain disaster occurrence.

Dynamic pressure results from structures which are responsible for pushing the vulnerable groups into unsafe locations. Local landowners, commercial companies and local government are examples of such structures. They impact on the poor through processes such as policies, practices and decision-making.

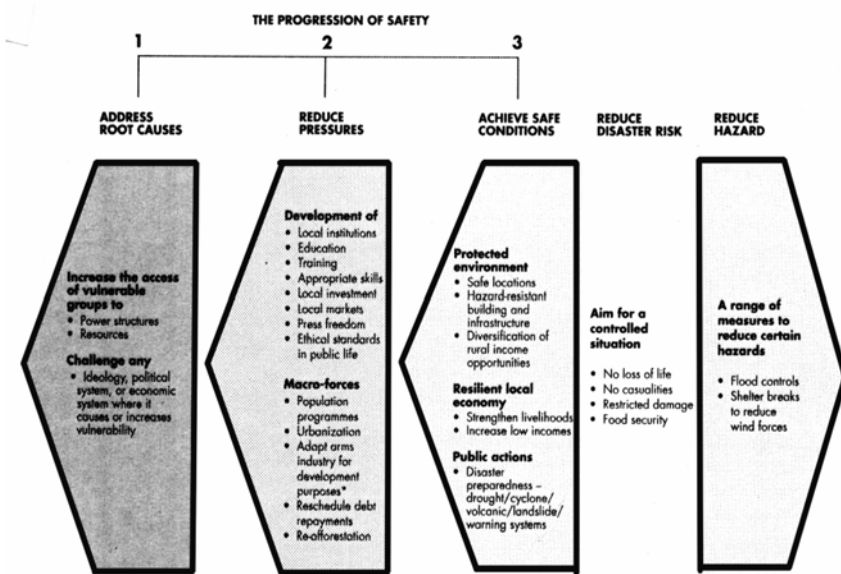
For structures and processes to create dynamic pressure, they need to be based on or influenced by underlying causes, such as political ideology, economic principles and culture. These underlying causes influence the behaviour of those in positions of power, whose decisions and actions can create the pressure that push people to unsafe conditions.

The Crunch Model shows the relationship between hazards and a complex condition of vulnerabilities (in a situation of low capacity) in causing a disaster.



Adapted from Blaike, P., Cannon, T., Davis, I., & Wisner, B. (1994). *At Risk: Natural Hazards, Peoples Vulnerability, and Disasters*. London: Routledge

The Crunch Model shows the strategies for the reduction of vulnerabilities. The outcome will be 'safe' as opposed to 'unsafe conditions', 'resilient or capable communities' as opposed to 'vulnerable communities' and 'sustainable livelihoods' as opposed to 'unsustainable livelihoods'. The second diagram, below, explains how to avoid disaster situations by working on the underlying causes and dynamic pressures that push communities into unsafe locations.



Adapted from Blaike, P., Cannon, T., Davis, I., & Wisner, B. (1994). *At Risk: Natural Hazards, Peoples Vulnerability, and Disasters*. London: Routledge.

The Crunch and Release Model addresses the limitations of the first three models. It provides a framework for reducing risk by looking at not only the hazard but other vulnerability conditions and their underlying causes. It brings in aspect of social analysis to identify the root causes of vulnerability and emphasizes human elements.

In this model, capacity is subsumed to be part of vulnerability. Whereas it is true that capacity is the positive side of vulnerability, looking at them as separate elements during assessment will bring out more information on existing capacity. To address this concern the *Disaster Risk Reduction Framework* (see below) has been developed.

Comparison of disaster and risk management models

The different models or frameworks can be categorized into two groups on the basis of their focus:

Disaster management models: Those which focus on disaster events. The interventions are mainly structural projects aimed at preparing for, mitigating and facilitating recovery from the hazard impact. The Disaster Continuum, Pre-during-post and Contract and Expand models fall in this category.

Risk management frameworks: Frameworks which look at what could be done to prevent hazards from progressing into disasters. The human aspects of vulnerability are given more attention through social analysis. The Crunch and Release Model and Risk Reduction Framework fall in this category.

Character	Continuum Model	Pre-during-post Model	Contract and Expand Model	Crunch and Release Model	RRD Framework
Assumptions	The activity is cyclical	The activity is very simplistic and linear	The extent of activities expand and stretch if there is crisis	Disaster happens when vulnerable groups are pushed into unsafe conditions and capacity is insufficient to cope with the hazard event	Risk is greater if the hazard and vulnerability is greater and capacity low
Concepts	Disaster is a natural process and activities are identified (there is no beginning and end)	Disaster will happen and activities are identified (there is a beginning and end)	Crisis event dictates t		

Disaster Risk Reduction Framework

Disasters and development are correlated; development efforts can either contribute to reducing or increasing exposure of communities to disaster risk. For example, constructions of many large water-pans in pastoralist rangelands of Borana region in the 1970s led to land degradation and increased pastoralist vulnerability to impact of drought; conversely introduction of quick-maturing and drought-resistant varieties of crops have helped agricultural communities to cope with drought.

To ensure that all development efforts are disaster-proof and contribute to reducing level of risk, it is important to integrate risk reduction efforts in development processes. Disaster risk reduction provides a framework for integrating risk reduction in the context of sustainable development. When natural or human-made hazards meet condition of vulnerability in a community, it is expected to lead to deaths, injuries and property losses and cause damage to the environment and physical infrastructure. Risk refers to the likelihood of suffering these consequences. To assess risk, the perception of the affected population needs to be clearly understood.

Acceptance of risk is necessary to motivate the affected population to contribute or participate in risk reduction efforts. Risk levels could be established through assessing the potential hazards, vulnerability conditions and existing capacities within the hazard-prone community. This process is referred to as **risk assessment**.

Relations between risk, hazard, vulnerability and capacity

The concept of risk is often confused with hazard and vulnerability. But risk, hazard and vulnerability are very different terms, with their own individual meanings.

Hazard is the potential for causing risk. Risk is the probability or chance of an undesired event happening as a result of a hazard exposed by living in vulnerable conditions. Hazard, vulnerability and capacity are the three variables of risk.

Vulnerability is lack of capacity to withstand the prevailing risk. This means there is a direct link between the capacities of those affected to withstand, cope and recover from the adverse effects of a hazard using only their own resources, and what constitutes disaster risk.

Simply put, disaster risk is the product of hazard and vulnerability over capacity. The *Risk Management Formula* illustrates their interaction:

$$\text{Disaster Risk (R)} = \frac{\text{Hazard (H)} * \text{Vulnerability (V)}}{\text{Capacity (C)}}$$

The formula illustrates that the greater the potential occurrence of a hazard and the lesser the capacity to cope, the greater the risk. It makes clear that risk can be reduced either by the reduction of the effects of a hazard or the vulnerabilities to it.

There is a global shift in disaster management, from reactive response to disaster events to proactive management of disaster risks by reducing vulnerability as well as preventing or mitigating hazards. Disaster risk reduction fits this new thinking. It entails systematic development and application of policies, strategies and practices to minimize vulnerability throughout society within the wider context of sustainable development. For the purpose of our understanding, sustainable development is a development process which meets the needs of the current generation without jeopardizing the needs of the future generation. We need to design development interventions that promote sustainable use of natural resources, develop human capital, strengthen social network and support systems and improve physical infrastructure for basic service delivery and access to market.

Many disasters in Ethiopia could be avoided, or at least made less destructive, by reducing the risks that people face. For example, if there was a way of warning the lowland communities of intense rainfall in the highland, flood damage would be minimized. Efforts made to reduce disaster risk have been proven to be effective and less costly in countries like India. In the case of the flood in Ethiopia in 2006, if investment had been made in a simple flood warning system, the communities would have relocated to higher ground in time, avoiding loss of life and minimizing loss of property. Consequently the cost of relief effort would have been less.

To achieve sustainable development which contributes to reduction of vulnerabilities among hazard prone regions of Ethiopia, the Risk Management Formula and the Crunch and Release Model could provide useful guidance to assess disaster risk and identify risk reduction measures. Whereas the Risk Management Formula provides a holistic approach to disaster risk assessment, the Crunch and Release Model provides a good basis for analysis of the underlying causes of vulnerability. The risk assessment outcome will be used to integrate prevention and mitigation measures in development plans, as well as developing comprehensive contingency plans for effective responses when need arise.

How the risk assessment feed into risk reduction measures

1. Hazard assessment → Hazard profile

Characteristics
Frequency
Forewarning
Duration
Causes
Effects

Is hazard preventable? - If so identify prevention measures
If the hazard is not preventable- identify measures to minimize its impact and develop contingency plan for effective response when need arise

2. Vulnerability assessment →

Who and what is vulnerable (elements at risk)? Level of vulnerability: high, moderate, low Reasons for vulnerability levels: identification of underlying causes and dynamic pressures

Can vulnerability be eliminated e.g. through relocation if the vulnerability level is unacceptable?
What can be done to reduce vulnerability if risk level is acceptable - measures should address different dimensions of vulnerability?

3. Capacity Assessment →

What are existing capacities?
How are the existing capacities being used to cope with hazards?
What are the gaps in existing capacities?

What is needed for existing capacities to effectively enable communities to cope with disaster risks?
What can be done to address the above capacity gaps?



Why disaster risk reduction?

Because incidence of disasters and number of people affected are increasing

The incidence, scale of economic impact and number of people affected by disasters have all increased over the last few decades. Disasters lead to loss of human lives, destruction of communities' social structures and support systems and have lasting impact on people's wellbeing and physical infrastructures. It is estimated that worldwide, disasters affected two billion people in the 1990s, triple the number affected in the 1970s. Global climate change is expected to increase incidences of extreme weather events, which may result in even more frequent and severe disasters.

Because disasters are costly

The global economic losses caused by disasters increased from US\$ 138 billion in the 1970s to US\$ 628 billion in the 1990s. In the last decade, disasters are estimated to have caused damage costing an average of US\$ 69 billion annually. Projections from the current trend show that if nothing is done, by 2050 annual economic losses from natural hazard-triggered disasters will reach US\$ 300 billion.

Because disasters increase poverty

Disasters in low human development countries are followed by an increase in the number of people living below the poverty line. Climate change is expected to increase incidences of extreme weather events, which may result in more frequent and intensive disasters pushing ever more people into poverty.

In Africa, besides reversing development gains, disasters are also both causes and consequences of poverty. In Ethiopia for example, a study conducted in 1999 showed that during the previous 20 years, 78 per cent of rural households had been hit by harvest failures.

It is increasingly becoming clear that in Ethiopia poverty and disasters are closely correlated. While the poor suffer the worst consequences of disaster events, they also become poorer after each disaster. Disasters therefore push the poor deeper into poverty while plunging those on the edge into poverty.

Because disaster responses are not effective in addressing underlying causes

Rain failures between 1971 and 1975 in Tigray and Wollo led to the loss of a quarter of a million lives and wiped out half the livestock. In 1984-85, devastating drought led to loss of an estimated one million human lives, with eight million

people being affected across the country. While improvements in disaster response have enabled the country to avoid mass starvation scenarios, as seen in 1984, effective responses in themselves have failed to forestall subsequent disaster occurrences.

Because inappropriate disaster response aggravates the problem

The international response to disasters before the 1990s was often reactive and mainly focused on provision of basic subsistence to affected population. This approach, though costly, has failed to address the vulnerability of affected populations to subsequent disaster events or situations. In some instances, emergency response has led to increasing risk levels of affected population through exposure to other hazards, as well as undermining recovery.

How emergency response can increase vulnerability

The Somali region of Ethiopia is prone to hazards such as drought, conflict and disease outbreaks. In 1999-2000, rain failure complicated by recurrent regional conflicts sparked a famine that is estimated to have killed more than 10,000 people. The humanitarian response only started after the death rate had peaked and most pastoralists had already lost their livestock. The start of relief operations attracted populations to temporary settlement on the outskirts of towns such as Gode and other major distribution centres. The main focus of the relief operation was food aid. This led to high concentrations of needy people gathering around relief centres but there was no provision of sanitation, which posed a risk to health. The poor health and sanitation conditions in and around relief centres seemed to contribute to a resurgence in child mortality.

With little or no help to re-establish their livelihoods, the population remained in the temporary settlements for two or more years after the disaster. They were trapped in a situation of chronic dependency on food aid. Relief food sold in the local market undercut locally produced food and undermined livelihoods of farmers and traders.

Source: White et al (2004) Disaster risk reduction: a development concern. A scoping study on link between disaster risk reduction, poverty and development. Overseas Development Group, University of East Anglia, Norwich, UK

Because disasters pose a significant threat to development

The increasing incidence of disasters has led to an increase in the cost of response interventions. National governments often reallocate development funds to meet the cost of relief operations. The high visibility given to disasters by the world's media has also made it easier for development agencies to fundraise for disaster response. Bilateral and multilateral donors also spend billions of dollars to meet subsistence needs of disaster-affected populations. While the international response has significantly contributed to a reduction in loss of life following disaster events, the increasing trend of these events calls for proactive measures to reduce disaster risk. This will reduce the cost of relief in the future.

Because investment in disaster risk reduction is beneficial

Investment in risk reduction has been proven to reduce the cost of subsequent response. Experience from Asia has shown that investment of one US dollar in disaster risk reduction will translate into cost-savings of up to ten US dollars in subsequent disaster response.

Key issues in disaster risk reduction

Current international and national disaster risk reduction strategies are guided by the Hyogo Framework. This outlines strategic objectives and key gaps which need to be addressed between 2005-2015 to enable the attainment of disaster resilient nations and communities. This is explored in more detail in Chapter 5.

Key elements of risk assessment

Details of risk assessment are provided in Chapter 4. However, the following key elements should be given attention:

- *Clear understanding of risk factors* among different regions, livelihoods and communities. This could be compiled through baseline data collection standardization and sharing.
- *Awareness raising* on the need to manage disasters risk at all levels to influence behaviour change among at-risk individuals and communities and responsible government agencies.
- *Knowledge management on disasters and disaster risks*. This could be collected and compiled through action research as well as documentation of indigenous technical knowledge.
- *Political goodwill* This entails institutional frameworks and legislation and policy formulation that promote a culture of resilience through equitable resource allocation to disaster risk reduction. The need for multi-agency and multi-sectoral approaches to disaster risk reduction should be emphasized. Vulnerable communities should play a central role in disaster risk reduction efforts.
- *Mainstreaming disaster risk reduction in development plans* Development projects should be informed by risk assessment in target communities. This will ensure that the interventions contribute to risk reduction rather than to increased susceptibility to negative impacts of hazards.
- *Emergency preparedness plans/contingency plans* for effective response to disaster when they strike. Baseline data collection and use of past and probable disaster scenarios could be used to develop contingency plans. Credible and effective early warning systems.