Brussels Rural Development Briefings

A series of meetings on ACP-EU development issues

Agricultural resilience in the face of crisis and shocks

This Reader was prepared by
Isolina Boto, Manager, CTA Brussels Office
Rajul Pandya-Lorch, Head of the 2020 Vision Initiative, IFPRI

Briefing n. 30

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March 2013

This Reader was prepared by:

Isolina Boto, Manager of CTA Brussels Office

Rajul Pandya-Lorch, Head of the 2020 Vision Initiative, IFPRI

Ronalee Biasca and Filippo Brasesco, Research Assistants, CTA, Brussels Office

Djhoanna Cruz, Administrative Coordinator, IFPRI

Editing / layout by Thérèse Burke, CTA

CTA and partners would like to thank IFPRI (www.ifpri.org) for their contribution to this Briefing.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE
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Supported by the CGIAR

The information in this document was compiled as background reading material for the 30th Brussels Development Briefing on Agricultural resilience in the face of crisis and shocks. The Reader and most of the resources are available at http://brusselsbriefings.net

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1. Context

Vulnerable populations are minimally resilient to shocks, whether caused by humans or natural disasters. Emerging threats and new trends—such as climate change, population growth, aging societies, urbanization, infectious as well as non-communicable diseases, and environmental degradation—are bound to aggravate the consequences of shocks on already vulnerable populations by triggering damage, loss, and displacement. Such threats pose an additional hurdle to the stated policy objective of the international community to eradicate hunger and malnutrition. The costs of shocks extend beyond short-term impacts. As malnutrition affects people's physical health, it can directly reduce their capacity to work and to engage in more productive and innovative income-generating activities.[1]

Three out of four poor people in developing countries live in rural areas (UNDP, 2007). Of these, most live in fragile environments such as arid or mountainous areas often at long distances from markets and other services. They have few resources at their disposal and have inadequate access to skills and technologies that could help them making best use of those resources. Therefore their income earning options are limited and their ability to diversify or adapt when circumstances change is constrained. Poor people also often live in risk-prone areas such as on steep slopes, river embankments or flood plains because they cannot afford to live in safer areas. The impacts of drought and floods are often exacerbated by unsustainable development activities such as deforestation or a combination of increasing population pressure, political tensions and economic changes that lead to practices that cause environmental degradation. Conflict is fuelled by easy access to weapons and the increasing competition over scarce resources such as pasture and water. In the event of hazards, the poor and their livelihoods tend to be the hardest hit. The livelihoods of marginal and small farmers, artisans and fishermen are affected through the loss of assets, loss of food sources and loss of employment or income-earning opportunities. When disaster strikes they may be forced to take desperate measures to survive such as abandoning their homes or selling vital land or livestock or tools on which their livelihoods depend because they have limited or no savings or other alternatives. This undermines their future recovery and each shock can drive them deeper into poverty. The poor are often politically marginalized and have little voice in the policy or institutional decisions that affect them. Services, such as schooling, health, extension, transport and markets are often inadequate or unavailable to people living in more remote areas. They lack safety nets such as savings, insurance policies or government services to warn and protect them from disasters. Growing uncertainty is a further characteristic of the lives of the poorest.

Poverty, vulnerability, shocks, and disasters are closely related and cannot be viewed in isolation from one another.[2] Disasters in a vulnerable population can significantly compromise development progress, reduce the effectiveness of aid investments and halt or slow progress towards achieving the Millennium Development Goals (MDGs).

2. Exposure to Risks: facts and trends

As highlighted by the *United Nations International Strategy for Disaster Reduction*, the environment and disasters are inherently linked because of the strong dependency and interconnectedness of natural resources with the environment.[3] Recorded disasters alone from 2001 to 2010 affected, on average, 232 million people per year, killed almost another 107.000 people, and caused US$108 billion in economic damages.[4] In addition, countless small-scale, unreported disasters put a cumulative strain on health, lives and livelihoods. Local risk landscapes are rapidly changing, with frequent and intense weather events, and societal and environmental stresses becoming increasingly uncertain and unpredictable.

Natural hazards continue to cause significant loss of life in Asia and the Pacific. From 1970 to 2010, 1.7 million hazard related deaths were recorded in the region. This accounted for 51% of total global deaths as a consequence of natural hazards, slightly lower than the region's average 57% share of total global population over the same period. Relative to total land area, however, loss of life has been much greater. Average annual deaths per 1,000 square kilometres averaged 0.5 globally from 1971 to 2010 but was double that, averaging 1.1 deaths per 1,000 square kilometres, in Asia and the Pacific. Some progress has been made in reducing loss of life from cyclones/typhoons through the implementation of highly effective early warning systems. However, there has been little apparent progress in reducing overall levels of mortality in Asia and the Pacific, and periodic disasters—including several earthquakes and tsunamis over the past decade—continue to cause major loss of life.[5]

Disaster risk can increase or decrease over time according to a country's ability to manage its vulnerability and risk governance capacities. In recent decades, countries in all regions have strengthened their capacities to reduce mortality risks associated with major weather-related hazards such as tropical cyclones and floods. Despite more and more people living in flood plains and along cyclone-exposed coastlines, mortality risk relative to population size is falling. In East Asia and the Pacific, for example, mortality risk is now only a third of what it was in 1980.

In contrast, many countries are struggling to address other risks. **Economic loss risk** to tropical cyclones and floods is growing as exposure of economic assets increases, outstripping reductions in vulnerability. Losses suffered by low-income households and communities due to frequently occurring extensive disasters are often under-recorded and are increasing rapidly. The improvement in risk governance capacity and reduction in vulnerability in low- and middle-income countries as they develop, are insufficient to address the run-away increase in asset exposure, particularly in countries that are experiencing rapid economic growth.

Amidst global uncertainty and change, the *2011 Global Assessment Report on Disaster Risk Reduction* [6]has some good news. **Mortality risk associated with major weather-related hazards is now declining globally**, including in Asia, where most of the risk is concentrated. In most of the world, the risk of being killed by a tropical cyclone or a major river flood is lower today than in 1990.

This trend is particularly encouraging when compared to the rapid increase in population exposure to such hazards**. Since 1970, the frequency of tropical cyclones has not increased, but 'at risk' populations have grown rapidly, with global physical exposure to tropical cyclones almost tripling.**

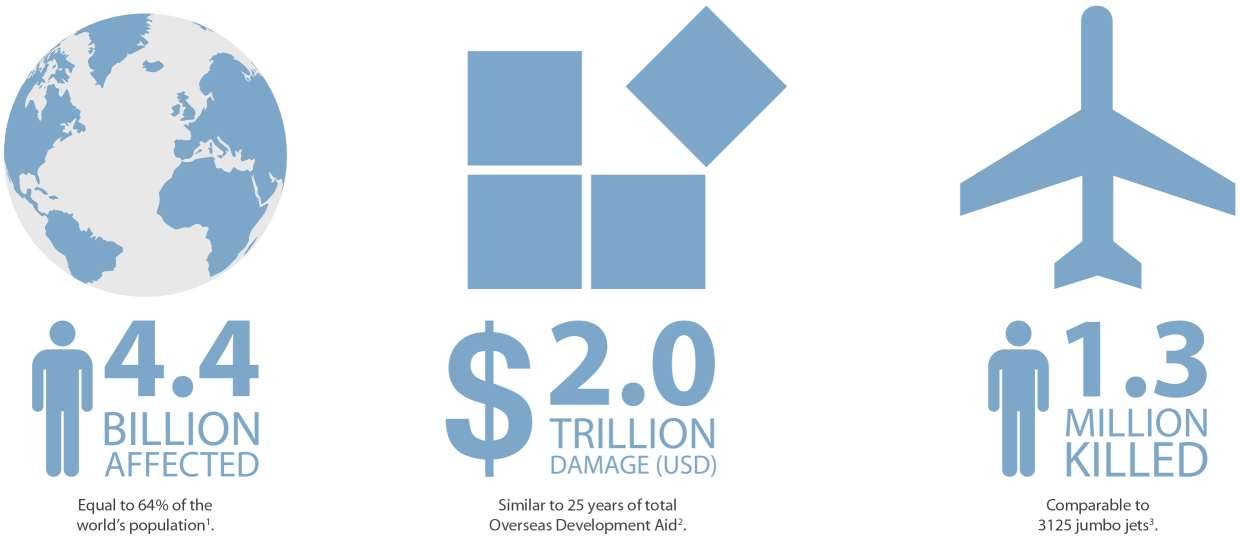
Mortality risk for all weather-related hazards continues to be concentrated in countries with low GDP and weak governance, and mortality is still increasing in countries with weak risk governance capacities.

Rapid economic growth in many low- and middle-income countries has improved human development and reduced poverty for millions of people. This is matched, however, by an equally rapid increase in the exposure of economic assets to physical hazards. Particularly in higher-income countries, the risk of losing wealth in a disaster is now increasing at a faster rate than that wealth is being created. Although countries are strengthening risk governance capacities and reducing vulnerability, this is not happening quickly or effectively enough– in general increases in exposure have meant increases in risk.

The ability of countries to maintain a sustainable human development (SHD) course over time depend on their accumulation of endogenous capacities in the form of *institutions,*

knowledge and *capital assets* (economic, human, natural and relational capital). In fact, in order not to deviate from their development paths, countries must permanently innovate and increase capacities in their key development-related processes: production of goods and services and insertion in the world economy; intervention on nature; and social consumption. [7]

Figure 1: Impacts of disasters since the 1992 Rio de Janeiro Earth Summit



Source: UNISDR. December 2012. http://www.unisdr.org/files/27162_infographic.pdf

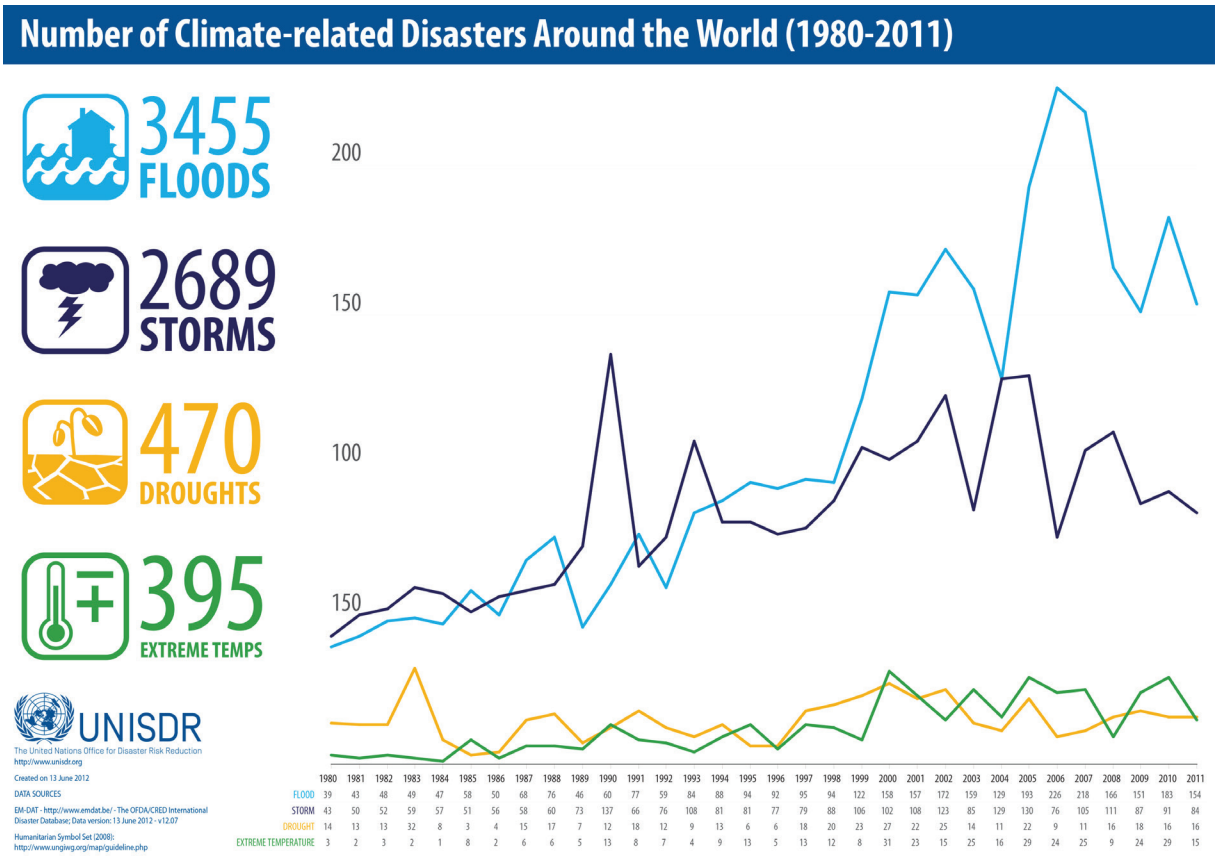
2.1. Exposure to floods and tropical cyclones

Between 1970 and 2010, the world's population increased by 87 percent (from 3.7 billion to 6.9 billion). In the same period, the average numbers exposed to flooding every year increased by 114 percent (from 32.5 to 69.4 million annually). Relatively speaking, ever more people are living in flood plains, suggesting that the economic advantages of living in such an environment must outweigh the perceived risks of flooding, although other social and political factors explain result in disadvantaged groups having to live in high risk areas.

Populations in cyclone-prone areas are also growing, highlighting the attractiveness of tropical coastlines for tourism as well as for economic and urban development in general. Global physical exposure to tropical cyclones almost tripled (increasing by 192 percent) between 1970 and 2010.

Low- and lower-middle-income countries not only have the largest proportion of their population exposed to floods, but their exposure is also growing faster than in middle-income and Organisation for Economic Co-operation and Development (OECD) countries. More than 90 percent of the global population exposed to floods live in South Asia, East Asia and the Pacific, but exposure is growing most rapidly in sub-Saharan Africa. In contrast, exposure is increasing only marginally in OECD countries and it is stable in eastern and south-eastern Europe and Central Asia, reflecting a broader demographic trend.[8]

Figure 2: Number of climate-related disasters around the world (1980-2011)



Source: UNISDR. June 2012[9].

Estimated economic loss risk associated with floods and tropical cyclones is increasing in all regions. The proportion of the world's GDP exposed to tropical cyclones increased from 4.13 percent in 1970 to 4.47 percent in 2010, while in absolute terms this tripled to more than US$1.9 trillion. Increases in economic loss risk associated with tropical cyclones were highest in high-income countries where they went up by 262 percent. Thus economic strength has failed to translate into lower economic loss risk, even in OECD countries. Of extensive disaster losses, i.e. low severity losses associated with high-frequency events, almost 97 percent are weather-related. Although extensive disasters do not cause significant fatalities, they are responsible for a large proportion of damage to local infrastructure and the housing and livelihoods of low-income households and communities. The exponential increase in damage associated with highly localized flooding, landslides, fires and storms in low- and middle-income countries indicates how risk is constructed alongside economic growth. The number of houses damaged relative to population growth in 21 countries and states has increased by approximately six-fold since the 1990s, far faster than the increase in economic loss risk due to major hazards[10] reflecting how the risks generated by rapid economic growth are transferred to low-income households and communities who least enjoy its benefits.

Figure 3: Exposure to tropical cyclones from observed events (in million people per year)

Region	1970-1979	1980-1989	1990-1999	2000-2009
East Asia and the Pacific (EAP)[11]	36.6	42.2	44.3	53.7
Latin America and the Caribbean (LAC)	1.1	1.6	1.2	5.2
Middle East and North Africa (MENA)	0.0	0.0	0.0	0.1
OECD countries (OECD)	26.2	27.2	39.7	53.2
South Asia (SAS)	1.5	7.8	11.1	7.6
Sub-Saharan Africa (SSA)	0.5	0.9	1.5	2.7
World	**65.9**	**79.8**	**97.8**	**122.5**

Source: The World Bank[11]

Figure 4: Flood exposure region (in million people per year)

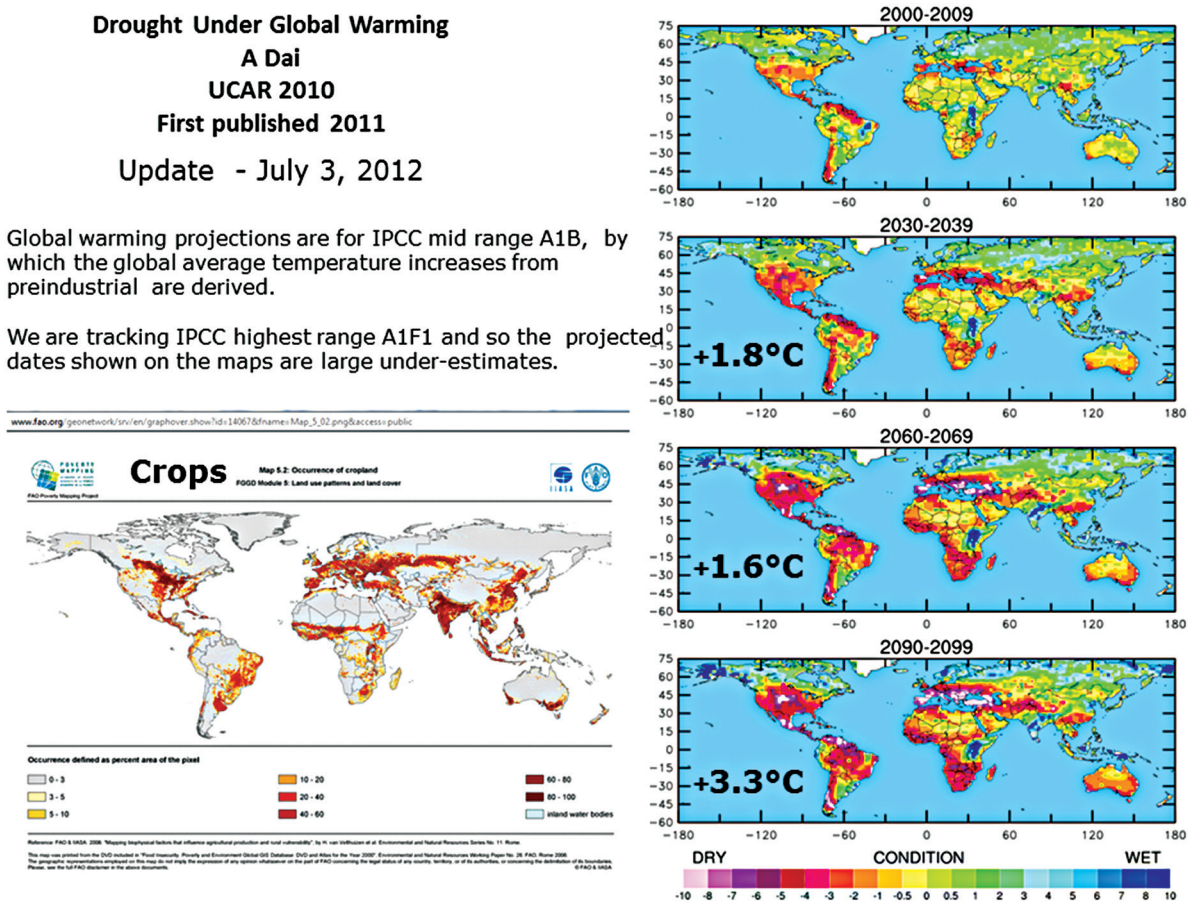
Region	1970	1980	1990	2000	2010
East Asia and the Pacific (EAP)	9.4	11.4	13.9	16.2	18.0
Europe and Central Asia (ECA)	1.0	1.1	1.2	1.2	1.2
Latin America and the Caribbean (LAC)	0.6	0.8	1.0	1.2	1.3
Middle East and North Africa (MENA)	0.2	0.3	0.4	0.5	0.5
OECD countries (OECD)	1.4	1.5	1.6	1.8	1.9
South Asia (SAS)	19.3	24.8	31.4	38.2	44.7
Sub-Saharan Africa (SSA)	0.5	0.7	1.0	1.4	1.8
World	**32.4**	**40.6**	**50.5**	**60.5**	**69.4**

Source: The World Bank[12]

2.2. Drought: the hidden risk[13]

Compared to other hazards, risks associated with drought remain poorly understood and badly managed. Meteorological drought is a climatic phenomenon rather than a hazard per se. It only becomes hazardous when it is translated into agricultural or hydrological drought, depending on factors other than just rainfall.

Figure 5: Drought Under Global Warming



Source: Dai A. 2010.[14]

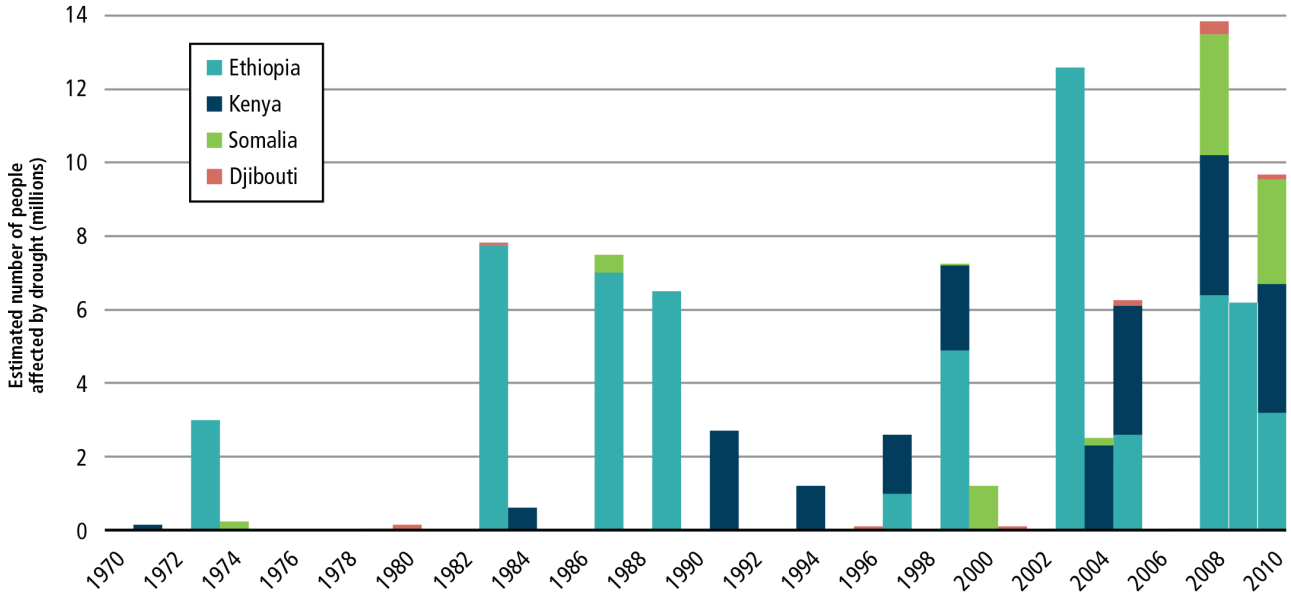
One third of all African people live today in drought-prone areas, and 250 million are exposed to drought every year.[15] This means that the already existing livelihood challenges of Africa are being compounded by the current climate variability and weather shocks on the continent, potentially undermining development interventions. The environmental decline of Africa's natural systems such as the Sahel, the Lake Chad Basin, and the Congo Basin has tremendous repercussions for future generations through impacting local drought risk. Worryingly, the depletion of natural resources — *land, water, and forests* — further exacerbates the declining trends in crop and livestock productivity, and these trends are intimately associated with increasing food insecurity and health risks.

Thanks to improved early warning, preparedness and response, the massive mortality from sub-Saharan

African droughts in the 1970s has not been repeated. However, the social and economic impacts of drought are still disproportionately concentrated on poor rural households that depend on rain-fed farming systems.

Despite this, only a few countries systematically document drought losses or have a national policy to address drought risk, meaning that drought is a largely invisible risk despite its significant impacts on agricultural production, rural livelihoods, and urban and rural economies. For example, recent droughts saw agricultural yields reduced by 20–40% in the Caribbean, losses of US$2.34 billion in Australia, and 75% of farmers suffering total crop failure in the Syrian Arab Republic in one season.[16]

Figure 6: Number of people adversely affected by droughts in the Horn of Africa (1970-2010)



Source: Headey D., Seyoum Taffesse A., You L. 2012. Enhancing Resilience in the Horn of Africa.[17]

Drought risk is constructed by a multitude of environmental, economic and social factors that all increase vulnerability and exposure of vulnerable populations and economies. The following are key drivers of both hydrological and agricultural drought risk.

- **Decreasing rainfall, climate variability and climate change.** Average annual rainfall has been decreasing in many regions in the past century. In areas with increasing water stress, even less intense drought episodes are now manifesting as agricultural or hydrological droughts. Increased frequency of weather events as a consequence of climate change means that even when average rainfall does not vary, drought risk can increase,
- **Increasing water demand due to urbanization, industrialization, tourism and the growth of agribusiness**, can lead to increased and conflicting demands for often declining water resources, unless these are carefully managed.
- **Inappropriate soil and water management.** Unsuitable agricultural or livestock practices are drivers that contribute to drought risk, and can occur even in regions where rainfall is high, above average or increasing.
- **Weak or ineffective risk governance.** Given that drought losses and impacts are not systematically recorded

and mainly affect rural and subsistence households, there is often little or no political incentive to seriously address drought risk

As a consequence, poor rural households whose livelihoods depend on rainfed subsistence agriculture are very exposed and vulnerable to drought, and are least able to buffer and absorb its impacts. Even minor droughts can lead to yield reductions with devastating livelihood impacts. In the Horn of Africa, longstanding traditional coping mechanisms—including the mobility of pastoralism and traditional family and clan support systems are breaking down. Mobility, in particular, is now thought to be much more restricted than in earlier times due to the complex combination of population growth; fragmentation of grazing lands caused by cropland expansion, pest invasion, and land grabs; and local, regional, and international conflict.[18]

Despite progress in forecasting, early warning and drought response, few countries have integrated policies or institutional frameworks to address the drivers of drought risk, and drought is rarely included within broader policy and institutional frameworks for disaster risk management (DRM). Meteorological agencies may be well equipped to provide increasingly accurate hazard assessments and warnings, but they are not responsible for addressing other risk drivers such as land use, water management, urban development and social protection. Strengthening drought risk management as an integral part of risk governance is fundamental to sustaining the quality of life in affected countries. [19]

3. Defining Resilience

The concept of resilience is rooted in material sciences and ecology, but has also been applied in various social disciplines and psychology. In concrete terms, it is the ability of critical physical infrastructure to absorb shocks. From a psychological point of view, it is the process of adaptation and of developing a set of skills, capacities, behaviours and actions necessary when dealing with adversity.[20]

Since the 1960s, the concept of resilience has been gaining critical mass in academia. It has now become a central paradigm in disciplines such as ecology, possibly replacing sustainability as the ultimate objective of development. In particular in domains where issues of shocks, vulnerability and risks are critical (such as disaster risk reduction (DRR), climate change adaptation (CCA), or even social protection (SP)), the growing influence of the concept of resilience is particularly prominent. Not only do academics increasingly make reference to it, but practitioners and non-governmental organisations (NGOs) are now increasingly exploring the modalities of its implementation in the field. At the international level, the Intergovernmental Panel on Climate Change (IPCC) recently reinforced this emerging prominence, pointing out: 'Disaster risk management and adaptation to climate change focus on reducing exposure and vulnerability and increasing resilience to the potential adverse impacts of climate extremes'.[21] In this context, the appropriation of the concept by bilateral and multilateral donor organisations in relation to humanitarian interventions, climate change adaptation or social protection should be seen as the ultimate evidence of this influence within key-players arenas.[22]

Resilience has been the focus of a large and growing body of research, seeking to understand which characteristics make a country, community or household resilient, and to establish the principles and processes that strengthen resilience and thus help populations withstand and recover from disasters.[23]

Adapting resilience means identifying where different areas can complement and enhance one another, including disaster risk reduction, climate change adaptation, social protection, working in fragile contexts and humanitarian preparedness and response.[24]

- The Asian Development Bank and the International Food Policy Research Institute (IFPRI) define resilience as the 'magnitude of disturbance that a system can withstand without crossing a threshold into a new structure or dynamic. In human systems, resilience refers to the ability of communities to withstand recover from stress, such as environmental change or social, economic or political upheaval, while for natural systems, it is a measure of how much disturbance (storms, fire and pollutants) an ecosystem can handle without shifting into a qualitatively different state.'[25]
- For DFID[26], resilience is "The ability of countries and communities to manage change, by maintaining or transforming living standards in the face of shocks or stresses –such as earthquakes, drought, or violent conflict- without compromising their long-term prospects"
- The Intergovernmental Panel on Climate Change defines resilience as "The ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity for self-organization, and the capacity to adapt to stress and change" (IPCC, 2007)
- The Resilience Alliance defines resilience as ""The capacity of a system to absorb disturbance and reorganize while undergoing change"
- For the United Nations International Strategy for Disaster Reduction, resilience is "The ability of a system, community or society exposed to hazards to resist, absorb, accommodate to, and recover from the effects of a hazard in a timely and efficient manner, including through the preservation and restoration of its essential basic structures and functions.
- The World Bank[27] defines resilience as "The ability to withstand, recover from, and reorganize in response to crises so that all members of society may develop or maintain the ability to thrive"
- The World Economic Forum defines resilience as (i) the adaptability to changing contexts, (ii) the capability to withstand sudden shocks, and (iii) the ability to recover to a desired equilibrium, either to the previous one or a new one, while preserving the continuity of its operations.[28]

In spite of the variations of the definition, all share four common elements:[29]

i) Context: Resilience should always be clearly contextualised – allowing a coherent answer to the question '*resilience of what?*' Resilience can be identified and strengthened in a social group, socio-economic or political system, environmental context or institution.

ii) Disturbance: Once the system or process of interest is determined, the next stage is to understand the disturbances faced, addressing the question '*resilience to what?*' These usually take two forms:

- Shocks are sudden events that impact the vulnerability of the system and its components. There are many different types of disaster-related shocks that can strike at different levels. These include disease outbreaks, weather-related and geophysical events such as floods, high winds, landslides, droughts or earthquakes. There can also be conflict-related shocks such as outbreaks of fighting or violence, or shocks related to economic volatility, such as food prices.

- Stresses are long-term trends that undermine the potential of a given system or process and increase the vulnerability of actors within it. These can include natural resource degradation, loss of agricultural production, urbanisation, demographic changes, climate change, political instability and economic decline.

iii) Capacity to deal with disturbance: The ability of the system or process to deal with the shock or stress is based on the levels of *exposure*, the levels of *sensitivity* and *adaptive capacities.=*

- Exposure to risk is an assessment of the magnitude and frequency of shocks or the degree of stress. For example, exposure to conflicts could be measured by the size and frequency of violent events caused by conflict or fragility, or the extent of political instability in other factors such as rule of law or human rights.

- Sensitivity is the degree to which a system will be affected by, or respond to, a given shock or stress. This can vary considerably for different actors within a system. For example, women accounted for up to 80% of those who died during the 2004 Indian Ocean tsunami, and death rates among women were almost four times higher than those among men in the 1991 Bangladesh cyclone. In this case, women's limited mobility, skills set and social status exacerbated sensitivity to the shock.

- The adaptive capacities of actors – individuals, communities, regions, governments, organisations or institutions – are determined by their ability to adjust to a disturbance, moderate potential damage, take advantage of opportunities and cope with the consequences of a transformation. Adaptive capacities allow actors to anticipate, plan, react to, and learn from shocks or stresses.

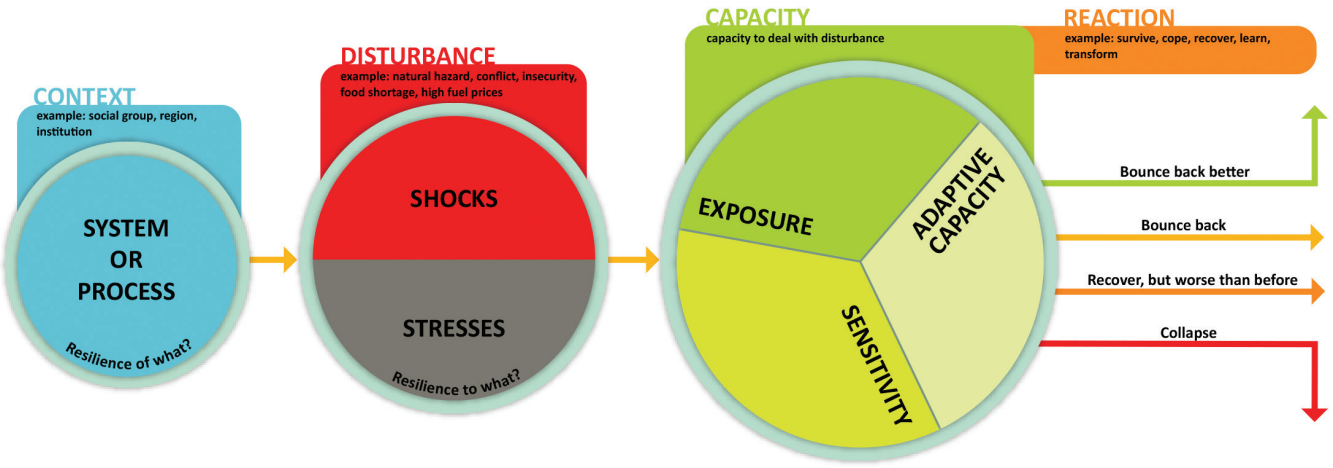
Sensitivity and adaptive capacity are determined by the pool of assets and resources that can be mobilised in the face of shocks and stresses. Assets and resources can be social, human, technological, physical, economic, financial, environmental, natural, and political. Whether a system or a process is resilient is a function of its sensitivity and adaptive capacity. The other side to this is vulnerability - the degree to which a system is susceptible to, or unable to cope with, the adverse effects of shocks and stresses. Therefore the higher the resilience of a system the lower its vulnerability.

iv) Reaction to disturbance: In the best case, the reaction to a shock or stress might be a *'bounce back better'* for the system or process concerned. In this case capacities are enhanced or sensitivities and exposures are reduced, leaving a system that is more able to deal with future shocks and stresses. An alternative reaction might be a *'bounce back'* to a normal, pre-existing condition, or to *'recover, but worse than before'* – the latter resulting in reduced capacities. In the worst-case scenario, the system or process might not bounce back at all, but *'collapse'*, leading to a catastrophic reduction in capacity to cope with disturbance in the future.

These elements form a resilience framework, pictured in the graphic below. The framework below is a simplified representation of

these four elements and does not represent the more complex situation in practice: the response curve could be slow and uneven due to secondary shocks or lack of information, and shocks and stresses may result in a number of different reactions.[30]

Figure 7: UK Department for International Development Resilience Framework



Source: DFID, available at: Headey D. and Kennedy A. 2011. Enhancing Resilience in the Horn of Africa

Resilience can be applied to different entities, ranging from local communities to countries and regions, but those must not be seen in isolation, rather as interlinking structures.[31]

The World Economic Forum defines the resilience of a country as having three components (i) robustness: the ability to absorb and withstand disturbances and crises; (ii) redundancy: having excess capacity and back-up systems that enable the maintenance of core functionality in the event of disturbances, and (iii) resourcefulness: the ability to adapt to crises, respond flexibly and, when possible, transform a negative impact into a positive one. In the face of crises, the resilience of a country is measured by its response to mobilise and react quickly, and lastly, its capability to recover and regain a degree of normality after a crisis or event.[32]

Resilience to global risks is becoming more and more critical in the context of climate change, a rapidly growing urban population and decreasing availability of resources[33], and threats to agricultural growth have been multiplying in frequency and scale.[34] Resilience, in the context of this Reader, is the capacity of agricultural development to withstand or recover from stresses and shocks and thus bounce back to the original level of growth. A lack of resilience may be indicated by a gradual decline of agricultural productivity, but at the same time, collapse may come suddenly and without warning.[35]

3.1. Linking Relief, Rehabilitation and Development (LRRD)

Humanitarian relief has traditionally focused on immediate life saving responses to disasters or crises. However, individuals and communities facing simultaneous or repeated shocks, such as economic crises, disease epidemics, or natural disasters are better supported when humanitarian action targets the underlying vulnerabilities and builds capacities to better cope with

future shocks. Thus, humanitarian efforts are increasingly becoming intertwined with development programmes and longer-term approaches that include the establishment and improvement of resilience. For instance, the International Federation of the Red Cross published a report in 2012, stating that their ambitions have moved towards combining humanitarian concern for imminent threats with sustainable approaches and institutional strengthening traditionally associated with development.[36]

Figure 8: Three-circle model with LDDR approach

Source: The Montpellier Panel. 2012. Growth with Resilience: Opportunities in African Agriculture.

The LRRD[37] approach focuses on the **interfaces** between the three circles. The intention is to bring differing dynamics and approaches under one umbrella, i.e. to foster **complementarity** and **coherence**. The concept of LRRD (*linking relief, rehabilitation and development*) is not new. It originated in the 1980s when practitioners and academics identified a funding gap — a 'grey zone' — between humanitarian assistance, rehabilitation and development activities surrounding the food crisis in Africa. The basic idea of LRRD is to link short-term relief measures with longer term development programmes in order to create synergies and provide a more sustainable response to crisis situations. As stated in the Principles of Good Humanitarian Donorship, humanitarian assistance should be provided in 'ways that are supportive of recovery and long-term development, striving to ensure support, where appropriate, to the maintenance and return of sustainable livelihoods and transitions from humanitarian relief to recovery and development'. In turn, well-designed development cooperation programmes should reduce the need for emergency relief, and LRRD development activities should include measures for conflict prevention, disaster risk reduction, disaster preparedness and the development of early warning systems.[38]

In the European Commission's Communication on resilience[39], released in October 2012, emphasis is put on closer cooperation between

humanitarian and development teams to include the building of resilience into the European Union's disaster response efforts. The two main goals are to ensure that 1) development gains are not lost to damage from natural disasters and 2) relief efforts incorporate long-term strategies for development.[40] Initiatives, such as Supporting the Horn of Africa's Resilience (SHARE) operate under a joint humanitarian-development analytical framework and include both short-term and long-term responses to assist the affected countries and communities in recovering from drought and increase their resilience to future droughts.[41]

In June 2011, the UK Government declared their interest in including disaster resilience as a new component of their humanitarian and development report. The humanitarian policy, 'Saving lives, preventing suffering and building resilience', puts resilience at the centre of their approach to addressing disasters, both natural and man-made. It includes commitments to embed resilience-building into all DFID country programmes by 2015, integrate resilience into their work on climate change and conflict prevention, and improve the coherence of their development and humanitarian work.[42]

Depending on context and dimension of a crisis, the grey zone between humanitarian aid and development differs in intensity and extent. Crisis situations include minor floods that hit small areas of a country only and leave infrastructure intact as well as major conflicts leading to droughts, famine and mass-migration across countries and regions. Natural disasters have been a major driver of humanitarian aid in recent years and are increasing due to climate change. Many disaster-prone countries are located in the vicinity of the equator and suffer from economic shortcomings and political instability.[43]

Some **positive examples** to build further on:[44]

- In 2012, the EU started piloting programmes in the Horn of Africa (SHARE)[45] and Sahel ('Agir Sahel')[46] which aim at improving LRRD in close cooperation with the national governments of the affected state(s) and with better resilience of the population as ultimate aim.

- Some member states seek to improve LRRD in-house and in the field. Sweden for example supports livelihoods, WASH and health programmes in Somalia that are financed from both the development and humanitarian budgets, making it possible for partners to adapt programming when the situation changes.

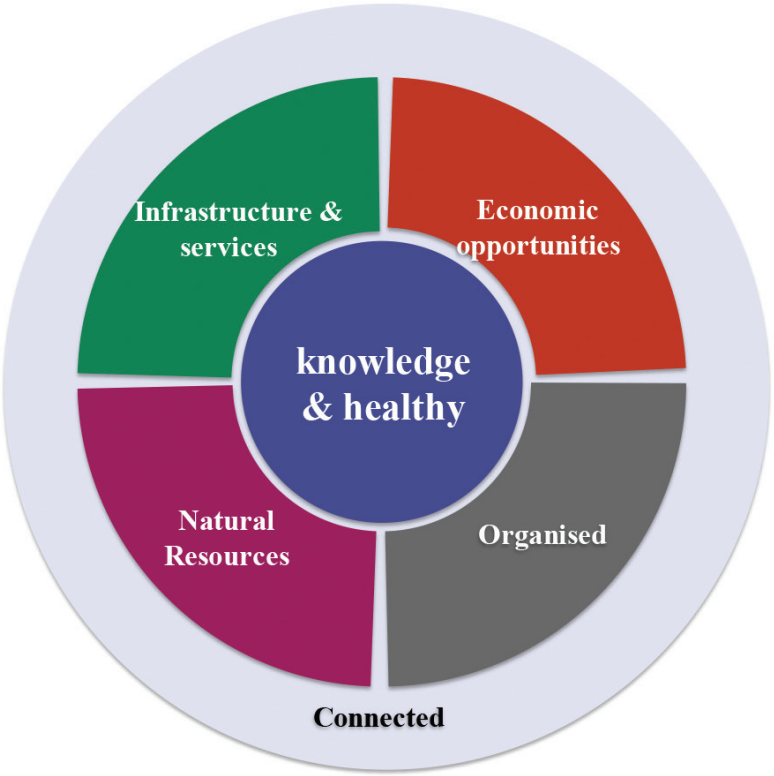
- The Ivorian government, DG ECHO and DG DEVCO launched a "Partnership for Transition" in 2012, bringing together humanitarian and development partners with the relevant government services to ensure good LRRD. The Partnership is tailored to the Côte d'Ivoire situation where it is essential to maintain direct assistance to the most vulnerable populations while giving time to government and development agencies to restore functional government infrastructure for the delivery of basic public services. For each intervention, a Memorandum of Understanding will be sought between the government, humanitarian and development agencies, clarifying responsibilities for each, with clear milestones and indicators for monitoring. From the EU side, funds will be available both from the humanitarian aid instrument and the EDF. An example of a health intervention could be that the government funds salaries of health workers, while a development agency focuses on reform of the health sector and a humanitarian agency gives some short term support and training for staff.

- Using its political leverage, the EU aims to raise awareness of the need for resilience and LRRD worldwide through engagement in the 'Political Champions for Disaster Resilience' initiative; a first meeting in April 2012 was co-lead by the UK and UNDP. This initiative aims to develop a more appropriate global approach to slow onset crises (such as the recent famine in the Horn of Africa).

3.2. Resilient communities

According to the IFRC, a resilient community will have the ability to assess, manage and monitor its risks, and be able to learn new skills and build on past experiences. It will have the capacity to identify problems, establish priorities and

Figure 9: The six characteristics of a safe and resilient community



Source: IFRC. 2012. Characteristics of a Safe and Resilient Community.

react in situations of crisis. It will also be engaged in the development of local policy for reducing risks and in establishing and maintaining relationships with external actors who are able to provide support, goods and services when necessary. Furthermore, a resilient community has the ability to maintain, repair and renovate any damage caused to the system, and to continue managing its natural assets.[47]

A resilient community would have all of the six characteristics illustrated in the image above, recognising the importance of human health, well-being and individual knowledge, and acknowledging the necessity of assets and access to wider resources beyond the immediate control of the community.[48]

An emphasis is put on building resilience as part of a process, not merely an outcome, as a resilient community is a theoretical concept that can never be fully achieved in practice. It should be considered a process that is multi-sectoral and involves multiple actors.

The Household Economy Analysis (HEA) indicates that structural forces are widening the gap between the better-off and poorer households. The poorest households often lack the means to engage in livelihood promotion activities required for resilience. They are increasingly trapped in a downward spiral of debt, asset loss, and chronic food and nutrition insecurity. In rural areas, effective development initiatives to increase non-farm and off-farm income of the poorest households need to be designed to complement agriculture. Evidence from other regions of Africa indicate that targeted social protection programs, focusing on the very poorest households, and women in particular, have the potential to overcome the structural roots of chronic food and nutrition crises. Combining cash transfers with livelihood support can be effective in improving resilience of the poorest households.[49]

Smallholder families account for a large share of vulnerable and food insecure populations. To help poor farmers reduce and manage the risks that come with farming, a range of measures are currently being evaluated. Measures that have already been shown to be effective can be used to build resilience against agricultural shocks, provided that smallholders' access to the necessary related products and services is facilitated. Such measures include investments in technologies and practices that reduce yield variability; access to financial services and insurance schemes; and policies that help mitigate and adapt to climate change. For instance, investments in the development and dissemination of disease-resistant crop varieties have helped reduce the vulnerability of smallholders to devastating crop losses and have accordingly improved food and nutrition security.[50]

Even if the poorest households could rely on a regular cash transfer, and related livelihood support, delivered through social protection programs, it would have little impact if local food prices doubled as they did in many parts of the Sahel in 2010. Thus another major challenge is the price volatility for basic grains, exacerbated by seasonal factors and regional market forces, and the failure of markets to distribute food to food deficit areas. A potential solution is significantly increasing food reserves and buffer stocks, at the regional and national level.[51]

4. Approaches and Tools for Strengthening Resilience

The definition of resilience implies that social systems have the ability to anticipate and plan according to perceived and real chances and, institutions and individuals have the capacity to take action, in order to avoid potential damage.[52]

Resilience can be strengthened in many different ways and at different levels: through political, economic, sociological and technological interventions. Drought can be countered by building irrigation systems, through improved water harvesting techniques, agro-ecological technologies, such as conservation farming and by breeding new crops or livestock that are tolerant of or resistant to drought. Open trade policies to facilitate trans-border access to food can also strengthen resilience.

The necessary steps to build resilience include:

- Anticipating the likelihood and location of stresses and shocks through surveys and agro-climatic monitoring – one of the most important steps in designing preventative or tolerant responses and decreasing the likelihood of damage and cost;
- Prevention includes measures such as building dams or sea walls to allow the continuation of agricultural growth;
- Tolerance involves the reduction of damage to allow rapid recovery, which can involve trade-offs that balance agricultural productivity against the reduction of risk exposure;
- Recovery and restoration where damage is inevitable;
- Learning from past experience and identifying outcomes, benefits and further options.[53]

Many institutions and governments are participating in initiatives to build resilience, recognising the urgent need to build systems that can withhold both predictable and unpredictable stresses and shocks. Some of these initiatives include the CGIAR, a global agricultural research partnership that seeks to strengthen agricultural resilience by reducing rural poverty, increasing food security, improving human health and nutrition, and ensuring more sustainable management of natural resources.[54] World Economic Forum's 'New Vision for Agriculture', which seeks to strengthen strategies, broaden and deepen stakeholder engagement, reinforce global support, build coordination capacity and monitor, evaluate and share outcomes.[55]

Interventions to strengthen resilience aim to address underlying causes of vulnerability, in order to protect development, reduce and mitigate radical drops in resilience caused by disasters and crises and enhance bouncing back from adversity.

4.1. Improving crisis prevention

It is no secret that disasters are eroding decades of effort in development, in terms of political progress, social and educational issues and infrastructure and technological development (ISDR 2007). The Inter-American Development Bank (IADB) says that disasters are "clearly a development problem". Several studies have highlighted the fact that money invested in development is wasted unless precautionary action is taken toward reducing disaster risk (DfID, 2004, UNDP, 2004; IADB, 2000). So why do such investments continue to take place without reliable risk management frameworks in place? While many development agencies have disaster response units, only very few consider the need to integrate a precautionary vision into design and management of projects. The more money invested in development without risk awareness, the more money is lost when a disaster occurs.

Many of the poorest are the most vulnerable to being affected by disasters as they often settle on the most marginal lands. Development investments are needed to raise these individuals out of poverty, yet disasters often push people into poverty – how can this vicious cycle be broken?

Environmental degradation is directly related to poverty (DfID *et al.*, 2002; Mainka *et al.*, 2005), particularly in developing countries and heavily populated coastal areas. People who live in environmentally degraded areas, for example where soil erosion has been heavy leading to loss of soil fertility, like in northern Ethiopia, struggle on a daily basis to survive. When ecosystems are not healthy, ecosystem services that all humans rely on cannot be produced.

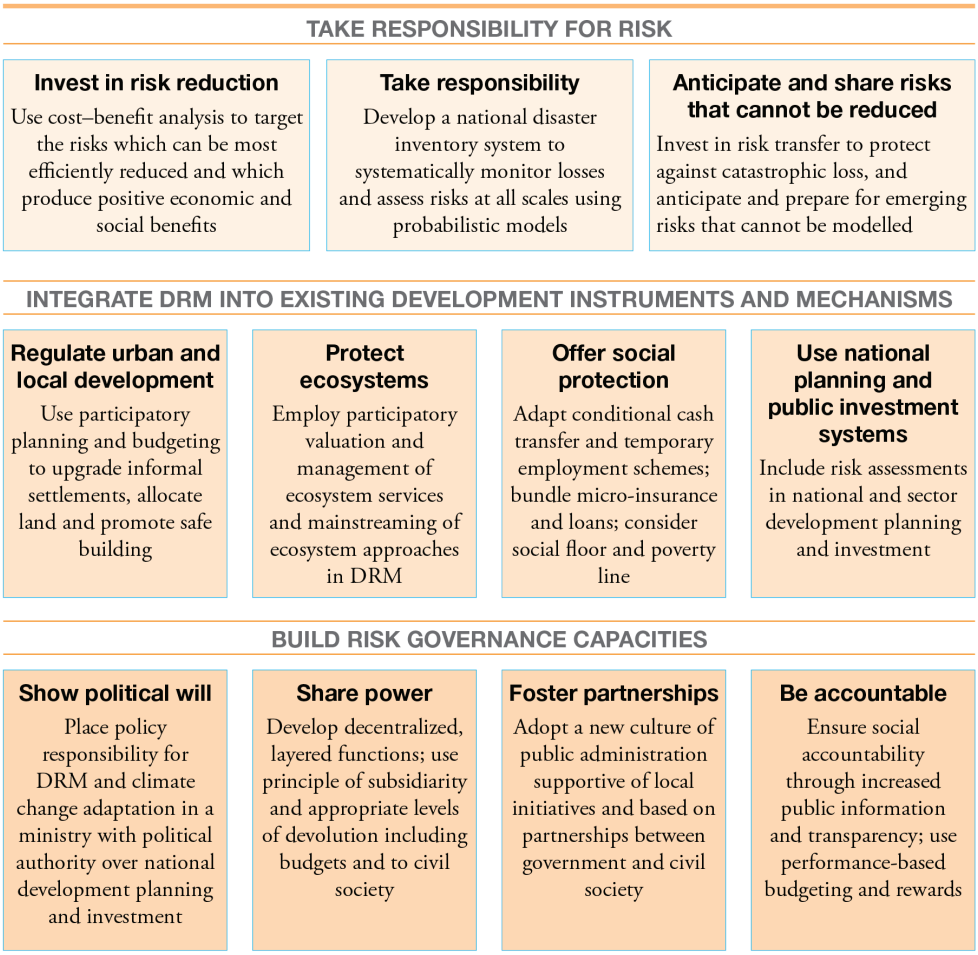
4.2. Disaster risk reduction

Approaches to disaster management – typically the domain of humanitarian agencies or humanitarian divisions of larger governmental or non-governmental agencies – have tended to focus on four areas: prevention, preparedness, response and recovery/reconstruction. These areas of activity are all directly related to hazard exposure – potential or actual – that can result in disaster.[56]

Disaster risk reduction (DRR) interventions are aimed at reducing the risk associated with specific types of hazards and disasters. In contrast to general development programs or broader resilience programming, DRR programs focus on potential hazards or shocks and generally target groups that are particularly vulnerable to these hazards and risks. These include: prioritizing and strengthening early warning, preparedness, mitigation, and prevention; integrating preparedness and mitigation with disaster response, early recovery, and transitions to foster resilience; and supporting diversified livelihood strategies.

While DRR programs are central to the goal of building resilience, they are not sufficient. Becoming resilient requires a range of approaches to help communities develop the capacity to manage the range of challenges that threaten stability, whether sudden or longer term, urban or rural, natural or human-made. DRR programs are one part of the solution; but to achieve resilience in any given area, a broader concerted and coordinated effort by both development and humanitarian actors is required. These approaches should integrate DRR with a diverse combination of other interdependent activities that contribute to increasing adaptive capacity, improving the ability to address and reduce risk, and improving the social and economic conditions of vulnerable populations.

Figure 10: Key elements for successful disaster risk management (DRM)



Source: UNISDR. 2011. Global Assessment Report on Disaster Risk Reduction.

Hyogo Framework: In January 2005, 168 Governments adopted a 10-year plan to make the world safer from natural hazards at the World Conference on Disaster Reduction, held in Kobe, Hyogo, Japan. The Hyogo Framework is a global blueprint for disaster risk reduction efforts during the next decade. Its goal is to substantially reduce disaster losses by 2015 - in lives, and in the social, economic, and environmental assets of communities and countries. The Hyogo Framework offers guiding principles, priorities for action, and practical means for achieving disaster resilience for vulnerable communities.

4.3. Ecosystem-based DRM

The protection, restoration and enhancement of ecosystems, including forests, wetlands and mangroves, has two important benefits for DRM. Healthy ecosystems both serve as natural protective barriers and buffers against many physical hazards, and they increase resilience by strengthening livelihoods and increasing the availability and quality of goods and resources. Although their value is difficult to measure in economic terms, estimates indicate that regulatory services that mitigate hazards may form the largest proportion of the total economic value of ecosystem services. For example, in the United States of America, coastal wetlands absorb wave energy and act as 'horizontal levees', providing US$23.2 billion per year in protection from Ecosystem-based DRM often realizes highly attractive cost–benefit ratios.

Given these important co-benefits, ecosystem based DRM often realizes highly attractive benefit–cost ratios compared with conventional engineering solutions. Experience from around the world shows that ecosystem-based DRM is an increasingly attractive option for addressing problems as varied as river basin and urban flooding, drought and wildfires. For example, New York City has decided to invest US$5.3 billion in green infrastructure on roofs, streets and sidewalks to reduce flooding instead of US$6.8 billion in traditional pipe and tank improvements. This promises multiple benefits. The new green spaces will absorb more rainwater and reduce the burden on the city's sewage system, air quality is likely to improve, and water and energy costs may fall. Another interesting example is the role of mangroves in coastal protection from tsunamis.

However, the monetary undervaluation of ecosystem services remains an important obstacle to the adoption of ecosystem-based DRM. As a consequence, relatively few countries are taking advantage of tools such as 'payments for ecosystem services'

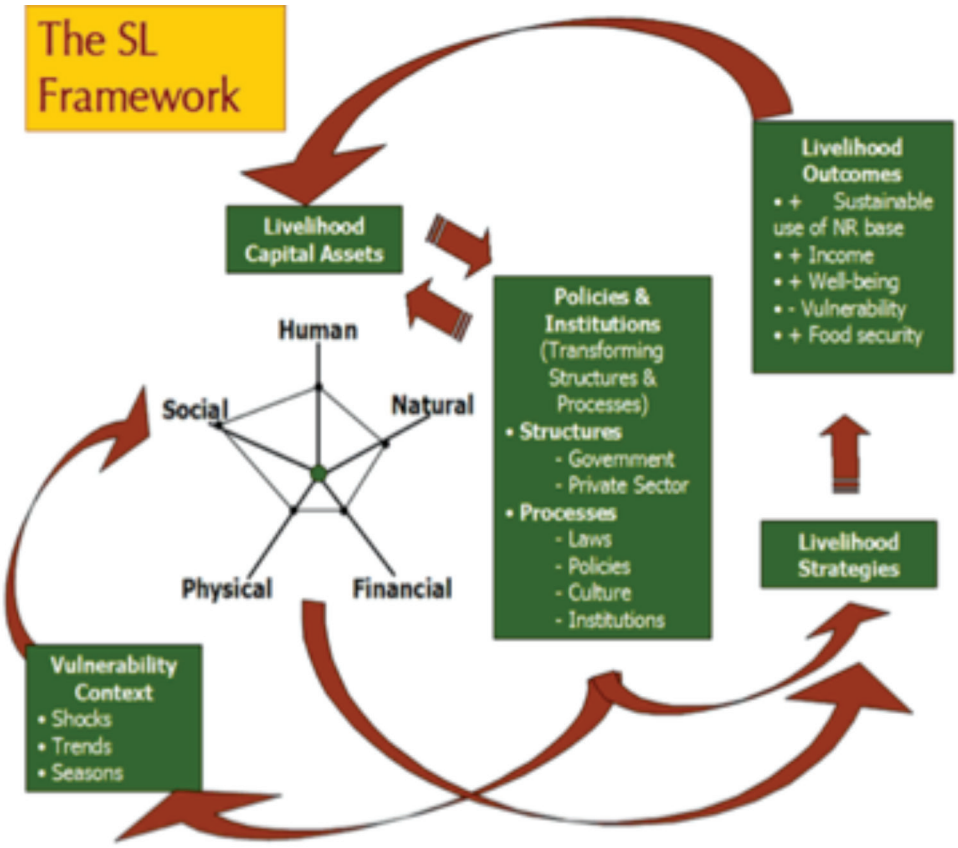
For example, during the past 30 years, agricultural growth in the Sahel region has made tremendous progress; per capita food availability (excluding imports) increased from 1.700 to 2.400 kilocalories between 1980 and 2007. However, this food production remains unreliable in the Sahelian strip due to environmental uncertainties, and a significant share of the population does not have sufficient access to this food. By increasing the risk of disasters (droughts, floods) and their negative consequences on food production and the livelihoods of vulnerable groups (destruction of reproductive livestock, reduction of harvests), climate change remains at the heart of food and nutritional issues in the Sahel.[57]

It is now recognised that the goal of development through sustainable agriculture must more explicitly acknowledge and integrate, not only the emerging need for agricultural systems to adapt to progressively changing climates, but must also consider the fact that agriculture itself can contribute to or help mitigate the process of climate change.[58]

4.4. Promoting sustainable livelihoods

The sustainable livelihoods approach is a holistic, people-centred approach to understanding and addressing the multiple factors that influence poverty and well-being. This approach has been used by a number of agencies, most notably the UK Department for International Development (DFID).

Figure 11: DFID Sustainable Livelihoods Framework



Source: DFID Sustainable Livelihoods Presentation http://www.livelihoods.org/info/Tools/SL-Proj1b.ppt

The World Bank is preparing a new Social Protection and Labor (SPL) Strategy based on the 3P framework (prevention, protection and promotion), the main functions being resilience, equity and opportunity, in order to respond more effectively to the emerging, fast-changing and challenging demands expected in the coming decades. The strategy seeks to establish a better balance between the supply and demand sides of labour markets and increase the coverage of safety net interventions, especially in low-income countries and fragile states.[59]

DFID has implemented a Productive Safety Net Program in Ethiopia, which assist 7.8 vulnerable people in need of emergency food assistance by providing them with regular and predictable cash and food transfers. This program can be expanded by a Risk Financing Mechanism in times of shock, which increases the period of time over which an individual received transfers or add more people to the program.[60]

Along with other types of tools designed to manage risk for farmers, the development of insurance markets can help protect poor households against risk. Index-based insurance is an innovative method to help farmers protect themselves against agricultural production risk by paying out when an independently observable trigger (level of rainfall or data on output) shows that an insurable event has occurred. A number of lessons involved in this process include: the need to improve access to credit or technology adoption so to raise expected incomes, improving individual understanding and trust of insurance is key to increase demand, and the need to invest in public goods, such as weather data infrastructure, to scale up insurance schemes.[61]

The need to link relief, rehabilitation and development (LRRD) in situations of fragility and crises is broadly accepted by scholars and practitioners. The European Commission and European Parliament have emphasised the necessity of LRRD, using different legislative instruments to strengthen LRRD activities, including the Instrument for Humanitarian Aid (IHA), the Development Cooperation Instrument (DCI) and Instrument for Stability (IfS), in order to complement humanitarian and development activities for increased effectiveness.

The IHA was adopted in 1996 and is the financing instrument for humanitarian aid interventions. The regulation stresses that humanitarian assistance can be regarded as a prerequisite for reconstruction and development and should therefore also target self-sufficiency, preventative actions and preparedness.

The DCI is more comprehensive and complex than the IHA, and gives provisions on including transition strategies from post-conflict situations to long-term cooperation. Unforeseen needs related to crisis situations that cannot be covered by neither the IHA nor IfS are covered in the DCI.

The IfS replaced the EU Rapid Reaction Mechanism and addresses several global security and development challenges. It covers both short-term crisis response and preparedness as well as long-term interventions concerning, for instance, enhancing capacity building for pre- and post-crisis preparedness. Out of these three instruments, the IfS is the most flexible instrument and provides financing of operations related to humanitarian disasters and natural catastrophes. It is flexible enough to function as a bridge between humanitarian aid and development cooperation, thus potentially filling the funding gap and playing a crucial role in the EU's LRRD approach.

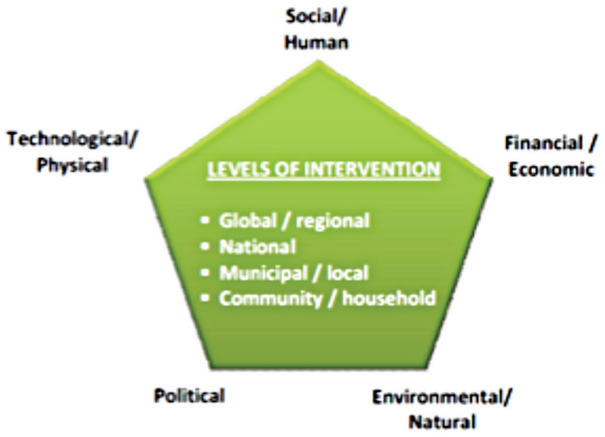
The 2010 revised Cotonou Agreement seeks to improve coordination and harmonization of development strategies and also includes legal provisions on LRRD, the main instrument being the European Development Fund (EDF). The EDF allows for financing measures to respond to humanitarian, emergency and post-emergency situations, in order to allow for flexibility and efficiency.[62]`

Along with the legislative and financing instruments, many consensus and strategy papers have been published by the EU with explicit or implicit provisions on LRRD, including the European Consensus on Humanitarian Aid[63], the European Consensus on Development[64], and the Agenda for Change.[65]

In practice, the European Commission (DG ECHO) has begun to adapt humanitarian tools by, for instance, including a chapter on exit strategies and LRRD in its project documents, making it necessary for partners to explain how they will link relief and development in their projects. For example, in DG ECHO's Sahel Plan, the new entry point is severe malnutrition among children under 5.[66]

Building resilience in the context of agricultural and rural development aims at contributing to a sustainable reduction in vulnerability and more resilience inclusive growth. This implies increased adaptive capacity, improved ability to address and reduce risk, and improved social and economic conditions of vulnerable populations.

Figure 12: Types and levels of resilience building activities



Source: DFID. 2011. Defining Disaster Resilience: A DFID Approach Paper.

4.5. Governance and accountability in support of resilience

Governance includes all aspects of rules and regulations that determine what and how people use the resource base.[67] Robust evidence shoes that the varied performance of different countries in implementing policies for disaster risk reduction is closely linked to political and institutional factors.

How well a country is able to address these risk drivers is an indicator of its risk governance capacities. In general, countries with weak governance and that have great difficulty addressing these drivers are low- and lower-middle-income countries. The countries with the lowest risk governance capacities are also experiencing conflict or political instability and have development trajectories that have been diverging not only from high-income countries but from successful low- and middle-income countries.

There is a growing recognition of government's responsibility for effective disaster risk reduction policy planning and implementation conducted through a transparent and multistakeholder approach.

Good governance requires institutions and processes that are transparent, accountable, and responsive to the people they serve and that promote positive state-society relationships (including a strong civil society and a vibrant private sector). Governance capacity determines the ability of the state to respond effectively to crises and to address the long-term development needs required to effectively address recurrent issues. Furthermore, good governance is crucial to prevent and mitigate conflict, which plays a detrimental role in many of the communities where we are applying a resilience approach and which has, in past efforts to build resilience, stood decisively in the way of sustainable progress.

Regulatory and legislative frameworks play a vital role in stimulating investment in resilience. Comprehensive DRM legislation, covering issues of ex ante risk reduction as well as ex post response, and reflecting the latest multi-hazard risk assessments, empower national and local governments to implement resilience strategies. In addition to their more obvious roles in establishing the necessary institutional arrangements and resources to implement these strategies, such frameworks also offer important opportunities to establish accountability for different forms and levels of disaster loss across all sectors of society. In addition, they not only require but also incentivize the wider society to take certain measures and actions to protect their individual lives, homes, productive assets, and livelihoods against hazard events.[68]

A key measure of accountability to communities is the extent to which a government is able to address the risk of poorly planned and managed urbanization, environmental degradation, and poverty.[69]

There are commonly observed inadequacies in DRR legislation that tend to focus mainly on response preparedness and rather less on risk reduction. Integration may also be lacking with laws relevant to DRR in specific sectors such the water and environment. However, despite these often observed inadequacies, legislation can play a useful role in strengthening incentives for DRR. Legislation can provide a lock-in effect that reinforces a government's commitments by making it politically costly to evade the written rules. It can also give judicial bodies, civil society organizations and watchdogs the possibility of calling leaders to account for their actions as legislation provides a yardstick to measure whether government has met its declared rules and standards.

The practical difficulties of ensuring coordination have sparked debate on which aspect of government should be responsible for disaster risk reduction and how it should be organized. Some governments have pursued the model of creating a high profile 'nodal unit' with a strong political mandate to coordinate action across government. Others have pursued a more mainstream approach in which a relevant line ministry is responsible for disaster risk reduction which is then coordinated through a horizontal network or committee structure.

Actions to address vulnerability and to strengthen resilience should promote a community-centered approach to reducing vulnerability. Communities are highly knowledgeable about their own environment and may have

already developed local strategies for prediction, early warning, preparedness and coping which have evolved over long periods of time. They are also likely to be aware of the local resources and capacity available for taking action. A community driven process will lead to more effective and realistic analysis, plans and action than those developed by outsiders.[70]

Innovations in local governance around the world show that new planning and urban development approaches are possible when civil society participation is supported by a new generation of mayors and civil servants. There are increasing examples of low-income communities negotiating safer and better-located land, adapting rigid zoning and building standards to local needs, upgrading vulnerable settlements to reduce risks, and participating in planning and budgeting. These practices contribute to reducing risks but have much wider benefits, from enhanced citizenship and social cohesion to planned urban development and greater investment. In this way, planning and building regulations can drive DRM instead of impeding it.[71]

Decentralization: There is wide diversity between countries in how various disaster risk reduction functions have been decentralized to lower levels of government. There are several theoretical benefits of decentralization that could help to resolve some of the political incentive problems identified in this report. These include the possibility of more active citizen participation in local DRR policies and programmes, the potential for stronger public accountability in local settings where decision-makers and service providers are closer and more accessible to the populations they serve, and the stronger alignment of interests between local politicians and citizens who are exposed to the same disaster risks.

4.6. Disaster risk management in development programmes

The need for disaster risk management (and in particular risk assessments) to be an integral component of development plans and poverty eradication programmes is now well accepted among experts. For countries to reduce their vulnerabilities and exposure to risk, a much bolder approach is required which needs to incorporate development mechanisms (such as national public investment planning systems, social protection, and national and local infrastructure investments) to reduce risks and strengthen resilience.

There are various practical links between disaster risk management, climate change adaptation and sustainable development. These links have not been fully internalized in the ways in which national government institutions, international development agencies and the United Nations system itself approaches disaster risk management. It is essential to continue to harmonize, integrate and embed disaster risk reduction within poverty eradication and sustainable development policies and programmes. Reducing disaster risk and re-enforcing resilience is increasingly seen as part of a new development paradigm where well-being and equity are core values and human and natural assets central to planning and decision-making.

The concept of building or reinforcing resilience is helpful in this regard. This implies the development of unified tools supporting greater coherence and coordination among different approaches. A disaster risk management approach leading to an outcome of strengthened resilience would lead to less duplication of efforts, optimized use of available resources; an increased potential for collaborative alliances and joint actions among disciplines; and the ability to provide better guidance for policy makers and practitioners in program design, implementation and evaluation.

4.7. Information systems supporting resilience

Information is critical to any kind of emergency response. In the absence of good information it is impossible to know that an emergency is taking place, much less mount a credible response. Recent research has improved our understanding of the requirements of information, and several major initiatives are seeking to improve the quality of information. Since the famine in the Sahel over 30 years ago, the emphasis on information has been on early warning before crises. On the response side, the emphasis has been

on commodity accounting – in other words, keeping track of food aid. Recently, however, it has become clear that early warning alone, even if well documented, is inadequate to plan a response, and the information requirements on the response side have more to do with monitoring *outcomes* than the previous emphasis on monitoring *inputs*. A much broader span of information is required across the board.

Nevertheless, almost by definition, emergencies are circumstances where information is less than perfect, and the humanitarian imperative often cannot wait for perfect information. At the same time, acting on poor or wrong information can compound a crisis. There is thus always a balance to be struck.

The concept of mapping poverty or hunger refers to the graphical representation of welfare and undernourishment estimates for highly disaggregated geographic units. Through this geospatial representation, the importance of geography and location, as determinants of food security, poverty and vulnerability become evident. Mapping exercises, on the grounds of recent advances in small area estimation methods, enable the identification of hunger or poverty hubs for small administrative areas, cities, villages, or even neighbourhoods. At the core of the exercise lie participatory or household survey data the analytical results of which are projected on census data. Additional information from satellite images or digital maps enriches the informational content of the maps and provides valuable input in discussions for antipoverty policy design and interventions.[72]

Better environmental information to prevent disasters[73]

In many places around the world, people have been forced to deplete natural resources to a point of complete degradation simply because there are no other livelihood alternatives. The process of development also carries with it environmentally damaging activities, such as land clearing for settlement or agricultural expansion, redirecting of rivers for agricultural, domestic or industrial purposes, and pollution – including greenhouse gas emissions. The trade-offs between development and environment were recognized by the World Commission on Environment and Development, and since the early 1980s, the concept 'sustainable development' has attempted to encourage environmentally, socially and economically sound development.

Damage to environmental resources affects the environmental sustainability and poses challenges in achieving the MDG7 – ensuring environmental sustainability. Environmental degradation is one of the underlying causes of disaster risk. Ample evidence indicates that better environmental information and/or environmental management could effectively support disaster risk reduction, post-disaster response and environmental and humanitarian recovery efforts. This has led to increased understanding of the contributions that natural systems make in reducing the impacts of disasters, the environmental consequences of disasters and of post-disaster recovery.

Some of the global environmental themes include – changing unsustainable patterns of consumption and production, climate change, desertification, drought, forests, industrial development, protecting and managing the natural resource base of economic and social development, waste management, water, etc. – all within the overall purview of disaster management and vulnerability.

Geographical Information Systems[74]

Rapid advances in information and communications technologies, especially Geographical Information Systems (GIS), are revolutionizing the potential capacity to analyse hazards, risks and vulnerability, and plan for disasters. The term GIS is currently applied to computerized information storage, processing and retrieval systems that have hardware and software specifically designed to cope with geographically referenced spatial data and corresponding attribute information. The spatial data is commonly in the form of "layers", which may depict topography, water availability, soil types, forests and grasslands, climate, geology, population, landownership, administrative boundaries and infrastructure (highways, railroads, electricity or communications systems). Evidence from development applications has highlighted several common operational problems that cause GIS initiatives to fail. These include:

- Underestimation of the workload required to input, retrieve and analyse data.

- Technical facilities (software,

hardware, networks) that is inadequate.

- Selection of data based on cost rather than usefulness.
- Lack of systematisation in collecting, inputting and storing data.
- Inadequate training or staff who is not sufficiently qualified to manage GIS.

In many developing countries, resource information collection and processing systems are still relatively undeveloped. This means that application of GIS at the country and subcountry level will, in many cases, need to be accompanied by the improvement of existing information collection systems and the introduction of new ones.

Innovative technologies for cash delivery[75]

There is growing use of the provision of cash as a mechanism to provide relief to people after disasters, on the part of international aid agencies and governments. The banking industry is also undergoing rapid changes, with new technologies providing different options for making payments and delivering banking services. The use of cash, as opposed to 'in kind' assistance, remains a relatively new approach and aid agencies are at the early stages of developing guidelines, policies and organisational capacity to implement cash projects.

One of the main concerns that agencies have when undertaking cash interventions in less developed countries is finding a safe and reliable mechanism for physically delivering cash into people's hands (Levine and Carrington, 2009).

There are many ways in which money can be transferred to people: the direct delivery of cash (by an agency or a sub-contracted party); cash payments at banks or post-office branches (with or without using bank accounts);and payments into bank accounts or wallets, accessed using smart cards, ATMs, Point of Sale (PoS) devices or mobile phone technologies. There are a range of options, from operating entirely outside of the payments and banking systems to operating entirely within the banking system.

Delivery agents include governments, aid agencies, banks, post offices, mobile phone companies, micro-finance companies, security companies, local traders...

4.8. Financing preparedness for increased resilience

The rising cost of humanitarian response, combined with repeated action and investment in a small number of targeted countries has led to renewed calls to change the way we address recurrent crises. In 2010, the amount of funding for emergency response was the highest on record, at $12.4 billion, and the joint agencies' Consolidated Appeal Process stood at $11.2 billion (it's highest figure ever, and double that of 2006).[76] Yet very little of this funding goes towards disaster prevention and preparedness necessary to build the resilience of communities to cope with emergencies: in 2009, for example, such aid accounted for just 1.8% of overall humanitarian expenditure to the top 40 recipient countries.[77]

The growing call for increased investment in emergency preparedness has been increasingly articulated as a means to bolster ex-ante capacity and support in an attempt to improve the effectiveness of humanitarian response and reduce the subsequent investment required for that response. Yet funding for emergency preparedness continues to fall far short of need. In the top 20 humanitarian recipient countries over the period 2005-2009, just 62 cents out of every $100 was spent on disaster prevention and preparedness. Furthermore, structures and funding for conflict preparedness lag significantly behind those that address disasters related to natural hazards.[78]

5. Building Resilience in key ARD areas

Improving resilience will have many impacts on the agriculture sector, including:[79] (i) increased adaptation of crops and livestock to climate stress; (ii) enhanced access and utilisation of technology and information; (iii) a rise in income generation; (iv) increased use of resource-conserving technologies; (v) open and transparent trade regimes and (vi) improved risk sharing.

5.1. Building Resilience and Sustainability in Agriculture

Agriculture is a form of natural resource management for the production of food, fuel and fibre; and depends on the resilience of the interlinked social and ecological systems. In social systems, resilience relies heavily on the assets and knowledge that farmers can mobilise and the services that governments and institutions provide. For agricultural ecosystems, resilience depends on changing variables, including climate, land use, nutrient availability and the size of the farming system. Thus, implementing measures to develop and increase agricultural resilience requires an understanding of strategies seeking to reduce vulnerabilities while at the same time generating income and reducing poverty.[80]

In their 2012 report on growth and resilience, the Montpellier Panel – a panel of international experts from the fields of agriculture, sustainable development, trade, policy and global development – made suggestions for building resilience, placing an emphasis on political leadership to achieve resilient markets, resilient agriculture and resilient populations, as demonstrated in the table below.[81]

Box 1: Building Resilience

Resilient Markets	Resilient Agriculture	Resilient People
✔ Reduction of food price volatility	✔ Enabling resilient and sustainable intensification	✔ Scaling up nutrition
✔ Facilitation of private investments	✔ Combating land and water degradation	✔ Focusing on rural women and youth
✔ Building better enabling environments	✔ Building climate smart agriculture	✔ Building diverse livelihoods

Agriculture is challenged by a number of threats such as food price spikes, land and water scarcity, rising energy and fertilizer prices and the impact of climate change on food production. Feeding more than 9 billion people by 2050 will require doubling food production on a sustainable basis. Therefore agriculture should be resilient — able to withstand or recover from stresses and shocks.

Humankind has long recognised the impact that the prevailing weather conditions have on agricultural production and over the centuries the natural sciences have determined the principles that govern how climate effects agricultural production.[82] Farmers have always lived in changing environments where uncertainty and disturbances are inevitable. Therefore, farmers need the ability to adapt to change in order to be able to maintain their farms.[83]

Climate change will intensify the already adverse conditions of crop production in the drylands. Considering the socio-economic and political contexts of climate change in sub-Saharan Africa, a central argument is that adaptations to climate change need to be resilient, that is, to have the ability to deal with stresses and disturbances as a result of change, while retaining the same basic structure and ways of functioning, the capacity for self-organisation, and the capacity to learn and adapt to change.[84]

For example, most of the emissions in Africa come from the agricultural

and related forestry sector implying that an integrated approach, which simultaneously addresses adaptation and mitigation, is more appropriate. The resilience check at the farm-level showed that each adaptation practice contributes to the resilience of smallholder farming to climate change in one or several dimensions (ecological, economic and social). Notable is the fact that building resilience in one dimension has mostly significant positive effects but in a few cases negative effects.[85]

Agro-ecological agriculture

Agro-ecology is both a science and a set of practices. It was created by the convergence of two scientific disciplines: agronomy and ecology. The core principles of agro-ecology include recycling nutrients and energy on the farm, rather than introducing external inputs; integrating crops and livestock; diversifying species and genetic resources in agro-ecosystems over time and space; and focusing on interactions and productivity across the agricultural system, rather than focusing on individual species. Agro-ecology is highly knowledge intensive, based on techniques that are not delivered top-down but developed on the basis of farmers' knowledge and experimentation.[86]

Evidence in some countries suggests that agro-ecological techniques such as agroforestry, integration of livestock, soil and water conservation have the potential to strengthen resilience, increase income and improve food security. However, agro-ecological agriculture, is not sufficient to significantly reduce food and nutrition insecurity of the poorest households and must be accompanied by complementary strategies to improve incomes, reduce risk, and protect livelihoods, and improve nutrition.

Pastoral systems

Pastoral systems support the livelihoods of millions of people living in harsh environments where alternative land use systems are highly risky or simply not possible. Livestock reared in pastoral systems also contribute significantly to national and regional economies and provide important environmental services such as carbon sequestration, and biodiversity conservation. Extensive pastoral production is practised on 25% of the global land area, from the drylands of Africa (66% of the total continent land area) and the Arabian Peninsula, to the highlands of Asia and Latin America[87]. It provides 10% of the world's meat production, and supports some 200 million pastoral households who raise nearly 1 billion head of camel, cattle and smaller livestock, about a third of which are found in sub-Saharan Africa.

Recurrent drought and disease epidemics decimate herds in pastoral areas. While ecological disasters and livelihood dislocations from war and famine contribute significantly to endemic poverty and underdevelopment of pastoralists, there is increasing acceptance that the root cause for the crisis lies in their political and economic marginalization of pastoralists and by the failure of governments and development agencies to devise and implement programmes aimed at sustaining pastoral production.

Pastoralism is a whole way of life, which utilizes marginal agro-ecological areas while also providing important environmental services – land management, biodiversity, carbon sequestration etc. It is a way of producing nutritious food and animal proteins in harsh, arid environment, thus representing a highly skilled natural resource management system.[88]

The 2010-211 drought in the Horn of Africa, which has rendered over 13 million people in need of food and caused a devastating famine in southern Somalia, has raised concerns that pastoralist livelihoods in this region are no longer viable or sustainable. Headey,Taffesse, and You (2012) argue that both economic theory and the existing evidence base warrant a more balanced development strategy involving movement out of pastoralism (intersectoral transformation), modernization of pastoralism (intrasectoral transformation), and cross-cutting transformations of the demographic, social, and political structure of populations in these areas. Being the dominant livelihood for the foreseeable future, and potentially quite a profitable one given growing demand for livestock products, pastoralism therefore needs to be an important component of local and regional development strategies. Transforming the pastoralist sector into a more profitable, more integrated, and more resilient economic system calls for a number of overlapping and largely reinforcing investments:

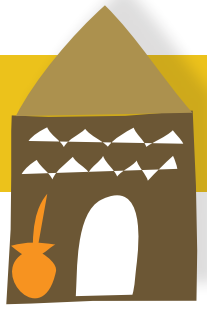
(1) commercializing pastoralism with the goal of improving the competitiveness, value addition, poverty impact and outreach of livestock markets; (2) improving natural resource management; (3) economic diversification in a manner that is compatible with existing pastoralist livelihoods; (4) improved social infrastructure (pertaining to health, nutrition, and education); (5) improved physical infrastructure (principally roads, mobile telephony, and irrigation where profitable); (6) more effective disaster risk management strategies; and (7) better protection of pastoralist property rights and strengthening of conflict resolution mechanisms.[89]

5.2. Risk management for smallholder farmers

Another type of negative impact of unpredictable prices relates to farm-level investment decisions in developing country settings where credit markets do not function well and income is highly variable due to fluctuating weather conditions or volatile prices. If farmers cannot obtain credit when they need it, they will be reluctant to make productive investments, [90]especially those that tie up capital for extended periods of time. This may happen even when prices are stable, but price volatility will exacerbate this effect. Other fundamental decisions, such as choice of crop, also may be affected by price volatility. And even investments in fertilizer use, which offer returns over a relatively short period of time, seem to be negatively affected in some situations; for example, in Ethiopia farmers were reluctant to invest in fertilizer for fear that they would be hit by an economic shock.[91] Because poor smallholder farmers are afraid that an adverse price shock might lead them into the type of poverty trap discussed above, they may be reluctant to adopt technologies that provide greater long-run returns. Thus, they adopt a low-risk, low-return strategy that may be optimal given their aversion to risk (which is due at least partially to their poverty), but slows down the long-term development process. Similarly, because much investment is irreversible or involves sunk costs, investors will tend to reduce investment in an environment of highly unpredictable prices.

Farmers face both production risks and price risks. A prudent risk-management strategy must consider both sources of risk, especially since one type of risk can offset the other in some circumstances (e.g. a domestic supply shock can lead to higher prices, so that reduced production is compensated for by higher prices). Adverse weather and pests and diseases reduce farm income and result in more variable production. Climate change will likely increase these types of risk in the future. Many technologies, such as the introduction of disease- or stress-resistant varieties or the construction of irrigation and drainage systems, can reduce the risk to which farmers are exposed. Another promising way to reduce the risk facing farmers is through the use of improved small-scale storage technologies that smallholder farmers and consumers can afford. Such technologies would reduce post-harvest losses and also provide a buffer against price shocks that might reduce the potential for panic-driven surges in demand. Such technologies are the most important way to reduce the risk facing farmers and countries, and should be strongly supported by both national governments and donors. Market-based insurance mechanisms provide another way to transfer risk and assist farmers in making production decisions. It must be recognized, however, that any commercially viable insurance when offered as a standalone product will lower the average level of farm income in the short term, as a private insurance company will not offer a product if it consistently pays out more than it receives. Over the longer term, however, the reduced risk faced by farmers can encourage them to invest in more-profitable technologies that raise their productivity and income. For example, insurance when bundled with credit, inputs, and other services can allow households to take prudent risks knowing they will be protected if there is a disaster. Governments can (and often do) provide subsidies for insurance, but these programmes have typically been very expensive to operate, even in developed countries. Subsidies to such programmes need to be balanced against the costs and benefits of expenditures on agricultural research and irrigation. Considerable effort and research are being invested in developing ways to address the challenges of insuring smallholders against production risks.

One such innovation is **weather-index-based crop insurance92**. This pays out to farmers whenever particular weather factors – rainfall or temperature, for example – cross



specific thresholds at which they are likely to cause a significant fall in crop yields. These factors are measured by weather stations or even satellite technology. The advantage of this approach is that insurers do not need to make field-level assessments, which reduces administrative costs. In addition, farmers who have such insurance do not have incentives to mismanage their crop (a problem known as moral hazard) in order to receive a payout, since the payout is based on an external measurement rather than crop yield. However, weather-index-based insurance requires a number of conditions to be in place: (i) the index chosen must be strongly correlated with local yields, or else farmers are not insuring themselves against the relevant risk (this is known as basis risk): (ii) there must be adequate infrastructure, such as a network of local weather stations and/or available remote-sensing options, reliable historical data and an adequate legal and regulatory environment; (iii) farmers should have a clear understanding of how such insurance works and should be able to pay for it; (iv) for index insurance to be effective, it should be linked to other financial services as part of a larger package of risk management solutions. The use of futures markets by smallholders in developing countries to manage price risk seems more problematic at present. Few developing countries have commodity exchanges where farmers and other market participants can hedge against price fluctuations. Moreover, there are substantial fixed costs of participation in such markets in terms of knowledge and understanding, and it is less profitable for a farmer to acquire such knowledge if her or his farm is small. Even in the United States of America, only 3 % of farms used futures contracts in 2008.[93] In general, it has proved extremely difficult to reach smallholders in a cost-effective manner. Governments face risks similar to those faced by farmers, and some of the available instruments are similar as well.

5.3. Nutrition security for resilient people

While short-term interventions in the aftermath of a crisis are crucial to maintain food and nutrition security, there is also a clear need for development investments to help poor and vulnerable groups build capacity, manage shocks, and develop resilience to future shocks. Yet donor funding for disaster prevention and enhanced resilience remains low.[94]

Fighting under-nutrition

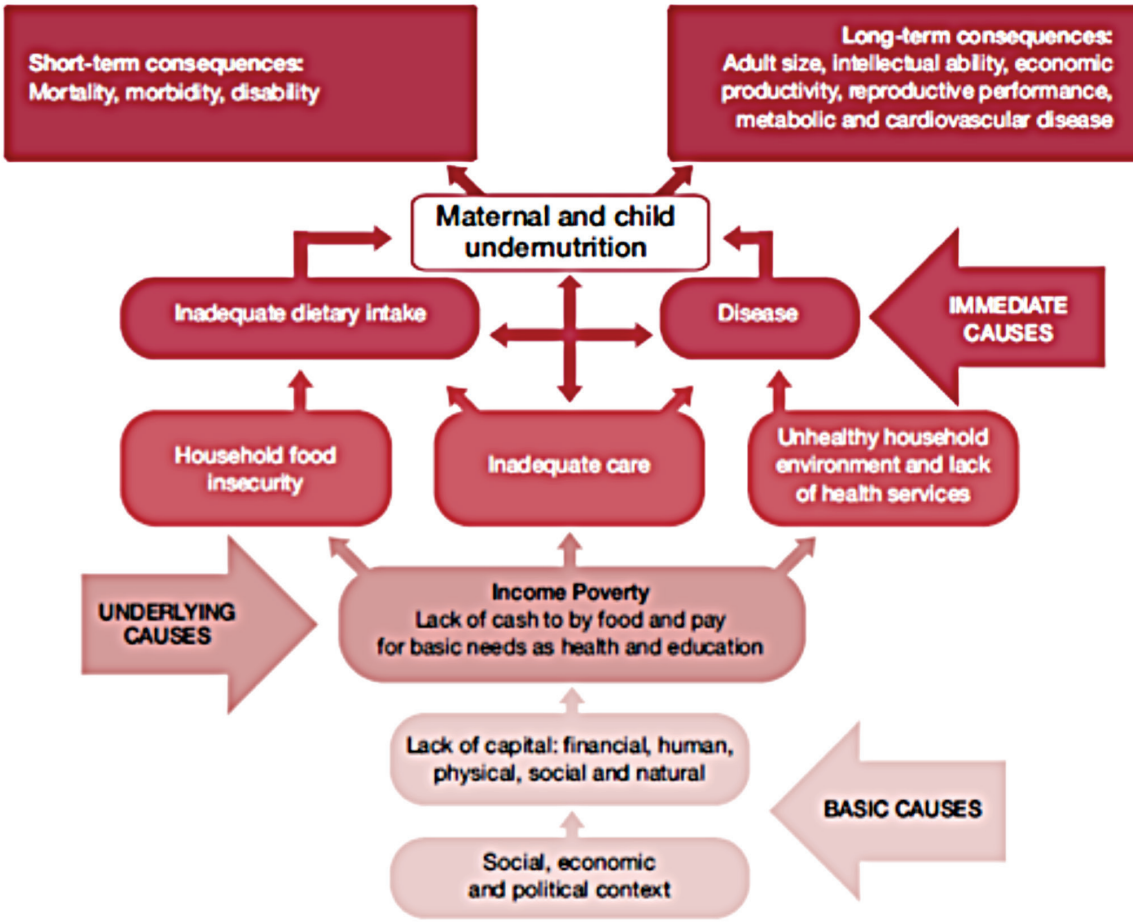
In 1970, 24% of the world's population suffered from chronic hunger: they were not getting sufficient calories. This figure has now dropped to 13%. Nevertheless, approximately 925 million were still going hungry every day in 2010. Many more subsist on a starchy, carbohydrate diet which fails to provide them with all the nutrients they need. An estimated 186 million children under the age of five are stunted by malnutrition, meaning they have low height for their age. This affects both their mental development and intellectual capacity. Vitamin A deficiency compromises the immune systems of 40% of children under the age of five in developing countries and leads to the death of 1 million children each year. Globally, anemia is responsible for the death of at least 50,000 women a year during pregnancy and childbirth.

While hunger is a major problem in sub-Saharan Africa, the excess intake of calories seriously undermines health in the Caribbean and Pacific regions. Chronic non-communicable diseases, many related to poor nutrition, now account for 57% of deaths in the Caribbean. A similar story can be told for the Pacific region, where half of the adult population is overweight. Malnutrition, in its various guises, deprives people of strength and energy, reducing their ability to work effectively. It is thus a significant cause of poverty and acts as a brake on socio-economic development.

Producing food of high nutritional quality requires a range of interventions. Smallholder farmers should be encouraged to produce a diversity of grains, roots and tubers, vegetables and fruits, fish and livestock. In doing so, they can provide themselves, and supply local markets, with a diverse diet containing the minerals, vitamins, proteins and calories essential for a healthy life. An important technological solution involves the breeding of micronutrient-rich staple food crops with high concentrations of important vitamins. Bio-fortification, as it is known, requires considerable upfront investment, but may prove more cost-effective than providing supplements to vulnerable groups. There have already been notable successes with the orange-fleshed sweet potato, rich in vitamin A, in Uganda and Mozambique.

In Brazil, the Zero Hunger Campaign *(Fome Zero)* dramatically reduced child malnutrition. Between 2003 and 2008, the number of malnourished children under five years of age dropped from 12.5% to 4.8%. The programme's success was based on a strong political commitment; making the eradication of hunger a central element of national policy; targeting social protection for families via women; and stimulating small-scale farm production to satisfy the extra demand for food, for example to supply the school meals programmes.[95]

Figure 13: Model of casual pathways leading to undernutrition



Source: EuropeAid. January 2011. Addressing Undernutrition in External Assistance Reference

5.4. Stocks and strategic reserves

Buffer stocks are an important policy instrument in a number of emerging economies and developing countries, though they have been virtually abandoned in the past. Some developing countries could have started increasing their stocks in an effort to become self-sufficient.

Three key challenges arise with maintaining these types of strategic reserves that will need to be addressed: the determination of optimum stock levels, the level of costs and losses associated with these reserves, and the uncertainties that strategic reserves can bring out in the market place. Not only is the

process of determining optimum stock levels politically loaded, but reserves are also highly dependent on transparent and accountable governance. In addition, predicting supply, demand, and potential market shortfalls can be extremely difficult. In terms of costs, physical reserves cost money and must be rotated regularly, for example in African countries, the costs of holding a metric ton of food varied from US$ 20 to US$ 46 in these countries.[96] The countries that most need reserves are generally those least able to afford the costs and oversight necessary for maintaining them, and the private sector is better financed, better informed, and politically more powerful, which puts them in a much better position to compete than most of the governments that would be managing these reserves. Finally, the uncertainties that strategic reserves can introduce into the marketplace can be problematic. They distort markets and any mismanagement and corruption associated with these reserves may actually exacerbate hunger rather than resolving food security issues. Some rice producing Asian countries rely on a combination of rice reserves, import or export monopolies, and domestic procurement to stabilise prices within a pre-determined band. These measures aim to stabilise domestic rice prices and, in some cases, have stimulated agricultural growth. In Africa, the experience with maize buffer stocks is mixed. The operational costs of buffer stocks are significant. Appropriate storage infrastructure is extremely costly to acquire, and buying the food stock and holding it is also very expensive. Domestic procurement, food releases from buffer stocks and trade programmes require continuing budgetary allocations to cover any operational losses occurring in domestic and international trading. Losses incurred on behalf of policy-dictated objectives for price stabilization may be viewed as direct subsidies. Although expenditures associated with the acquisition and holding of stocks for food security purposes can qualify under the WTO Green Box, from a WTO point of view, such price stabilisation mechanisms could also be considered as trade distorting support. In times of price increases, such costs can escalate to significant levels, rendering buffer stocks ineffective in containing price surges.[97]

Poor management makes buffer stocks ineffective. There is repeated evidence that releases are made too late to influence food prices or to safeguard food security. Abrupt and unpredictable changes in buffer stock operations raise market risk significantly and discourage private investment.

Policies that would facilitate access to credit for storage improvements by farmers, cooperatives and private traders should be considered. Producer organizations are critical to food storage development. There is also need for training to build specialized storage management skills both for farmers' association and cooperatives as well as for the private sector.[98]

Emergency food reserves

Relatively smaller food security emergency reserves can be used effectively and at lower cost to assist the most vulnerable. Unlike buffer stocks that attempt to offset price movements and which act as universal subsidies benefiting both poor and non-poor consumers, emergency food reserves can make food available to vulnerable population groups in times of crisis. In addition, emergency reserves of relatively small quantities of staple foods will not disrupt normal private sector market development which is needed for long term food security. Governments in vulnerable countries should integrate such emergency food reserves in their national food security strategies. Emergency reserves should be integrated with social and food security safety nets and other food assistance programmes, to increase their effectiveness in benefiting the vulnerable. Finally, emergency reserves ought to be adequately resourced and financed, whether by governments, the international donor community, or both. For food emergencies, contingent financing plans are important and governments should be prepared to allocate budget when there is need. Some developing countries may not have the capacity to operate national emergency reserves and small, strategic food reserve systems at regional level could fill the gap. In regions, where food crises are likely to recur and transport infrastructure is weak, such emergency reserves could help to provide food to the hungry fast.[99]

5.5. Building resilience to Climate Change [100]

Figure 14: Seven Pillars of Climate Resilient Sustainable Agriculture

Source: Action Aid. May 2012. Climate Resilient Sustainable Agriculture.

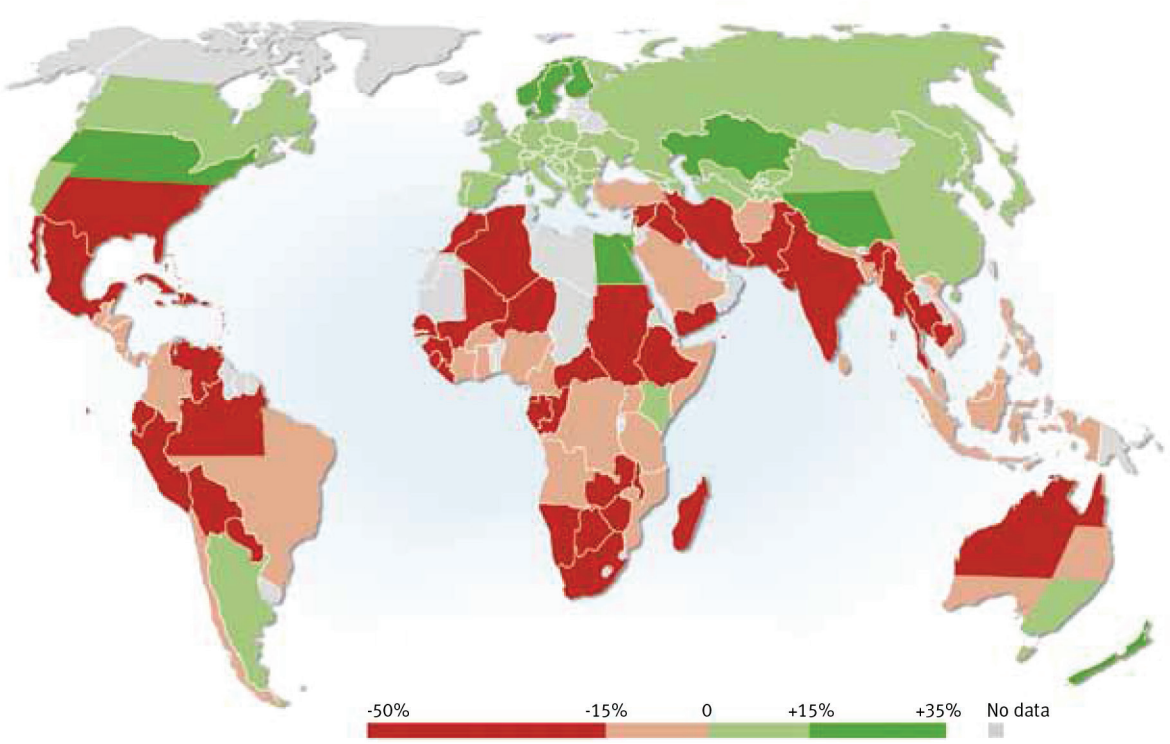
Conventional approaches to promoting climate-smart agriculture tend to focus on technologies to reduce emission of greenhouse gases (mitigation), to cope with climate variability or uncertainty (adaptation) and to increase production (growth).[101]

Crop research is a crucial area for adaptation to climate change in order to deal with changes in the length of growing seasons, increased droughts and periodic water logging as well as increased temperature and salinity.[102]

In order to reduce the risks of food and nutrition insecurity among vulnerable populations, rural and urban poor people must have access to instruments that not only help them manage risks and respond to shocks in the short term, but that also improve their resilience and promote their food security in the long run. Accordingly, governments, donors, and the private sector must develop and scale up approaches that are specifically adapted to the needs of vulnerable populations.[103]

Early work on climate change focused on understanding the possible changes that would take place in climate and weather, and the impacts that these would have on the physical environment. Much of the attention in terms of action was directed towards climate change mitigation – preventing further global warming by reducing carbon dioxide and other greenhouse gas emissions. However, in the past few years there has been a shift towards understanding the impacts of climate change on the poor better as well as the actions they need to take to adapt to those changes.[104] Climate change is leading to an increase in the frequency and severity of hazards and stresses, with detrimental effects on livelihoods, and an increasing frequency of disasters. In addition climate change impacts bring gradual changes to seasonal patterns and stresses such as pests and diseases that directly affect livelihoods, especially farming, and which are perhaps too complex for those who are most vulnerable to understand. Facing this uncertainty about what the future might bring, people struggle to adapt to the changes in their environment. The relevance of livelihoods and disaster management approaches to understanding and addressing the impacts of climate change is therefore becoming increasingly clear.

Figure 15: Projected changes in agricultural productivity



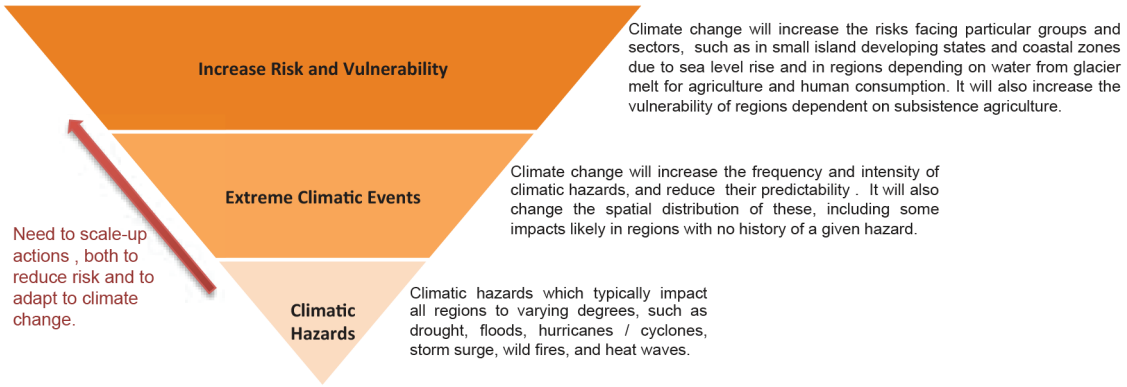
Source: Beddington J. et al. 2012. Achieving food security in the face of climate change.

Climate change is a major stress that must be considered in designing strategies to build resilience. Taking steps to anticipate and incorporate plans for responding to potential climate change impacts into economic and political systems is referred to as "adaptation." Climate adaptation requires that we utilize science, technology, innovation, and the best available information to understand and respond to unavoidable impacts.

For countries to reduce their vulnerabilities significantly, a different approach is required, adapting existing development mechanisms to reduce risks and strengthen climate resilience. Fortunately, innovative low- and middle-income countries are starting to use instruments designed, for example, to evaluate public investment decisions or reduce structural poverty. By making them risk-sensitive, governments can address risk on a much larger scale and allow both adaptation and DRM to be delivered through existing administrative capacities. This can avoid the creation of new risk and generate important co-benefits for society.

The costs of many adaptation measures cannot be borne by smallholder farmers in Africa. Considering that the UNFCCC funds are not enough to address the problems caused by climate change, there is a need to look for complementary funding sources. Since knowledge on how to access such funds is still exclusive, capacity building is crucial in this area. Otherwise, there is high danger of the funds being used exclusively for what the few that have access to them deem fit, without acknowledging the needs of the vulnerable. In this sense, development policy and donor coordination in development cooperation need to be improved so that the scarce resources can be bundled to achieve increased benefits.[105]

Figure 16: Climate Change and Disaster Risks



Source: FAO. 2011. Resilient Livelihoods.

Disaster risk reduction protects development investments in the agriculture, livestock, fisheries/ aquaculture and forestry sectors, helping the world's most vulnerable people become food secure. Disaster risk reduction is vital for ensuring one of the most basic human rights — the right to food and freedom from hunger. Furthermore, disaster risk reduction creates a multiplier effect that accelerates the achievement of the Millennium Development Goal 1: the eradication of extreme poverty and hunger.[106]

For instance, over the past three decades, hundreds of thousands of farmers in Burkina Faso and Niger have found low-cost methods of intensifying agriculture that allow production to grow with the increase in population and that have transformed the region's arid landscape into productive agricultural land, improving food security for about 3 million people. These landscapes now have abundant trees, crops and livestock, and evidence shows that farmer management is a strong determinant of land and agroforestry regeneration. Sahelian farmers achieved their success by modifying traditional agroforestry, water and soil-management practices, thus creating complex agricultural landscapes with more vegetation and variation.[107]

To improve water availability and soil fertility in Burkina Faso's Central Plateau, farmers have sown crops in planting pits and built stone contour bunds, which are stones piled up in long narrow rows that follow the contours of the land in order to capture rainwater runoff and soil. This has contributed to the rehabilitation of 200,000 – 300,000 hectares of land and produced an additional 80,000 tons of food per year. In southern Niger, farmers have developed innovative ways of regenerating and multiplying valuable trees whose roots already lay underneath their land, thus improving about 5 million hectares of land and producing more than 500,000 additional tons of food per year.[108]

In the 1980s farmers in Burkina Faso began experimenting with traditional planting pits to reclaim severely degraded farmland that water could not penetrate. The innovation of farmers was to increase the depth and diameter of the pits and add organic matter, such as manure, to the bottom of the basins. This technique improved soil fertility and agricultural production, and allowed farmers to effectively raise their yields from virtually nothing to 300 to 400 kilograms per hectare in a year of low rainfall, and up to 1,500 kilograms or more per hectare in a good year. This technique spread rapidly and over time farmers around the world/country have managed to improve and adapt the pits to their own needs.[109]

In the 1970s and 1980s in Niger, farmers started experimenting with a process known as farmer-managed natural regeneration (FMNR) – a low-cost way of growing and reproducing trees and shrubs that provides useful food, fuel or fodder. The trees generate a range

of benefits, including the reduction of wind speed and evaporation, the production of at least a six-month supply of fodder for livestock, the provision of firewood, and fruit and medicinal products that farm households can consume or sell. Many villages in Niger now have 10 to 20 times more trees than 20 years ago, and an estimated 1.25 million new trees have been planted.[110]

Environmental migration is likely to pose new challenges to policymakers in the decades to come. While environmental migration appears to be limited to a net figure of about 128,000 migrants due to climate anomalies over the period 1960–2000, the phenomenon is likely to magnify in the future. Under moderate scenarios, in terms of both climate and population changes, future climate changes could lead to an additional displacement of 5 to 24 million people every year by the end of the 21st century. Extreme weather shocks, likely to magnify in frequency and intensity in the future, increase the economic incentives of individuals to migrate. Sub-Saharan African countries that have a large agricultural sector are particularly vulnerable. Weather anomalies increase the incentives to migrate out of one's country of origin and strengthen the urbanization process especially in agricultural-dependent countries. Recommendations include promoting policies that make crops and livestock less sensitive to weather stresses and shocks, practices that encourage crop and livestock diversification, mechanisms to mitigate risk, such as insurance packages, and removing internal migration barriers.[111]

5.6. Targeted safety nets

Social protection constitutes long term support for households to reduce, prevent and overcome hazards which adversely affect their livelihoods. Social protection can also be an effective tool to enable vulnerable households to recover from shocks, and increase resilience and well managed social protection interventions, linking social assistance and development. Social protection, including support payments and insurance against risk, does not reduce disaster risk in itself. Nor is it an alternative to development investments in public infrastructure and services. However, there are two compelling reasons why social protection should be part of a larger DRM strategy.

Bilateral donors have developed a consensus on social protection as referring to "policies and actions which enhance the capacity of poor and vulnerable people to escape from poverty and better manage risks and shocks". [112]

Safety nets provide buffers in times of need and they keep disaster losses from cascading into other household impacts and outcomes, such as taking children out of school, or selling off productive assets – coping strategies with negative long-term consequences. Although such instruments were not designed to deal with disaster impacts, they can be adapted to reach those at risk, preventing significant medium- to long-term increases in the number of those suffering after disasters.

The two main categories of safety nets are targeted **cash-based transfers** and **food access-based approaches**. There is a growing recognition in the humanitarian sector that cash and voucher transfers can be an appropriate and effective tool to support populations affected by disasters while stimulating local economies and markets. Cash is increasingly being used as a complement or alternative to a range of in-kind assistance. Transfers are often targeted at the poorest households and the most vulnerable groups. Evaluations in Ethiopia, Lesotho, Malawi, Mozambique, Swaziland, South Africa and Zambia all confirmed that cash transfers are used mainly for meeting basic needs (food, groceries, health) but also for investment (education, agriculture, business), as well as asset protection and, to a limited extent, asset accumulation. In contrast to food aid, cash transfers stimulate production, trade and markets.[113]

Conditional cash transfers (CCT, payment made upon meeting requirements such as attending training, sending children to school, etc.) seek to create incentives for individuals to invest in human resource development. CCTs have been shown to reduce income inequality in Brazil, Chile and Mexico.[114] Where CCT programs already exist, increasing their benefit or coverage has been a key part of the government response. Establishing new CCTs however requires capacity and may take too long to constitute a rapid response to the crisis, while also carrying the risk of being poorly targeted and excluding the neediest.

Food assistance includes direct food transfer, food stamps or vouchers and school feeding. Countries such as Bangladesh, Cambodia, Ethiopia, Haiti, India, Liberia, Madagascar and Peru implemented self-targeted food-for-work programmes, while Afghanistan, Angola, Bangladesh and Cambodia distributed emergency food aid[115]. School feeding programmes have been reported by Brazil, Burkina Faso, Cape Verde, China, Honduras, Kenya, Mexico and Mozambique, among others. Countries such as Dominican Republic, Egypt, Ethiopia, Indonesia, Jordan, Lebanon, Mongolia, Morocco, the Philippines and Saudi Arabia[116] have been selling food at subsidized prices to targeted groups. Surges in food prices and increases in the prices of inputs such as fertilizers reduce the incomes of poor and vulnerable households and put stress on family budgets. In response, households sell off assets, take children, especially girls, out of school or change their diets to include cheaper, less nutritious ingredients, all of which have consequences that last long after the price surge has receded.

The long-lasting nature of such impacts provides both a humanitarian and an economic rationale for safety nets that mitigate the impact of the shock. School feeding programmes, for example, can help to prevent children from leaving school during a crisis, thus reducing the long-term impact of the price shock on human capital. For poor consumers, scaling-up existing safety nets is a viable option in countries where these are already in place. This could be achieved by adding new beneficiaries, by increasing transfers made to current beneficiaries or both.

However, such safety nets require a lot of resources. This presents an obstacle, especially for low-income developing countries, which cannot afford such expenditures in times of crisis. Another difficulty is that many countries do not already have safety-net mechanisms in place. It is of critical importance to design safety net mechanisms *ex ante*, even if funds are not sufficient to implement them at first.

However, targeted input subsidies involve high costs, and such programmes are difficult to manage, especially during periods characterized by volatile food and input prices. For example, it is typically very difficult to make sure that fertilizer is delivered on time to farmers. Even if this problem is solved, political pressures for expansion of input support programmes may lead to an unsustainable fiscal burden that may hinder rather than promote long-run growth. Therefore, it is important that such programmes are temporary and target only those farmers that have no means to finance input purchases.[117]

Box 2: Targeted safety net measures

Improving incomes through credit warrantage: the case of Niger118

An ingenious financing scheme designed to raise the income of African smallholder farmers has been so successful that it is to be scaled up in Niger, where it was pioneered, and extended to neighbouring countries. Like many African smallholders, Niger's farmers had long been penalized by having to sell their produce immediately after harvest – when prices are lowest. The first step was to help them form farmers' groups. Then the groups were helped to get credit through a local version of the warrantage, or inventory credit system, used by European farmers in the nineteenth century. Under the system, rather than selling their harvest at once, farmers use it as collateral for a bank loan. With the money they can buy essential inputs for the next planting and also hold on to their produce until the lean season – when prices climb. A study of the Niger project carried out in December 2009 found that participating farmers were able to increase their income by between 19 and 113 % in six months. And since they were able to buy better seeds and fertilizer, their yields went up – by between 44 and 120 %. more droughts in the past five years, the food security has improved by 0.93 months per year compared to those who did not participate in the program for five years.[121]

Safety Nets at work: Mexico's *Oportunidades programme*

Following the food price crisis of 2008, the Mexican government undertook a major expansion of its existing *Oportunidades programme*[119], a targeted scheme providing cash to poor families on condition that children attended school and family members regularly visited health centres. The programme had been introduced in 1997 when it was realized that direct food subsidies, such as tortilla price support, were expensive and not very effective in reducing poverty (it was calculated that administrative costs amounted to 40 percent of the total). To shield poor people from soaring prices, Oportunidades' budget was increased from 39 to over 42 billion pesos while the number of beneficiaries went up by a million to a total of five million. Selection of beneficiary families is made according to strict eligibility criteria. Cash transfers, made on a monthly basis, increase with the school grade and are also higher for girls in middle school. Families now receive an average of 665 pesos (US $57) a month. Although the programme did not fully compensate for the increased food prices, it did provide one in four families with major protection against the turmoil in food markets. It has also been credited with improving the health of children and adults, and raising nutrition and school enrolment levels.

Building Resilience through the Productive Safety Net Programme: Ethiopia's experience

From 1993 to 2004, Ethiopia relied heavily on emergency assistance to avert mass starvation. Although successful to some degree, this practice did not prevent asset depletion or integrate well with ongoing economic development activities that might reduce the threat of future famine. The Productive Safety Net Programme (PSNP) was created to change this by providing recipients with a predictable source of household income either via cash transfers, food transfers, or paid labor within a public works program. This program works in combination with the Household Asset Building Program (HABP), which links people in the PSNP with the agriculture extension service that disseminates technological packages and on-farm technical advice. By building institutions to plan and manage public works, integrating public works into *woreda* development plans and early warning systems, and working with communities to determine beneficiaries, the PSNP builds resilience into government structures and strengthens capacity for better governance.[120] The PSNP is also building resilience into the natural resource base by focusing on tree planting, rehabilitation of stream beds and gullies, and terracing to prevent erosion. Households that received five years of support from the PSNP public works programs have seen an improvement in food security of approximately one month per year. In the drought-prone areas where people have experienced two or more droughts in the past five years, the food security has improved by 0.93 months per year compared to those who did not participate in the program for five years.[121]

5.7. Resilience in contexts of conflict and fragile states

DFID defines a fragile state as one that 'cannot or will not deliver core functions to the majority of its people, including the poor'. Core functions usually include reducing poverty as well as providing public services. Fragile states often face multiple challenges, including a limited capacity to absorb external funding.

Violent episodes of conflict weaken resilience in individuals, households, communities, the natural environment, markets and economies, civil society, and governing institutions. Resilient governing institutions can mitigate the causes of violent conflict, but the meaning of resilience when referring to institutional attributes diverges somewhat from the more common usages of the term. Investments in conflict resolution mechanisms can strengthen resilience to other types of shocks (e.g. droughts). This note now turns to elaborating on each of these dimensions.

According to results reported in the World Development Report 2011[122], major civil wars have devastating impacts on some of the core sources of individual, household, and societal resilience.

Agricultural resilience in the face of crisis and shocks

- After emerging from civil war, the average country takes 14 years to return to its pre-war economic growth trajectory.
- Of the 70 million children worldwide who are not enrolled in school, 40 million of them reside in conflict-affected countries.
- In countries affected by major violence, poverty reduction is approximately a percentage point slower per year than in countries with no violence.
- In fragile or conflict-affected states, children are twice as likely to be undernourished compared with children in countries with no conflict.

Research on the consequences of conflict indicates many other adverse impacts on population displacement, public health systems, as well as regional spillover effects. The combined toll erodes resilience, making populations even more vulnerable to future economic shocks, natural disasters, and recurrences of violent conflict. Therefore, resilient governing institutions play a pivotal role in conflict management and mitigation.

6. The way forward. Investing in resilience: ensuring a disaster-proof future

Risk reduction and strengthening resilience are critical elements in promoting sustainable development and should be part of the international development agenda beyond 2015 (post MDGs). Risk reduction must be integrated into public investment policies and planning. Risk assessments, based on analysis of loss and estimation of potential future losses, are essential for informed decision-making. Governments, policy makers and other relevant stakeholders should encourage the development and financing of plans for resilience in a coordinated and coherent manner across sectors. All involved actors must work in global and local partnerships to strengthen resilience including enacting necessary reforms of governance at all levels; to strengthen accountability, as well as citizen monitoring of environmental and development performance at all levels.[123]

While short-term interventions in the aftermath of a crisis are crucial to maintain food and nutrition security, there is also a clear need for development and scale-up investments to help poor and vulnerable groups build capacity, manage shocks, and develop resilience to future shocks. Other avenues to serve the long-term needs of vulnerable groups include creating the legal and administrative infrastructures that facilitate the expansion of social safety nets, which also help build resilience to economic crises. Depending on the context, programs like cash transfers, food stamps, in-kind transfers of food, work-for-food, and nutrition education campaigns can help raise household income and consumption. Social safety nets need to be incorporated into national social protection agendas and risk-management strategies.[124]

Most decision makers agree that the integration of disaster preparedness, mitigation and prevention measures into policy development is key to reducing the vulnerability of human populations to natural hazards. Interventions must build on local institutions and livelihood adaptation strategies to achieve more sustainable solutions. The current aid architecture needs to be more flexible and support longer term interventions and development approaches, even during acute crisis situations.[125]

Integrated approaches are also needed in development interventions aimed at promoting adaptation to climate change. Smallholders are exposed to global environmental change and economic globalisation leading to competition between smallholder produce and highly subsidized produce from industrialised countries. There is a need to examine the trade-offs and synergies between international climate and trade policies as these can impede or enhance adaptations. This means that any introduced adaptation measures should be tested through the whole chain from smallholder producers to consumers to ensure that adaptation practices are really providing layers of resilience against climate change. It does not make sense to improve productivity and not have a market for the produce thereby leaving this to waste – this does not contribute to poverty alleviation in the long-term.[126]

Developing tools that enable decision makers at various levels to factor climate change into policies and their activities can promote adaptation. Projecting climate change impacts could be one way of informing decisions on climate change but the current drawback is that many projections have coarse spatial resolutions and are thus not so useful for decisions pertaining to smaller geographic areas.[127]

National or regional early warning systems capable of predicting imminent disasters need to be strengthened or developed where they do not exist, and better linked to decision making and response organisations. Linking weather data with nutritional information, crops and animal disease outbreaks and market prices, the systems need to draw their data from all levels, including community-level. To mitigate volatility, the stock-to-use ratio of food products needs to be improved by creating conditions for production increases and for adequate stock. Moreover, export restrictions of basic food products should be discouraged. This will include responding through market transparency (information on production, reserves, prices, etc.), promoting storage, and local/national food reserves where appropriate and feasible. The impacts of price volatility can be mitigated by using a range of measures, including the establishment of scalable safety nets,

food security information systems, use of (weather, index) insurance, and an enhanced capacity to use price risk management instruments.[128]

A significantly more rigorous monitoring and evaluation (M&E) system is needed, comprised of greater efforts to collect indicators and to establish impact through more rigorous research and evaluation. While there is no consensus as to what an ideal summary indicator of resilience is—or whether such an indicator is needed—there are many productive ideas on which indicators suite which resilience domains. In health and nutrition, M&E systems are highly developed, for example, and largely consist of well-established physical indicators. In governance and conflict there is a greater need for qualitative indicators, and where possible the development of more objective quantitative indicators (such as "number of violent conflicts"). In natural resource management, indicators of technology uptake, conflict incidences, aerial data, and geographic information systems data are all relevant. Economic development is perhaps the most challenging domain, given the difficulties of systematically surveying mobile and dispersed populations. Beyond M&E, there is clearly a broader need to strengthen and expand the evidence base for policymaking.[129]

Evidence on the **cost-effectiveness of resilience-building** activities is lacking in many areas. While economic appraisals of some aspects of resilience, such as community- based disaster risk reduction activities, have been carried out, other areas of resilience have had less cost-benefit analysis. More research is needed on the complementarities between strengthening disaster resilience and other development goals and on the cost effectiveness of individual investments, different financing arrangements and leveraging private sector financing. More work is also needed to set out the wider economic and financial evidence that could be used in support of more effective investment in disaster resilience to incentivise donors, partner governments, multilaterals and implementing agencies.[130]

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GLOSSARY[131]

Adaptability
The capacity of actors in a system to manage resilience, either by moving the system toward or away from a threshold that would fundamentally alter the properties of the system, or by altering the underlying features of the stability landscape.

Adaptation
The adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities (UNFCCC).

Adaptation includes capacities, measures and strategies that enable communities to change in order to address expected negative consequences of natural hazards and climate change. It implies that a society has already changed before the occurrence of negative effects in such a way that coping is no longer necessary to the extent that it had been in the past. In contrast to coping capacities, adaptive capacities and measures are strongly aimed at the transformation of current structures (education, status of the environment, etc.). Adaptation focuses primarily on capacities that can trigger the appropriate changes.

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

Adaptive Governance
Institutional and political frameworks designed to adapt to changing relationships between society and ecosystems in ways that sustain ecosystem services; expands the focus from adaptive management of ecosystems to address the broader social contexts that enable ecosystem-based management.

Biological hazard
Process or phenomenon of organic origin or conveyed by biological vectors, including exposure to pathogenic micro-organisms, toxins and bioactive substances that may cause loss of life, injury, illness or other health impacts, property damage, loss of livelihoods and services, social and economic disruption, or environmental damage.

Capacity
The combination of all the strengths, attributes and resources available within a community, society or organization that can be used to achieve agreed goals.

Capacity building
Efforts aimed to develop human skills or societal infrastructures within a community or organization needed to reduce the level of risk.

Capacity development
The process by which people, organizations and society systematically stimulate and develop their capacities over time to achieve social and economic goals, including through improvement of knowledge, skills, systems, and institutions.

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

Complex Adaptive Systems (CAS)
These include companies, the weather, our immune systems, the economy, ecosystems, single cells and brains. In CAS simple rules of cause and effect do not apply, they are complex, unpredictable and constantly adapting to their environments. Hence, they are far from being machines that you can take apart and investigate the parts to understand the whole.

Coping capacity
The ability of people, organizations and systems, using available skills and resources, to face and manage adverse conditions, emergencies or disasters.

Coping and coping capacities include the capacities of societies and exposed elements (such as systems and institutions) to minimize the negative impact of natural hazards and climate change through direct action and resources. Coping is therefore based on the direct effects of natural hazards and climate change. According to the concept of the WorldRiskIndex, coping includes available abilities and capacities that may be highly relevant for minimizing damages in the occurrence of a hazardous event.

The capacity to cope requires continuing awareness, resources and good management, both in normal times as well as during crises or adverse conditions. Coping capacities contribute to the reduction of disaster risks.

Disaster
A serious disruption of the functioning of a community or a society involving widespread human,

material, economic or environmental losses and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

Disaster risk management
The systematic process of using administrative decisions, organization, operational skills and capacities to implement policies, strategies and coping capacities of the society and communities to lessen the impacts of natural hazards and related environmental and technological disasters.

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

Disturbance
In ecological terms, disturbance is a relatively discrete event in time coming from the outside, which disrupts ecosystems, communities, or populations, changes substrates and resource availability, and creates opportunities for new individuals or colonies to become established.

Early warning system
The set of capacities needed to generate and disseminate timely and meaningful warning information to enable individuals, communities and organizations threatened by a hazard to prepare and to act appropriately and in sufficient time to reduce the possibility of harm or loss.

Ecosystem Resilience
The measure of how much disturbance (storms, fire or pollutants) an ecosystem can handle without shifting into a qualitatively different state. It is the capacity of a system to both withstand shocks and surprises and to rebuild itself if damaged.

Ecosystem Services
The benefits that people derive from the ecosystem, including the production of goods (food, fibre, water, fuel, genetic resources etc), regeneration processes (purification of air and water, seed dispersal and pollination); stabilizing processes (erosion control, moderation of weather extremes), life-fulfilling functions (cultural value) and conservation of options (maintenance of ecological systems for the future).

Environmental impact assessment (EIA)
Process by which the environmental consequences of a proposed project or programme are evaluated, undertaken as an integral part of planning and decision-making processes with a view to limiting or reducing the adverse impacts of the project or programme.

Exposure
Exposure in its core meaning in natural hazard research refers to entities exposed and prone to be affected by a hazard event. These entities include persons, resources, infrastructure, production, goods, services or ecosystems and coupled social-ecological systems.

Extensive risk
The widespread risk associated with the exposure of dispersed populations to repeated or persistent hazard conditions of low or moderate intensity, often of a highly localized nature, which can lead to debilitating cumulative disaster impacts.

Geographic information systems (GIS)
Analysis that combine relational databases with spatial interpretation and outputs often in form of maps.

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

Intensive risk
The risk associated with the exposure of large concentrations of people and economic activities to intense hazard events, which can lead to potentially catastrophic disaster impacts involving high mortality and asset loss.

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

National Platform for Disaster Risk Reduction
A generic term for national mechanisms for coordination and policy guidance on disaster risk reduction that are multi-sectoral and inter-disciplinary in nature, with public, private and civil society

participation involving all concerned entities within a country.

This definition is derived from footnote 10 of the Hyogo Framework. Disaster risk reduction requires the knowledge, capacities and inputs of a wide range of sectors and organisations, including United Nations agencies present at the national level, as appropriate.

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

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

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

Residual risk
The risk that remains in unmanaged form, even when effective disaster risk reduction measures are in place, and for which emergency response and recovery capacities must be maintained.

Resilience
The capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity and feedback.

Resilience means the ability to "resile from" or "spring back from" a shock. The resilience of a community in respect to potential hazard events is determined by the degree to which the community has the necessary resources and is capable of organizing itself both prior to and during times of need.

Response
The provision of emergency services and public assistance during or immediately after a disaster in order to save lives, reduce health impacts, ensure public safety and meet the basic subsistence needs of the people affected.

Response Diversity
The multitude of responses to environmental change and disturbances, among species contributing to the same ecosystem function. This kind of diversity plays a crucial role in sustaining the resilience of ecosystems to cope with disturbance and change. If all species within a functional group (pollinators, seed dispersers or decomposers) are equally sensitive to a particular disturbance the system will have low response diversity and be vulnerable to that particular disturbance.

Risk
The combination of the probability of an event and its negative consequences.

Risk assessment
A methodology to determine the nature and extent of risk by analysing potential hazards and evaluating existing conditions of vulnerability that together could potentially harm exposed people, property, services, livelihoods and the environment on which they depend.

Risk management
The systematic approach and practice of managing uncertainty to minimize potential harm and loss. Risk management comprises risk assessment and analysis, and the implementation of strategies and specific actions to control, reduce and transfer risks. Risk management is a core issue for sectors such as water supply, energy and agriculture whose production is directly affected by extremes of weather and climate.

Risk Mapping
A risk map is a map of a community or geographical zone that identifies the places and the structures that might be adversely affected in the event of a hazard.

Social-ecological Systems
Social-ecological systems are complex, integrated systems in which humans are part of nature.

Social Resilience
The ability of human communities to withstand and recover from stresses, such as environmental change or social, economic or political upheaval. Resilience in societies and their life-supporting ecosystems is crucial in maintaining options for future human development.

Susceptibility
Susceptibility refers to selected structural characteristics of a society

and the framework conditions in which the social actors face potential natural hazards and climate phenomena. In this regard, the nutritional and the economic situation as well as the condition of infrastructures are particularly important. These characteristics render it possible to make provisional assumptions on the relative susceptibility of societies compared to other societies.

Sustainability
The capacity to create, test and maintain adaptive capability. Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable Development
Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Transformability
The capacity to create a fundamentally new system when ecological, economic or social (including political) conditions make the existing system untenable.

Vulnerability
The propensity of social and ecological systems to suffer harm from exposure to external stresses and shocks. Research on vulnerability can assess how large the risk is that people and ecosystems will be affected by climate changes and how sensitive they will be to such changes. Vulnerability is often denoted as the antonym of resilience.

ACRONYMS

AfDB	African Development Bank
ADB	Asian Development Bank
CAADP	Comprehensive Africa Agriculture Development Programme
CAS	Complex Adaptation Systems
CBA	Community-based Adaptation
CBO	Community-based Organization
CDBRM	Community-based Disaster Risk Management
CC	Climate Change
CCA	Climate Change Adaptation
CDM	Clean Development Mechanism
CILSS	Permanent Inter-State Committee for the Fight against Drought in the Sahel
CSO	Civil Society Organization
DCI	Development Cooperation Instrument
DFID	UK Department For International Development
DDRM	Decentralized Disaster Risk Management
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
ECHO	EC Directorate General for Humanitarian Aid and Civil Protection
EDF	European Development Fund
EWS	Early Warning System
FAO	Food and Agriculture Organization of the UN
FEWSNET	Famine Early Warning Systems Network
FNS	Food and Nutrition Security
FMNR	Farmer-managed natural regeneration
GAM	Global Acute Malnutrition

GCCA	Global Campaign for Climate Action
GHG	Greenhouse Gases
HEA	Household Economy Analysis
HFA	Hyogo Framework for Action
IHA	Instrument for Humanitarian Aid
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IFRC	International Federation of Red Cross and Red Crescent Societies
IfS	Instrument for Stability
IPCC	Intergovernmental Panel on Climate Change
LDC	Least Developed Country
LLDC	Land Locked Developing Country
LRRD	Linking Relief, Rehabilitation and Development
NGO	Non-governmental organization
NRM	Natural Resource Management
PSNP	Protection Safety Net Program
PVCAs	Participatory Vulnerability Capacity Assessments
RFM	Risk Financing Mechanism
RPCA	Food Crisis Prevention Network (West Africa)
RUTF	Ready to use therapeutic food
SSA	Sub-Saharan Africa
SHD	Sustainable Human Development
SIDS	Small Islands Developing States
SPL	Social Protection and Labor strategy

UN	United Nations
UNDP	UN Development Programme
UNECA	UN Economic Commission for Africa
UNECLAC	UN Economic Commission for Latin America
UNEP	UN Environmental Programme
UNESCAP	UN Economic and Social Commission for Asia and the Pacific
UNFCCC	UN Framework Convention on Climate Change
UNISDR	UN International Strategy for Disaster Reduction
USAID	US Agency for International Development
USDA	US Department of Agriculture
WASH	Water, Sanitation and Hygiene
WB	World Bank
WEF	World Economic Forum
WFP	UN World Food Programme
WHO	World Health Organization
WMO	World Meteorological Organization
WRI	World Resource Institute

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