Natural resource management – a central pillar of crisis-affected people's resilience

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There is a close link between a preserved ecosystem, its resilience and that of the people who depend on it. It is urgent to make natural resource management a central part of resilience strategies, by focusing more on existing strategies based on endogenous knowledge and innovation. This needs to be accompanied by strong commitment from governments, donors, actors and communities to reverse the process of environmental degradation and reinforce people's resilience.

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For a number of decades, there has been global concern about natural resource management and the protection of the environment. This is the consequence of over-exploitation of natural resources and uncontrolled urbanization as well as pollution from industry and agriculture (chemical, greenhouse gases). Aid actors are not exempt from these concerns as these phenomena have direct consequences on certain operational contexts and affect the people who live there. In addition, the fact that aid organizations often have to return to the same contexts to provide assistance raises questions about their ability to reinforce the autonomy of authorities and communities in the face of such situations. These issues are causing a change in paradigm and are placing resilience at the centre of many key actors' strategies [1] and at the interface between several types of operation, between emergency relief and development.

Resilience is defined as "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" [2]. Preservation of the environment and resilience building are two concepts which make it possible to respond to the question of disaster risk while preserving the existing potential of the context in question and strengthening the capacity of the affected populations in the medium and long term. The interactions between these two concepts are all the more important as the people who are the most concerned by international aid are also the most weakened by a degraded environment. Wherein the importance of raising awareness among aid actors so that they take the environment into account more in programmes which aim to build resilience.

Degradation of the natural environment: causes and consequences for livelihoods

In several regions of the world (e.g. the Sahel, the Horn of Africa, the foothills of the Andes, the fringes of the Andes and island areas) environmental degradation is taking place in the form of desertification, deforestation, reduced soil fertility, degradation of pastureland, reduced biodiversity, reduced availability of water, etc. The causes are both climatic (increase in frequency and scale of natural hazards) and man-made (major demographic growth and poor management of natural resources).
The degradation of the natural environment causes the deterioration of ecosystems and ecosystem services on which people depend to meet their basic needs (food, water, medicine, fuel, shelter and revenue). Poor people in rural areas are particularly affected as the resources provided by their environment are often their only means of subsistence. Communities change their coping strategies in order to adapt to this deterioration. Though certain strategies contribute

to re-establishing the balance between human activities and environmental preservation (e.g. transhumance, migration, etc.), others consist of short-term solutions which increase long-term degradation (reducing fallow periods, cultivating fragile areas like hillsides with inappropriate techniques, abusive tree felling, etc.). "Harmful" coping strategies therefore create a spiral which makes communities both actors and victims of the degradation of their natural environment.

In addition, certain changes in recent years, notably in terms of food production, have had harmful effects on the environment, reducing long-term production capacity. The intensification of agriculture, for example, characterized by the introduction of improved seeds, GMOs, very erosive tilling practices, non-organic fertilizers and intensive irrigation (particularly in south Asia) has allowed productivity to increase, but has contributed to resource depletion and degraded the structure and fertility of soils, robbing future generations of their productive heritage.

Desertification in the Sahel

The degradation of the environment has disrupted the mechanisms which communities had used for a long time, whether nomadic or sedentary, to protect themselves as much as possible against climatic hazards (migration during the dry season, transhumance, etc.). Transhumance routes have been disturbed, forcing livestock farmers to explore new pastureland further south, which leads to a greater number of conflicts with crop farmers. Conflicts have also arisen between herders due to the degradation of fodder resources and the drying up of certain wells. Solidarity mechanisms are sometimes disturbed due to conflicts over these resources. Each year, several million people are threatened in the Sahel.

The brown revolution is underway in Ethiopia

Ecological intensification has replaced the green revolution with the brown revolution, doubling yields in four years and restoring the soil. Using agroforestry based on Sesbania and local herbaceous plants, composting and cover crops in watersheds, the Tigray project has doubled yields of barley, wheat, maize and "teff". The production of "faba" beans has risen from 250 to 2500 kg/ha. The water table is rising in the area, springs are re-appearing and vegetation resists twice as long to dry periods. Studies by the Rodal Institute show that organic matter in the soil retains up to 30 times its weight in water. Based on this work, ecological intensification makes it possible to go from 160 to 480 m3 of water or more per hectare. With the support of the government, the extension of land used for agro-ecological practices is estimated to grow to 40 million hectares of cultivated land by 2015 [3].

Programmes which aim to build resilience therefore need to give a central place to the rehabilitation and preservation of natural resources. Agricultural methods of production should preserve natural potential in a sustainable and energy efficient manner. Techniques such as agro-forestry, permaculture, agro-ecology, etc. aim to create ecosystems which produce food and other useful resources (firewood, shade, etc.). In addition, specific techniques for degraded soils in areas with an arid or semi-arid climate have been developed and tested and have given convincing results in terms of the rehabilitation of soil fertility and increased agricultural production. This is the case for Zaïs [4], half moons and stone bunds [5], for example, which are easily reproduced but require more time to prepare the soil and agricultural equipment which the poorest farmers sometimes do not have (hoe, cart, wheelbarrow, etc.). These techniques deserve to be more widely disseminated. There should be investment in training for farmers (building human capital) and they should be provided with support to apply these techniques. Other techniques more specifically for natural resource management are also used. The results have been encouraging (e.g. FMNR [6], community management of natural resources like forests, timberless construction techniques to reduce deforestation, etc.).

Lastly, support for innovation is needed to help new solutions to emerge adapted to areas where there is a danger of environmental degradation. Research into innovative solutions should combine scientific knowledge and the endogenous knowledge of communities. In order to guarantee ownership on the part of local communities, their knowledge of the natural environment, the changes taking place and the risks they face needs to be improved and they should be involved in

the search for solutions.

Environmental degradation and vulnerability to natural disasters

In addition to supply services such as water, food and firewood, and cultural services such as religion and leisure pursuits, ecosystems [7] can also provide different regulation services with regard to natural disasters. As underlined by the United Nations International Strategy for Disaster Reduction, "the risk of disasters is fundamentally linked to environmental problems" [8]. The preservation of the environment therefore helps to build the resilience of communities to disasters, by reducing the risk that they will take place as well as their impact in terms of human lives, health, goods and services, and livelihoods.

Well-managed ecosystems can considerably reduce the impact of numerous natural risks such as flooding, avalanches and landslides. The capacity for an ecosystem to play this natural regulator role depends on the intensity of the natural hazard and the health of the ecosystem. This implies having an ecosystem that is well-preserved and functional, and resource use and demand for ecosystem services which do not exceed the capacity of production, with a view to sustainable regulation over time. Degraded ecosystems can still reduce the impact of such events, but much less so than functional ecosystems [9].

In addition, the state of an ecosystem can also influence the frequency and intensity of natural risks, if it is sufficiently preserved, by playing the role of a natural barrier. For example, the existence of well-developed mangroves in coastal areas reduces the cyclone surge effect and the entry of tsunami waves onto land. The reduction of mangroves to develop the production of prawns results in the weakening of marine ecosystems (fish multiplication zones), but also their capacity to act as a buffer. More generally, ecosystems like wetlands, forests and coral reefs are all susceptible to absorb all or part of a shock by acting as a "buffer".

Natural hazards lead to the degradation of the environment through the loss of specific habitats, the mortality of endemic species, the destruction of natural elements (wood, reefs, etc.) by acting as a barrier. Ecosystems will be all the more resilient to such events if they are preserved, diversified and functional. What is more, the damage created by such climatic events (chemical pollution from cracks in industrial buildings caused by an earthquake, detritus of all kinds, bodies) reduces the resilience of a given environment.

A preserved ecosystem helps to reduce the vulnerability of communities [10] to natural risks, particularly if their livelihoods depend on the environment. If a storm or a cyclone takes place and affects local buildings in a context where building materials (wood, sand) are already locally depleted, reconstruction will require much more time and money, and will even require external assistance. Being actively engaged in the preservation of the natural environment creates the necessary conditions for vulnerable groups to become engaged in sustainable development, and increases their dignity and their respect by giving them the means to identify risks and limit them, rather than simply waiting for a disaster to strike.

Investing in the management of healthy and sustainable ecosystems brings solutions at a lower cost and allows the vulnerability of communities to be reduced in relation to crises. According to the World Bank, investment in preventive measures, such as the preservation of healthy ecosystems, makes it possible to save seven times what is spent during the response to an emergency of this kind. According to UNEP, natural disasters hinder development objectives, and few governments, donors and aid and development organizations adopt an approach that is sufficiently cautious during the design and management of their projects, and even fewer recognize the importance of good ecosystem management to reduce the risk of disaster (UNEP, 2007).

Preservation of the natural environment in Honduras

In the isolated villages in the rolling landscape of south west Honduras, farmers use an ancestral technique to protect their fields. For a number of years, thousands of them have returned to and re-adapted these traditional agro-forestry techniques which are very beneficial in improving livelihoods and reducing the impact of natural disasters.

Thus, for example, though hurricane Mitch struck the area fully in 1998, there was little destruction, whereas there was significant damage in the surrounding areas.

This technique adapted to a sub-humid tropical context is called the Quesungual Slash and Mulch Agroforestry System (QSMAS) [11]. It is a cultivation method which aims to increase agricultural production at the same time as preserving and making use of natural resources. This consists of cultivating crops under the cover of an endemic forest whose large and deep roots stabilise the soil. Foliage is pruned to reduce competition for light with the crops, enrich the soil's nutrients and maintain high water retention capacity. The crops are planted without tillage and without slash and burn. This ensures that there is a permanent cover of vegetation, limits the formation of a slaking crust and reduces evaporation from the soil. Based on a holistic, participatory and collaborative approach which makes use of knowledge based on traditional community know-how, such a project not only makes it possible to reduce disaster risk, but has also led to an integrated development strategy which brings many benefits both at the level of smallholding and at the level of landscape management.

During the initial analysis and the design of disaster risk reduction and resilience building programmes, it is therefore essential to take environmental considerations into account at the different stages of the project cycle. Understanding the underlying causes of risks, particularly those linked to the state and management of the natural environment, should allow long-term action to be taken in response. The analysis of vulnerabilities should include the extent of environmental degradation in the area, possible loss of environmental resilience caused by the hazard and the level of exposure to dangerous pollution. It is also important to study the opportunities which exist at the different levels of governance in the area to know what physical, institutional, social and economic means need to be put in place. A variety of tools exist to do this, such as the CEDRA [12] method developed by Tearfund.

Lastly, risk mitigation activities based on managing the natural environment can also be put in place.

Natural risks	Actions to implement
Avalanche	• Stabilise slopes with vegetation • Prevent people from entering at-risk areas
Drought	• Promote drought-resistant varieties • Work on improving the physical and chemical quality of the soil to increase its capacity to retain water. • Promote the association of crops • Diversify crops and seed varieties • Encourage preservation/reintroduction of wild plants which can be eaten • Limit working of the soil (e.g. tillage) to limit evaporation and erosion • Avoid slash and burn to maintain vegetation cover and the biological activity of the soil • Encourage cultivation practices which are adapted to arid and semi-arid zones
Floods / Rapid rise in river level	• Stabilise slopes with vegetation as a natural barrier and to encourage the infiltration of water into the soil • Establish the limits of natural areas to be preserved and not to be inhabited close to marshes, estuaries and rivers • Position evacuation channels and install rock fill • Stabilise the banks of waterways • Limit settlement on and exploitation (farming, tree felling, etc.) of at-risk areas

Loss of biodiversity and reduced resilience

Resilience is directly linked to the biodiversity of an environment which represents the variety and variability of nature and which includes the three basic levels of organisation of living systems: the genetic level, that of species and that of ecosystems [13]. Monoculture and the introduction of

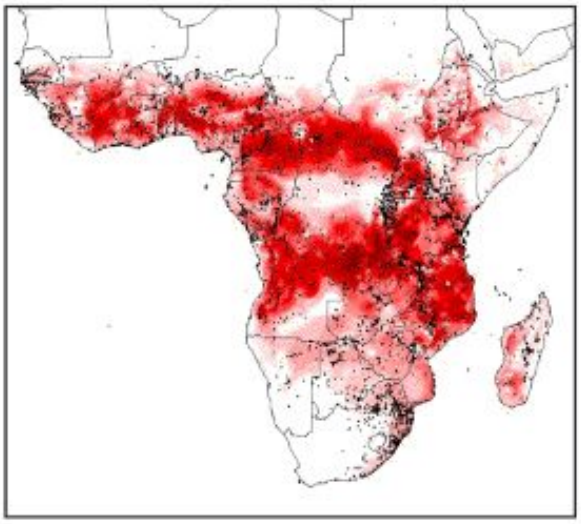
GMOs are a threat to this diversity and lead to environmental simplification, increased risks for production and genetic erosion.

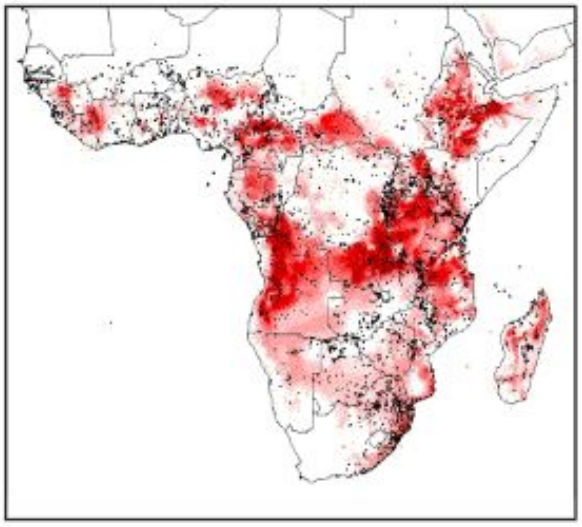
Diversity is a factor of productivity and includes a high capacity to evolve. Resilience is also linked to the capacity of living organisms to adapt to an environment which may or may not be changing, the ability to resist attacks and the general level of stability. All these capacities are encouraged by a diversified environment, which makes it possible to evolve into a new structure if necessary. History has repeatedly shown that the uniformity that characterizes agricultural areas which have less seed variety is a source of increased risk for farmers because genetically homogenous fields are more vulnerable to illness, to being attacked by harmful insects and to climate change.

Lastly, climate change is a major threat to biodiversity, as shown by the Millenium Ecosystem Assessment [14] (2005). Good management of local biodiversity can preserve the health of ecosystems such as forests and soils, which are both major carbon sinks. It can also reduce the need for nitrogen fertilizers on farm land, which are a major source of greenhouse gases, and which are not always available or accessible. It is important, therefore, to cultivate biodiversity to combat climate change and its effects. Local biodiversity and varieties stored in gene banks remain under-used in terms of climate change adaptation [15].

Restoring biodiversity to reduce the impact of climate change

It is predicted that by 2055 climate change will cause a dramatic decline (map 2 [16]) in the major genetic resource of wild Vigna (related to niébé, a basic African crop and important source of protein) with regard to its current distribution and its genetic diversity (map 1) [17].





It would be useful to reinforce inventories of the biodiversity of the type of products concerned (food, firewood…) which exist in the wild or are cultivated, and to encourage use of existing global genetic exchange mechanisms. On another scale, advocacy is needed vis-à-vis governments in favour of giving communities access to the biodiversity that they need. More globally, informing rural communities and their local institutions about how to make use of biodiversity (preserving, reinforcing), and the benefits that it brings in terms of economics, risk reduction and climate change adaptation, is essential in order to build their resilience.

Conclusion

Despite the importance of a preserved environment for community resilience, the mobilisation of international aid organisations and particularly the countries concerned is still too hesitant. Yet, the importance of preserving the natural environment has been recognized for many years in key institutional frameworks. For example, principle 8 of the Code of Conduct for the International Red Cross and Red Crescent Movement and Non-Governmental Organisations (NGOs) in Disaster Relief (1994) stipulates that "Relief aid must strive to reduce future vulnerabilities to disaster as well as meeting basic needs", adding that "We will pay particular attention to environmental concerns in the design and management of relief programmes". The Sphere project now includes the environment as a cross-cutting theme, and states, "*It provides the natural resources that sustain individuals and contributes to quality of life. It needs protection and management if essential functions are to be maintained. The minimum standards address the need to prevent over-exploitation, pollution and degradation of environmental conditions*". Lastly, the post-2015 MDGs [18] will be called the "Objectives for Sustainable Development" following the proposals made by the United Nations Secretary General at the Rio+20 conference: "We must act now to halt the alarming pace of climate change and environmental degradation which pose unprecedented threats to humanity [19]".

Natural resource management and environmental protection therefore deserve to be given a central place in operations, not from a "conservationist" angle, but because they contribute to reinforcing the resilience of communities and societies. An environmental impact assessment is crucial when such a strategy is aimed for, because, despite the fact that the challenges are global, appropriate responses need to be contextualised, integrating endogenous knowledge and appropriate coping strategies. Building resilience also depends on political will, coordination, technical know-how, innovation and shared responsibility in terms of risk reduction and crisis management between countries, local authorities, communities, civil society, the private sector and the international community. The Millenium Ecosystem Assessment (carried out by UNEP) shows that appropriate actions could reverse the degradation of numerous ecosystem functions in the next fifty years, even though this will require major changes in policy and practices.

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[1] European Union, World Bank, USAID, DFID, United Nations agencies and NGOs.

[2] Terminology on Disaster Risk Reduction, 2009, UNISDR.

[3] *Agroécologie, une transition vers des modes de vie et de développement viables*; publication of the desertification work group; January 2013; p.91.

[4] Zaïs are holes for planting which have a diameter of between 20 and 40 cm and a depth of between 10 and 20 cm (the dimensions vary depending on the type of soil). The holes are dug during the dry season from November to May and the number of Zaïs per hectare can vary from 12.000 to 25.000.

[5] This technique consists of digging a furrow 10 to 15 cm deep and 15 to 20 cm wide, then placing a line of big stones along its contours. This line is strengthened downhill by another line of small stones and earth to consolidate the foundation line of stones.

[6] Farmer Managed Natural Regeneration.

[7] Ecosystem: complex and dynamic system including vegetation, animals, micro-organisms and their inorganic environment which interact as a functional unit. http://www.cbd.int/

[8] Living with risk: a global review of disaster reduction initiatives, UNISDR (2004).

[9] Sudmeier-Rieux, K. and N. Ash 2009. Environmental Guidance Note for Disaster Risk Reduction : Healthy Ecosystems for Human Security. Revised Ed. Gland: IUCN.

[10] Disaster Risk Reduction Terminologys, UNISDR, 2009.

[11] FAO, Rome, Mr Luis Alvarez Welchez, Agroforestry expert at the FAO Lempira Extension System Project (SEL), Lempira, Honduras. Available at: http://www.bbc.co.uk/mundo/participe/2009/05/090515_participe_cambio_climatico_quesungual_am.shtm

[12] Climate change and Environmental Degradation Risk and Adaptation assessment (CEDRA) by Tearfund, 2009.

[13] European Environment Agency (EEA) Glossary - http://glossary.en.eea.europa.eu/

[14] The Millenium Ecosystem Assessment is an international work programme set up to respond to the needs of decision makers and the public in terms of scientific information about the consequences of changes to ecosystems in terms of human well-being and the possibility of doing something about these changes. For more information: http://www.unep.org/maweb/en/index.aspx

[15] Climate change and biodiversity for food and agriculture, FAO - ftp://ftp.fao.org/docrep/fao/meeting/013/ai784e.pdf

[16] Source of the two maps: Jarvis, A., et al., The effects of climate change on crop wild relatives, Agriculture, Ecosystems and Environment, Elsevier B.V. (2008).

[17] Climate change and biodiversity for food and agriculture, FAO - ftp://ftp.fao.org/docrep/fao/meeting/013/ai784e.pdf

[18] Millennium Development Goals: http://www.un.org/fr/millenniumgoals/

[19] A New Global Partnership: Eradicate Poverty and Transform Economies Through Sustainable Development, The Report of the High Level Panel of Eminent Persons on the Post-2015 Development Agenda; 2013.

OTHER IMAGES


Action to implement
PNG - 39.7 kb
783 x 398 píxels


Carte 1
JPEG - 23.2 kb
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Carte 2
JPEG - 23.5 kb
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Impact environnemental des désastres, Bada Aceh
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