The Role of Ecosystem Management in Climate Change Adaptation and Disaster Risk Reduction
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SUMMARY

- This Issues Paper firstly analyzes the vicious spiral between climate change impacts, ecosystem degradation and increased risk of climate-related disasters;
- secondly, defines the central role of ecosystem management in climate change adaptation and disaster risk reduction and their multifaceted linkages;
- and thirdly, assesses the challenges for enhanced ecosystem management for climate change adaptation and disaster risk reduction.

Given the increasing importance of ecosystem management in adapting and responding to climate change impacts and associated disaster risks, the paper concludes that political commitment at the highest level is urgently needed if ecosystem management is to have the adequate weight it deserves in the post-2012 climate change agreement.

It is further recommended that adequate financial, technological and knowledge resources be allocated for integrating ecosystem management in the climate change and disaster risk reduction portfolios, including within national policy-setting, capacity building, planning and practices, particularly in developing countries vulnerable to climate change impacts and increased risks of climate-related disasters.

1. VULNERABLE COMMUNITIES AT RISK: CLIMATE CHANGE, ECOSYSTEM DEGRADATION AND INCREASING RISK OF CLIMATE-RELATED DISASTERS

Science has established that global climate change increases the frequency and intensity of climate-related disasters such as floods, fires, and droughts, and causes ecosystem degradation. This in turn reduces the resilience of ecosystems and human societies against the impacts of climate change and the increased risk of disasters. Ecosystem degradation compromises the carbon sequestration ability of natural systems, and may turn these systems from carbon sinks to sources, thus exacerbating the downward spiral. Unwise use of ecosystems by human beings aggravates this vicious cycle as illustrated in Figure 1 below.
a) Climate change increases the risks of climate-related disasters, which cause the loss of lives and livelihoods, and weaken the resilience of vulnerable ecosystems and societies. Communities around the world are already vulnerable to the impacts of climate-related hazards. Figure 2 shows a sharp increase in the occurrence of natural disasters such as floods, droughts, extreme temperatures, and wildfires from 1960 to 1989, and an even more rapid increase since 1990. While this trend may not be wholly attributable to climate change, the increase in the frequency and intensity of climate-related hazards does correspond to temperature increase, and is projected to continue even if greenhouse gas emissions were to be stabilized today (IPCC, 2007), thus further aggravating the vulnerability of communities, assets and livelihoods.

b) Climate change exacerbates ecosystem degradation. The IPCC Fourth Assessment Report (AR4) projected, “The resilience of many ecosystems is likely to be exceeded by 2100 by an unprecedented combination of change in climate, associated disturbances (e.g., flooding, drought, wildfire, insects, ocean acidification), and other global change drivers (e.g., land-use change, pollution, over-exploitation of resources) (high confidence).” Tundra, boreal forest, mountains, Mediterranean-type ecosystems, mangroves and salt marshes, coral reefs and the sea-ice biomes are amongst these vulnerable ecosystems. Substantial changes in the structure and function of terrestrial, freshwater and marine ecosystems are very likely to occur. In particular, 20-30% of species assessed so far are likely to be at an increasingly high risk of extinction as global mean temperatures exceed 2 to 3°C above pre-industrial levels. If the temperature increases by more than 4°C, few ecosystems will be able to adapt, more than 40% of global ecosystems are projected to be transformed, and major extinctions will occur around the globe.

c) Ecosystem degradation triggers more disasters and reduces nature’s and societies’ resilience against climate change impacts and disasters. Ecosystem degradation is a process which will eventually lead to the collapse of the ecosystem. The degradation process reduces the capacity of the ecosystem to buffer the impacts of climate change, for example, more frequent heavy rains, droughts, melting glaciers and sea level rise. Biodiversity loss from ecosystem degradation could cause the break down of food chains and eventually the collapse of the ecosystem, leading to biological disasters such as the invasion of new species. Hence ecosystem degradation also increases the vulnerability of natural and human systems to the impacts of disasters such as floods, landslides and storm surges. The worst case scenario is the collapse of the ecosystem, leading to the total loss of its buffering ability and other services to human well-being.

d) Ecosystem degradation reduces carbon sequestration in the ecosystems and may turn them from carbon sinks to sources, exacerbating the vicious spiral. The IPCC projects that “the terrestrial biosphere is likely to become a net carbon source by 2100, while ocean buffering capacity begins saturating, thus amplifying climate change, given continued greenhouse gas emissions at or above current rates and other unmitigated global changes, such as land use changes (high confidence).”

2. BREAKING THE VICTIOUS SPIRAL: THE MULTIPLE BENEFITS OF ECOSYSTEM MANAGEMENT

In a world where climate change is resulting in more unpredictable weather patterns, sea level rise and more frequent and extreme storms, the regulating services provided by ecosystems are critical for climate change adaptation and disaster risk reduction. Examples of these services include climate and water regulation, protection from natural hazards such as floods and avalanches, water and air purification, carbon sequestration, and disease and pest regulation. These services determine the central role of ecosystem management in climate change adaptation and disaster risk reduction as shown in Figure 3 on the next page.

a) Ecosystem management increases the resilience of natural systems and human societies to climate change impacts. Managing ecosystems to conserve and improve their health is crucial for sustaining the various ecosystem services important to human well-being. Healthy ecosystems also act as buffers, increasing the resilience of natural and human systems to climate change impacts and disasters.

Ecosystem-based adaptation strategies cut across all sectors. Some examples of these strategies include using mangroves for coastal defense, floodplain management for flood defense, and maintaining genetic diversity for adaptation in the agricultural sector. Good practices already exist on the ground, such as wind-sheltering and breaks to increase resilience of rangelands in Sudan, re-forestation of mangroves to protect shorelines from storm surge and sea-level rise in the Philippines, sea-level rise land acquisition programmes in the US, and drought adjustment of
planting dates and crop varieties in Mexico and Argentina. However, these practices are limited and very much on an ad hoc basis, and much more needs to be done. Two major approaches for adapting to and managing climate risks are already in place to enhance the role of ecosystem management, and full advantage should be taken of them: Integrated Water Resource Management (IWRM) to manage increasing water scarcity, and Integrated Coastal Zone Management (ICZM) to manage the threat of sea level rise.

b) Ecosystem management also maximizes co-benefits of mitigation of climate change by reducing emissions and fixing carbon through good practices such as Land Use, Land Use Change and Forestry (LULUCF) activities and Reduced Carbon Emissions from Deforestation and Forest Degradation (REDD), reducing the loss of natural habitat and deforestation as well as increasing or maintaining carbon stocks in ecosystems. Managing ecosystems to enhance biological carbon sequestration (biosequestration) is a promising tool in the efforts to mitigate climate change, and may often also support the achievement of other societal goals. The discussion about possible ways of reducing carbon emissions in various land uses, such as forestry and agriculture, is gaining momentum. Given the high rates of global forest loss and associated GHG emissions (18-25% of annual emissions), reducing emissions from deforestation and forest degradation would make a major contribution to meeting emission stabilization targets.

c) Ecosystem management provides physical defense from climate-related disasters. Healthy ecosystems protect societies from disasters and improve their ability to cope with the impacts. Mountain meadows, bushes and forests protect people in the downstream from landslides and flash floods from glacier lake outbursts due to the accelerated melting of high mountain glaciers and snows. Coral reefs provide offshore breakwaters which reduce the impacts of sea surges and tropical storm waves before
they reach the shoreline. Mangrove forests act as revetments or dikes: depending on their health and extent, mangrove forests can mitigate 70-90% of the energy from wind-generated waves (UNEP-WCMC 2006).

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biosequestration and reducing carbon emissions. It is recommended the same approach be applied to use ecosystem management for climate change adaptation and disaster risk reduction.

Meanwhile, knowledge and technology support to vulnerable countries should also be adequate and timely. For instance, there is a need to start developing guidance on mixed engineered/ecosystem-based adaptation and disaster risk management solutions.

An unprecedented level of cooperation is urgently required from the policy and scientific communities to act on the combined threats of climate change, disasters and continuous ecosystem degradation. This will help foster closer links between ecosystem management, climate change adaptation and disaster risk reduction communities, as well as between science and policy such as the links between the IPCC and UNFCC and IPCC, CBD and the IPBES process, and catalyze North-South and South-South cooperation.

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