iied briefing

DECEMBER 2009

Natural resilience: healthy ecosystems as climate shock insurance

Resilience to climate change has many roots. A healthy, biodiverse environment is increasingly recognised as key to resilience, particularly in poor communities directly dependent on natural resources. Knowledge about ways of coping with climate variability is also essential – and for many of the poor who live in climate-vulnerable regions, already an area of expertise. A look at the National Adaptation Programmes of Action of the Least Developed Countries shows that many of these nations recognise and prioritise the role that biodiversity, ecosystems and natural habitats play in adaptation. It is now up to policymakers to follow suit.

Policy pointers

- **Strategies for adapting** to climate change must draw more on approaches ensuring mutually supportive outcomes on adaptation, human development, and biodiversity and ecosystem conservation.
- **Failure to do this will** undermine action in all these areas – and negatively affect the poorest first and worst.
- **National Adaptation** Programmes of Action of the Least Developed Countries suggest that 'soft' approaches linked to effective natural resources management are important for adaptation.
- **Soft 'green' approaches** are key alternatives to or should compliment the big infrastructure projects often favoured as adaptation strategies.
- **Adaptation that works with** both natural systems and vulnerable communities, who often have considerable knowledge of adaptation, can provide cost-effective, sustainable, locally managed solutions giving biodiversity, climate change and poverty reduction benefits.

Ecosystems: portfolio for the poorest

Ever-increasing evidence suggests that healthy, biodiverse environments play a vital role in maintaining and increasing people's resilience to climate change, and in reducing climate-related risk and vulnerability. A growing number of studies suggest that diverse, well-functioning ecosystems are more stable and may be better able to adapt to climate change than impoverished systems.[1] As the groundbreaking study The Economics of Ecosystems and Biodiversity (TEEB) puts it:

> The security value of biodiversity can be compared with financial markets. A diverse portfolio of species stocks, as with business stocks, can provide a buffer against fluctuations in the environment (or market) that cause declines in individual stocks. This stabilizing effect of a 'biodiverse' portfolio is likely to be especially important as environmental change accelerates with global warming and other human impacts.[2]

Backstory

The science is clear: climate change is happening, and those likely to be worst affected are the world's poorest countries and poor and marginalised communities and people. Yet these nations and people have contributed least to cause it. The Intergovernmental Panel on Climate Change (IPCC) – the leading body reviewing and assessing the evidence for climate change – and the UN Framework Convention on Climate Change (UNFCCC), both acknowledge Least Developed Countries (LDCs) as being particularly vulnerable to the climate crisis. It threatens to disrupt and even reverse the development efforts of these countries, undermining efforts to eradicate poverty. Poor countries are more vulnerable for a variety of physical, social, financial and institutional reasons. They tend to be located in geographic areas vulnerable to severe climate impacts, such as flood-prone Mozambique, drought-prone Sudan or cyclone-prone Bangladesh. Poor people also tend to live in more vulnerable locations.

For example, the slums and informal settlements surrounding many of the world's largest cities in developing countries are usually on land prone to landslips or to flooding and erosion. Wealthy people, commerce and industry can afford to live on safer land and often have private insurance. Poor communities have no such safety net and less capacity – either financial or through access to institutions and support structures – to cope with climate shocks.

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Such 'security value' is most important, of course, to the poor. They are disproportionately more reliant on ecosystem services and natural resources such as wood, fish, grazing and wild medicinal plants for their subsistence and livelihoods than wealthy people – particularly in times of hardship. And increasing hardship is more likely, as climate change impacts play out and are often first felt through the natural resource base that the poorest depend on – farmland, fish resources, forests and biodiversity. This combination of high dependence and high risk makes climate change one of the major development issues of our time.

How climate change erodes biodiversity

Some changes already observed in species and ecosystems have negative consequences for the services these species and ecosystems provide and, consequently, for the livelihoods and economic sectors that depend on them. Coastal and marine ecosystems are suffering increasing disruption from ocean acidification – the decrease in pH caused by the oceans' uptake of human-driven carbon dioxide.

One of its most likely impacts of is the slower growth of organisms with calcareous skeletons and shells, such as corals and molluscs. Damage to coral reefs is already being observed, and a 3 °C rise could mean most reefs would be suffocated by algae, which would prevent the coral from colonising.

As temperatures rise, increasing frequency of wildfires will contribute to forest decline worldwide. Scientists predict that a 2 °C or more rise above pre-industrial levels will cause irreversible damage to ecosystems, with devastating consequences for people and biodiversity.[3]

This adds to stark warnings from the 2005 Millennium Ecosystem Assessment and the current TEEB. Such a rise in average temperature would also be likely to exacerbate the effects of other stresses, including habitat fragmentation, loss and conversion; overexploitation; invasive alien species; and pollution. All these affect biodiversity, ecosystems and the poorest people, and are in many cases already hindering efforts to reach Millennium Development Goal targets.

Healthy, functioning ecosystems are needed to ensure that the goods and services they provide, such as food, water, air purification and the control of pests and diseases, remain available to society. Enhancing the resilience and protective capacity of ecosystems will also help ensure the economic and social well-being of a country's people. This statement is particularly true for the rural poor who earn a living from the land and are highly vulnerable to ecosystem degradation and change.

NAPA Least Developed Countries Expert Group, 2002

How biodiversity supports adaptation

Wetlands are important floodwater reservoirs – a key asset if climate change brings more flooding events to an area, and vital for storing water in times of drought. Vegetation on hillsides reduces erosion and the risk of landslides when rain comes in heavy bursts. Well-vegetated watersheds slow the movement of rainfall to rivers, reducing flood risks downstream. Mangroves are well-known coastal buffers, reducing the strength of waves before they reach the shore and so protecting against cyclone damage. They also sequester carbon and provide a resource base for local livelihoods and income generation.[4]

Many people already use natural resources and biodiversity, including genetic diversity, as part of their adaptation processes.[5] For instance, alternative crop varieties or wild relatives of food crops are used to breed new varieties that often better survive the changing temperatures, water shortages and pest infestations associated with climate change. Biodiversity and ecosystem services are already the foundation of many successful adaptation strategies, especially for poor people – while also delivering livelihood and climate change mitigation benefits.

'Learning by doing' has become an adage of the 2009 UNFCCC climate talks. As scientists and policymakers work to find solutions to climate change, local communities often have a wealth of experience of how to cope.[6]

Natural routes for NAPAs

National Adaptation Programmes of Action (NAPAs) are being developed by LDCs through the UNFCCC process, as a way to identify their urgent and immediate climate change adaptation needs and design projects accordingly. NAPAs identify priority adaptation activities for which further delay would increase vulnerability or costs later. Rather than focusing on scenario-based modeling to assess future vulnerability, they build on existing coping strategies to identify priorities. Guidelines state that NAPAs should be action-oriented, country-driven, flexible and based on national circumstances.[7]

An assessment of current NAPAs[8] shows that many of the world's poorest countries recognise and prioritise the role that biodiversity, ecosystems and natural habitats play in helping people adapt to climate change.

A focus on natural resources Some 56 per cent of projects reviewed (283 out of 501 priority adaptation projects) had significant natural resource components (see Table and also 'Case studies', opposite). In LDCs such as Cape Verde,

Eritrea, Sudan, Solomon Islands and Vanuatu, every NAPA project reviewed had a strong natural resource component. Although the number of projects differed between countries, NAPAs submitted by Cambodia, Laos, Mauritania and Sierra Leone each described 15 or more projects with strong natural resources components. Each LDC had at least one project in this category. Further analysis looked at the relative importance of different sectors.[9] Of the 283 NAPA projects with a strong natural resource component, most were in the context of the agriculture sector (25 per cent), followed by forestry (17 per cent) freshwater[10] (16 per cent), and the marine/coastal sector (13 per cent). Other sectors with natural resource or ecosystem components included disaster management,[11] energy and health.

This should be no surprise given the focus of LDCs' development, economy and local livelihoods on these sectors. What it does do, however, is reinforce the need to address and value the importance of natural resources and natural systems when planning and delivering

Case studies: natural resource-based NAPA project proposals

Lesotho: Conservation and rehabilitation of degraded wetlands in the mountain areas, recognising that wetlands are important to the environment as natural habitat and as natural reservoirs that maintain perennial stream flows and the quality of water flowing from them.

Sierra Leone: Sensitisation and awareness raising campaigns on climate change impacts on women linked to the three Rio conventions (on climate change, biodiversity and desertification), and development of an integrated natural resources and environmental management system.

Sudan: Reducing the vulnerability of communities in drought-prone areas of southern Darfur State through improved water harvesting practices, and environmental conservation and biodiversity restoration in northern Kordofan State as a coping mechanism for rangeland protection under conditions of increasing climate variability.

Bangladesh: Capacity building for integrating climate change in planning, designing of infrastructure, conflict management and land-water zoning for water management institutions.

Kiribati: To encourage communities to participate in coastal-ecosystem enhancement projects and to develop their own small-scale projects with similar purposes, for example appropriate coastal resilience enhancement projects such as mangrove replanting will be initiated with the communities.

Table: Number of NAPA projects with a significant natural resources component, by LDC

LDC NAPA reviewed	Number of NAPA projects reviewed	Number of NAPA projects with a significant natural resources component
Bangladesh	15	6
Benin	5	1
Bhutan	9	2
Burkina Faso	12	5
Burundi	12	7
Cambodia	37	16
Cape Verde	3	3
Comoros	13	9
Democratic Republic of Congo	3	2
Djibouti	11	10
Eritrea	5	5
Ethiopia	11	7
Gambia	10	6
Guinea Bissau	14	9
Haiti	14	11
Kiribati	9	4
Laos	44	18
Lesotho	11	5
Liberia	3	2
Madagascar	15	5
Malawi	5	4
Mali	19	14
Mauritania	25	16
Maldives	12	1
Mozambique	4	2
Niger	14	10
Republic of Central Africa	10	5
Republic of Guinea	25	13
Rwanda	7	3
Samoa	9	5
São Tomé and Príncipe	18	7
Senegal	12	10
Sierra Leone	24	15
Solomon Islands	7	7
Sudan	5	5
Tanzania	6	4
Tuvalu	7	4
Uganda	9	7
Vanuatu	5	5
Yemen	12	7
Zambia	10	6
Total	501	283

adaptation strategies and projects at all levels – including through UNFCCC policy, principles and guidance.

A focus on biodiversity Several NAPA projects had a strong conservation component involving protected areas, natural wetlands or preserving relatively undisturbed ecosystems. Ethiopia, Laos, the Republic of Guinea and Sierra Leone have three or more such priority projects. This may be a recognition of the economic or cultural significance that certain species or ecosystems have, or could reflect who drew up NAPA documents. That is often the environment departments of national governments, but as the NAPA process should be bottom up, it does also suggest these issues are significant to local people.

It acknowledges that natural resources underpin adaptation and that good natural resources management and conservation can help address many of the challenges faced by poor people trying to cope with climate change impacts. Without well-functioning ecosystems, the provision of clean water, and hence health, education and much more would be impossible.

Lessons learned In acknowledgment of the interconnectedness of ecosystems, biodiversity, poverty and adaptation to climate change, and in recognition of the importance of the three multilateral environmental agreements negotiated following the Rio Summit in 1992,[12] adaptation interventions should, at the very least, aim to minimise harm to ecosystems and biodiversity. This should help avoid mal-adaptation and negative repercussions on people's ability to adapt, and help ensure resilience into the future. Planned adaptation involves taking practical action to either reduce vulnerability to climate risks or exploit positive opportunities. It can be done in many different ways. The priorities of the LDCs show us how important it is to ensure close links between climate change adaptation, human development, and biodiversity and ecosystems, and suggests that adaptation approaches can achieve mutually supportive outcomes. These lessons need to be learned well and quickly, and written into adaptation planning and strategies at all levels.

A successful Copenhagen outcome needs to incorporate and value ecosystems in adaptation. We would go further to suggest that failing to do this could undermine adaptation and development needs now and in the future, as well as action in all these areas – and will negatively impact the poorest first and worst.

We also urge the international community to fund NAPA proposals now, helping to meet the urgent and immediate needs of the LDCs, who are being affected most severely by climate change but are least responsible for it.

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The authors would like to thank Catherine Baker, Lea Larsen-Volay and Bhopal Pandeya for help with this research.

Further reading & websites

Millennium Ecosystem Assessment: www.millenniumassessment.org/en/index.aspx. ■ The Economics of Ecosystems and Biodiversity (TEEB): www.teebweb.org.

Notes

■ [1] Ives, A. R. and Carpenter, S.R. 2007. Stability and diversity of ecosystems. *Science* 317(5834):58-62. ■ [2] TEEB. 2008. *The Economics of Ecosystems and Biodiversity: An interim report.* TEEB, Bonn. ■ [3] IPCC. 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II.* In: M.L. Parry *et al*. (eds) Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge; Secretariat of the Convention on Biological Diversity. 2009. *Connecting Biodiversity and Climate Change Mitigation and Adaptation: Report of the Second Ad Hoc Technical Expert Group on Biodiversity and Climate Change.* Technical Series No. 41. CBD, Montreal. See www.cbd.int/doc/publications/cbd-ts-41-en.pdf. ■ [4] Reid, H. 2004. Climate change – biodiversity and livelihood impacts. In: D. Roe (ed) *The Millennium Development Goals and Conservation.* IIED, London. ■ [5] World Bank. 2009. *Convenient Solutions to an Inconvenient Truth: Ecosystem-based approaches to climate change.* Environment Department, World Bank, Washington DC. ■ [6] Simms, A. and Reid, H. 2005. *Africa – Up in smoke?* Second report from the Working Group on Climate Change and Development. nef, London; Simms, A. and Reid, H. 2006. *Up in smoke? Latin America and the Caribbean.* Third report from the Working Group on Climate Change and Development. nef, London; Reid, H. and Simms, A. 2007. *Up in Smoke? Asia and the Pacific.* Fifth report from the Working Group on Climate Change and Development. nef, London; Reid, H. and Swiderska, K. 2008. *Biodiversity, Climate Change and Poverty: Exploring the links.* IIED Briefing. IIED, London; BirdLife International. 2009. *Partners with Nature: How healthy ecosystems are helping reduce vulnerability to climate change.* BirdLife, Cambridge. ■ [7] Least Developed Countries Expert Group. 2002. *Annotated Guidelines for the Preparation of National Adaptation Programmes of Action*. UNFCCC, Bonn. ■ [8] At the time this research had been completed, some 41 NAPAs detailing roughly 501 priority adaptation projects have been submitted to the UNFCCC and are available on the UNFCCC website http://unfccc.int. Each NAPA project profile was reviewed for natural resources components or an ecosystem basis; analysis focused on the high priority projects, which had been both costed and described. ■ [9] Sectors included freshwater management, marine/coastal, energy, forestry, agriculture/livestock, disaster management and health. Projects that included protected areas, natural wetlands or had a strong emphasis on relatively undisturbed ecosystems were listed in the conservation sector. ■ [10] Freshwater management projects that were based solely on large infrastructure-oriented engineering solutions were not deemed to have a natural resource or ecosystem base in this analysis. Water management projects that included issues related to water basin management and vegetation cover were, however, included, as these clearly have a strong natural resources base focus. ■ [11] Drought-related projects were generally classified as freshwater management projects rather than projects aiming to reduce risks from, or deal with the aftermath of, disaster events. In this analysis, ecosystem or natural resource-based NAPA projects with a disaster component responded more to risks from floods, sandstorms, cyclones, landslides etc. ■ [12] The UN Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD) and UN Convention to Combat Desertification (UNCCD).

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