1 · *The economics of ecosystem services and poverty*

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1.1 Introduction

Ecosystems play a crucial role in the survival and well-being of human beings. Increasing pressure on ecosystems resulting from economic development and population growth has resulted in degrading ecosystems and losses of the services ecosystems provide throughout the world. According to the UN (2010) 'as a consequence of human actions, species are being lost at a rate estimated to be 100 times the natural rate of extinction. In the past century, 35% of the mangroves, 40% of the forests and 50% of the wetlands have been lost … action is urgently needed to avoid reaching critical thresholds that will lead to an irreversible loss of biodiversity and ecosystem services, with dangerous consequences for human well-being'.

The Millennium Ecosystem Assessment (MEA) (2005) was the first to explicitly underline the linkages between ecosystems and human well-being, coining the term 'ecosystem services' to stress the important benefits that people derive from ecosystems (MEA 2005). The term 'Ecosystem Services' serves as a catalyst to stress the importance of ecosystems for human well-being. As indicated in Figure 1.1, the number of publications using the term has increased exponentially since 2005. Figure 1.1 also shows that most of the publications are in the domain of the natural sciences, with the governance-based sciences somewhat lagging behind. The publication of the influential 'The Economics of Ecosystems and Biodiversity' (TEEB) report (2009) on the value of ecosystem services for human well-being changed this picture, but still social sciences research that assesses the linkages between ecosystem services and human well-being is limited, especially where questions

Nature's Wealth: The Economics of Ecosystem Services and Poverty, ed. P. J. H. van Beukering, E. Papyrakis, J. Bouma and R. Brouwer. Published by Cambridge University Press,

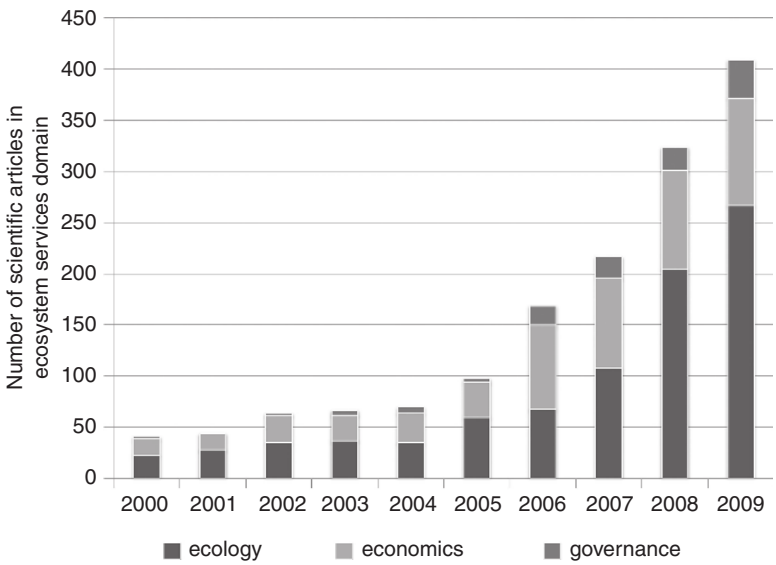

Figure 1.1 Number of journal papers in the 'ecosystem services' domain categorized by scientific discipline

relating to the governance of ecosystem services are concerned in the political science. Also, especially given the global nature of biodiversity and ecosystem service provision, the distribution of human well-being impacts needs to be assessed. The MEA (2005) and TEEB (2009) assume that ecosystem protection always benefits human well-being, but given the trade-offs arising between conservation and development, ecosystem protection can have adverse impacts on human well-being as well (Sunderlin *et al.* 2005). Understanding the linkages between ecosystem service provisioning and human well-being is crucial for avoiding adverse effects in environmental and economic development policy. Research assessing these linkages is limited, however, and constitutes an essential knowledge gap.

Nature's Wealth takes up this challenge and presents new insights into the relationship between ecosystem services and livelihoods in developing countries around the world. Based on 18 studies in more than 20 developing countries, evidence is presented on the role of ecosystems in supporting human well-being, especially in the livelihoods of the poor. *Nature's Wealth* pays special attention to innovative management opportunities that improve local livelihoods and alleviate poverty while at the same time enhancing ecosystem protection. To demonstrate the variety of

ecosystem services and their linkages to local livelihoods, *Nature's Wealth* is organized in five parts, describing the role of biodiversity-, marine-, forest-, water- and land-related ecosystem services.

In the past decade, several books addressing poverty and the environment have been published. *The Environmentalism of the Poor* published in 2002 (Martinez-Alier, 2002) analyses several manifestations of the growing 'environmental justice movement' and the 'environmentalism of the poor'. It presents a systematic analysis of the clash between economy and environment, and discusses the attempts 'to take nature into account'. The book differs from *Nature's Wealth* in that it follows a socio-political framework instead of an environmental and ecological economics approach, and views the 'environment' in a more general, holistic manner, not specifically addressing the various types of ecosystem services it provides. A more recent book on poverty and ecosystem was written as part of the MEA. In the volume *Ecosystems and Human Well-Being* Chopra (2005) addresses the challenge of reversing the degradation of ecosystems while meeting increasing demands for their services through drastic policy and institutional changes. Although the aims of the book are similar to those of *Nature's Wealth*, the main difference is that it is not based on empirical case studies, but rather on the conceptual knowledge and views of a large number of experts. The book also has a more general macro-economic focus, while *Nature's Wealth* is more context-specific, based mainly on micro-economic research. The *Economics of Poverty, Environment and Natural-Resource Use* by Dellink and Ruijs (2008) also contributes to an improved understanding of the economic dimensions of environmental and natural resource management and poverty alleviation. The book differs from *Nature's Wealth* in that it focuses specifically on three themes: searching for explanations for the resource–poverty nexus; payments for and values of environmental and forestry resources; and sustainable land use. The book does not specifically have an ecosystem services perspective and considers the environment more generally. Finally, 'The economics of ecosystems and biodiversity' (TEEB) study (2009) generated various volumes specifically aimed at drawing attention to the global economic benefits of biodiversity, while highlighting the growing costs of biodiversity loss and ecosystem degradation. Although TEEB is currently the most extensive international initiative estimating the economic value of ecosystem services, it does not explicitly address poverty issues in contrast to *Nature's Wealth*.

In this chapter, we set the stage for the book by sketching a general framework for the assessment of the multiple dimensions of the

relationship between ecosystem services and poverty. The background to the chapter is provided in Section 1.2, which describes the ecosystems–human well-being link. Section 1.3 more specifically addresses the link between ecosystems and poverty and highlights the relevant components underlying this complex relationship. Section 1.4 identifies various forms of interventions that can help to strengthen the link between ecosystem services and poverty alleviation. With this background in mind, Section 1.5 reflects on the main lessons learned from the 18 case studies covered in the book, following the central asset categories of security, capacity and ownership.

1.2 Ecosystem services and human well-being

The Millennium Ecosystem Assessment – MEA (2005) – built upon the concept of ecosystem services introduced in the 1970s (e.g. Ehrlich and Ehrlich 1981) to underline the inextricable linkages that exist between biodiversity, ecosystems and human well-being. Ecosystem services are 'the benefits people obtain from ecosystems' and by putting ecosystem services central to the debate on nature conservation, the MEA underlines the societal benefits of nature conservation and the need to align conservation and development goals. The MEA (2005) recognized four categories of services: supporting (e.g. nutrient cycling, soil formation and primary production); provisioning (e.g. food, fresh water, wood and fibre and fuel); regulating (e.g. climate regulation, flood and disease regulation and water purification); and cultural (aesthetic, spiritual, educational and recreational). Protecting the ecosystem helps to ensure the provisioning of these services in the long run and hence the associated flow of benefits.

Human beings benefit from ecosystem service provisioning through the access they have to it: for a global good such as climate regulation or biodiversity the whole world basically benefits, their public good character implies that people cannot be excluded from these benefits (Fisher *et al.* 2009). In practice, access may be limited by people's ability and capacity to access certain services, for example certain stretches of land providing the services, but the option and intrinsic value of climate regulation and biodiversity is often a benefit shared by all. For the different ecosystem services access to the benefits of service provision might be more confined to certain individuals or groups of people as property rights are assigned. In the case of food production, for example, land-use rights are usually with individual farmers, and access to food production is determined by these

rights, and often rights to underlying groundwater resources to irrigate the land. Typically, regulating services like carbon uptake, water purification and climate regulation are public services, whereas many of the provisioning services have to a certain extent been privatized and submitted to the forces of market mechanisms. Especially in industrialized economies, water and food are usually provided through commercial companies, and ecological processes are being replaced by technological processes, but still depend on the ecological resource base. Finally, people benefit at different levels, provisioning services typically benefiting local and regional stakeholders and cultural and regulating services often benefiting stakeholders also at national and even global scale.

Protecting ecosystems thus serves human well-being, but this usually comes at a cost. Protecting ecosystems usually implies defining and enforcing resource-use restrictions, which may reduce the short-term extractive benefits that can be derived. Here too the distribution of benefits across spatial and temporal scales plays an important role. The benefits of protection may be regional, national or even global (biodiversity, carbon uptake, water purification), whereas the (opportunity) costs of conservation are felt locally. Here it is important to note, for example, that most of the world's biodiversity is located in developing countries, specifically in remote areas where economic development is low (Fisher and Christoph 2007). Depending on the approach taken to protect biodiversity, the opportunity costs of their protection will vary, but are still likely to be substantial. Ecosystems are often protected by completely banning the use and extraction of natural resources, i.e. fencing off an area and prohibiting human use. Cernea and Schmidt-Soltau (2006) showed that this approach may increase local poverty as people are relocated and denied access to the resource base on which their livelihoods depend. This increases vulnerability and makes them poorer, with sometimes adverse impacts on ecosystem conservation as well, due to the absence of resource maintenance and management.

Subsequently, integrated conservation–development approaches were developed, to improve local livelihoods and conservation at the same time (Salasky and Wollenberg 2000). Integrated conservation–development approaches try to substitute resource harvesting economically by creating alternative, higher use values of the ecosystem. These typically include approaches that complement the designation of protected areas with investments in alternative livelihoods, such as marketing of non-timber forest products (NTFP), community forestry and ecotourism. However, in those cases where there is no direct linkage between ecosystem

conservation and the livelihood benefits people derive, integrated conservation–development approaches have not been very successful and the literature indicates that trade-offs are common and hard to avoid (Barrett *et al.* 2005, Sunderlin *et al.* 2005). For example, recent ecotourism studies indicate that income has increased in regions surrounding protected areas (Andam *et al.* 2010, Sims 2010), but Wittmeyer *et al.* (2008) suggest that ecotourism nevertheless results in increased ecosystem pressure due to increased population density and resource use. Similarly, the literature indicates that without additional investments in market access and services the economic feasibility of most NFTP projects is low (Belcher *et al.* 2005). Such investments, however, tend to increase resource exploitation and create conservation–development trade-offs.

Alternatively, more inclusive approaches to ecosystem protection have been developed together with approaches that directly link conservation and livelihood goals. Ferraro and Kiss (2002) indicate that direct linkage or incentive approaches are more effective in protecting biodiversity and enhancing livelihoods since they explicitly make local communities responsible for the conservation of the environmental resource base. Examples of direct linkage approaches are payments for ecosystem services (PES), as well as efforts to formalize the user rights of local communities and involve communities in protected area management, creating non-monetary incentives for sustainable use (see for example Maffi and Woodley 2010, Niesten and Milne 2009). For example, in PES schemes farmers are paid to conserve the forest and stop cutting trees (Ferraro and Kiss 2002). Thus, farmer income is improved and secured, and nature is conserved at the same time. Alternatively, decentralizing ecosystem management to local communities creates non-monetary incentives for conservation by partly transferring user rights: indigenous protected area or co-management approaches are examples of this approach where communities define, monitor and enforce resource-use restrictions themselves (Carlsson and Berkes 2005, Plummer and Fitzgibbon 2004). This has another advantage as local communities usually have more knowledge about the ecosystem and can better monitor and enforce sustainable resource use (Danielsen *et al.* 2008). This not only increases the effectiveness of conservation, but also lowers protected area monitoring and enforcement costs (Kubo and Supriyanto 2010, Somanathan *et al.* 2009). Community co-management of protected areas requires, however, that communities self-enforce resource use restrictions. Although the literature on common pool resource management has convincingly shown that communities are capable of doing this (Ostrom 1990, 2009), for effective self-enforcement certain conditions have to be met (Agrawal 2001).

Thus, even when it is possible to protect ecosystems at low opportunity and transaction costs, it is important to understand how ecosystem protection improves human well-being at different scales. This book explores the options for combining ecosystem protection with livelihood improvement for the poor. In the next section we further elaborate how the characteristics of poverty, ecosystem services and their protection relate.

1.3 Poverty, local livelihoods and ecosystem protection

In a world of more than 7 billion people, about a billion live on the estimated equivalent of less than a dollar per day (World Bank 2009). The overwhelming majority of these people live in rural areas in South Asia and sub-Saharan Africa, and due to population growth their number is expected to increase. Because poor people tend to have few assets, they depend for an important part of their livelihood on the natural resource base (Chen and Ravallion 2007). For example, poor people often depend on collective resources for livestock grazing (Kerr 2002), and consequently migrate to open access forest and wetland areas to improve their livelihood (Sunderlin *et al.* 2005). In fact, it is because of the dependence of poor people on common property resources that influential reports like MEA (2005) and TEEB (2009) argue that ecosystem protection will benefit the poor and that by improving the quality of ecosystem services, the benefits to poor people from the ecosystem will increase as well.

We view the relationship between poverty and ecosystem services in a slightly more critical light. First, there is increasing evidence that poor people might benefit less than non-poor people from improved resource management, and also bear most of the costs (see for example Adhikari *et al.* 2004, Kerr 2002). This is partly due to the fact that poor people are often not well represented in decision-making processes so that resource-use restrictions are not defined in their interests but in the interests of the better-off. Scholars such as Amartya Sen have pointed out that not being represented is an important determinant of poverty: people without a voice in decision-making lack the capacity and capability to pursue their needs (Anand and Sen 1997, Sen 1983, 1995). Although policymakers are becoming increasingly aware of the importance of ensuring the engagement of local communities in ecosystem management, getting the poor really on board to participate in decision-making is very difficult, and involves empowerment, awareness raising, education and other interventions as well (Bawa *et al.* 2007, Murphee 2009).

Second, the poverty–ecosystem nexus is not a one-way relationship but consists of a complex of interrelated factors. Poverty is often seen as one of the determinants of environmental degradation and loss of ecosystem services. At the same time, there is evidence suggesting that environmental degradation reinforces the extent of poverty. This suggests that the relationship between poverty and ecosystem services is often complex, since processes are often interlinked and several mediating factors influence the magnitude and sign of effects (Duraiappah 1998). This is illustrated in Figure 1.2.

1.3.1 How the poor affect ecosystems and their services

There are several potential mechanisms through which the poor influence available ecosystem services (summarized in the upper part of Figure 1.2). One should bear in mind that these mechanisms should always be analysed in combination with the effects of the environment on poverty (summarized in the lower part of Figure 1.2) rather than in isolation. Also the empirical evidence of the importance and validity of these mechanisms remains somewhat uncertain. We will start here by briefly describing some of the main driving forces behind ecosystem degradation and the pressures they exert on ecosystem services provision.

1.3.1.1 Depletion of natural resources

The poor are often accused of degrading their surrounding ecosystem, primarily through rapid depletion of natural resources (e.g. tree-cutting,

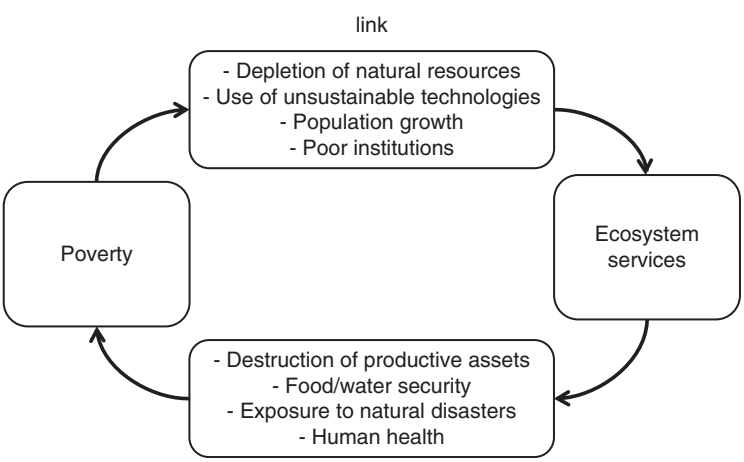

Figure 1.2 Complex relationship between poverty and ecosystem services

overfishing, etc.). Their livelihoods are largely dependent on their local natural resource base and environmental degradation is often the result of sole reliance on resource-intensive economic activities. While the poor may resort to unsustainable harvest patterns of their surrounding natural resource base, it is only fair to say that they are also often the victims of unsustainable consumption of the rich (Boyce 2002). Moreover, the poor often lack the skills and credit to diversify their economic activities and as a result they may rely exclusively on natural resources to sustain their livelihoods. Postponing consumption and use of natural resources for the sake of preventing environmental degradation is often not an option for the poor.

1.3.1.2 Population growth

A number of reasons explain why poorer countries and communities are traditionally characterized by higher fertility rates. In the absence of a well-established social security system parents tend to rely on their children for income transfers when old. Children often become productive assets of the household and participate in everyday economic activities. Due to the lack of formal employment and income for mothers, the opportunity cost of raising children is rather small. Population growth, coupled with inadequate means to increase production at the same rate, can lead to overexploitation of already fragile ecosystems.

1.3.1.3 Poor institutions

Poorer economies are generally characterized by weak institutional arrangements that often constrain further expansion of production. In poorer countries property rights are often poorly defined and enforced. This discourages households from investing in natural resources since there is high uncertainty about their future availability as household assets. Moreover, 'tragedy of the commons' scenarios often arise in the absence of well-defined property. Individuals fail to realize that private actions create negative external effects to other common-property users, which may result in pasture land degradation, water scarcity or extensive deforestation.

1.3.1.4 Use of unsustainable technologies

The lack of access to sustainable production technologies can lead to substantial disruption to ecosystem services (Asche 2008). Inappropriate fishing practices (e.g. in the form of unsuited fishing nets) often impact negatively on the stock of species and fish sizes not meant to be harvested. The lack of alternative environmentally friendly technology often restricts the poor to the unsustainable use of forest products for access to energy for

cooking and heating. There are many reasons why the poor may resort to environmentally destructive technologies, such as lack of knowledge of alternative environmentally benign technologies and implementation, resistance to adopt unfamiliar practices and lack of credit to purchase alternative equipment.

1.3.2 How degraded ecosystems and their services affect the poor

The state of the ecosystem matters a lot to poor people, who are often hit the hardest by environmental degradation (Comim *et al.* 2009). Environmental damage can exacerbate poverty through destruction of productive assets, loss of food/water security, health impacts and exposure to natural disasters (see lower part of Figure 1.2).

1.3.2.1 Destruction of productive assets

Environmental damage often deprives the poor of productive assets. Pollution and soil erosion can reduce agricultural productivity of farmers and water pollution and water scarcity can reduce the availability of fish for dependent communities. Unsustainable deforestation can reduce the amount of forest products available to the poor and reduce energy access since they often rely excessively on locally available biomass for heating and cooking. Gradual environmental degradation may also imply that poor households need to travel longer distances to access ecosystem services that were previously locally located and directly available.

1.3.2.2 Food and water security

One of the most important provisioning services of ecosystems is in the form of food and water. The poor are often self-sufficient and dependent on locally produced food in order to meet their nutritional needs. They lack access to distant markets where food is traded and many of them resort to subsistence agriculture to meet their needs in food consumption. Significant declines in yields of staple food crops are often associated with soil contamination and erosion. The quantity and quality of water is also very much regulated by the conditions of local ecosystems. Water contamination restricts accessibility to safe drinking water for the poor. Deforestation often alters the local hydrological regime and significantly reduces water availability. Water scarcity is increasingly linked to migration, food security and conflict. With more than 1 billion people still lacking access to clean water sources, water poverty still remains a major challenge in the developing world (World Bank 2009).