

Ecosystem services – local benefits, global impacts

The importance of ecosystem services (ES) for ecological and human well-being in the past, present, and future is being recognised more and more. Increasing demand but decreasing provision of ecosystem services, aggravated by changes in the ecosystems under external drivers like climate change, including climate change mitigation efforts, has led to a growing concern for ecosystems, and a need for a deeper understanding of local benefits and global impacts.

According to the Millennium Ecosystem Assessment report (MEA), “ecosystem services are the benefits people obtain from ecosystems”. Following the MEA (2005), ES can be differentiated in supporting, provisioning, regulating, and cultural services (Figure).

The role of ecosystem services for human well-being

Changes in the production and consumption patterns and the demand of ES, as well as changes in the provision of ES under external drivers of change like climatic events, have often led to a loss of resilience and decline in services provided by the various ecosystems. Human use of all ecosystem

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services is growing rapidly. However, provision is decreasing; approximately 60 percent of the ecosystem services evaluated in the MEA report are being degraded or used unsustainably (MEA, 2005).

One major focus in the current debate on ES is related to potential rewarding schemes that include innovative financial instruments to bridge the divide between environmental concerns and economic develop-

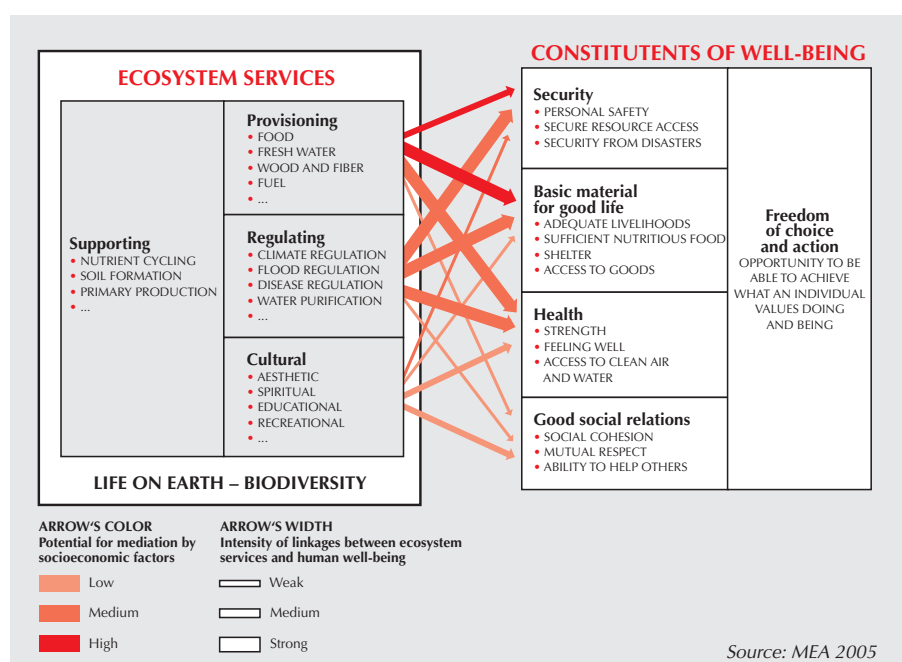
ment, and to support provision of specific services like carbon sequestration in the context of mitigation to climate change – this by acknowledging the linkages of ecosystem services and human well-being.

Forest ecosystems, among others (e.g. agriculture, marine, mangrove ecosystems,) play a key role in the provision of ecosystem services, particularly in developing countries where forests, with their multiple services, often provide the base for livelihoods of the poor and serve as safety nets, and/or as carbon sinks providing climate regulating services. According to the World Bank, over one billion people rely heavily on forests for their livelihoods. Over two billion people, a third of the world’s population, use biomass fuels, mainly firewood, to cook and to heat their homes, and billions rely on traditional medicines harvested from the forests. In some 60 developing countries, hunting and fishing on forested land supplies more than a fifth of protein requirements (World Bank 2004).

Local benefits and global impacts

There are many efforts undertaken to distinguish between local and glo-

Benefits of ecosystem services



Making use of environmental services may reduce deforestation. This brings a high global impact as deforestation contributes to 20 percent of the global CO₂ emissions.

bal benefits (Boyd & Banzhaf 2007). Spatial characteristics in provision and use of the specific services and its benefits to the constituents of human well-being (Figure) can serve as criteria. The services can be categorised by the following (spatial) characteristics:

1. provided and used locally or at landscape level, where benefits for providers and consumers are depending on the proximity to the ecosystem itself;
2. provided locally but global consumption, independent of proximity to the place of provision.

Examples of the first category can be those forest ecosystem services (e.g. non-timber forest products like medicinal plants, food and fodder, water regulating services, soil erosion protection, etc.) that provide local benefits related to improved livelihoods, higher income, secured production, access to clean water, etc. Examples of the second category are those forest ecosystem services like climate regulation (carbon sequestration and storage) that benefit the global community in climate change mitigation efforts.

Lack or reduction of such services by continued deforestation and degradation would have enormous global consequences, as forest deforestation and degradation contribute to approximately 20 percent of the global CO₂ emissions, which is more than the entire transportation sector emits, including air transportation (Kanninen et al 2007).

Beside these direct global benefits, indirect global benefits also result from local services by contributing to biodiversity conservation, food security and secured livelihoods, and hence to economic and political stability in a globalised world. Here, local eco-



Photo: J. Boethling

system services would serve as local intermediaries for global benefits.

A case study from Niger on the recovery of degraded areas shows such benefits and inter-linkages between local benefits and global impacts – see Box one page 10).

Managing and maintaining ecosystem services

The MEA (2005) stated that, in general, planned and proactive action to manage systems sustainably and to build resilience into systems would be advantageous, particularly when conditions were changing rapidly, when surprise events were likely, or when uncertainty was high. This approach is beneficial largely because the restoration of ecosystems or ecosystem services following their degradation or collapse is generally more costly and time-consuming than preventing degradation, if that is possible at all. In this context of internal but also external drivers of change like climate change and extreme events, forest ecosystems are of high importance.

The international community primarily focuses on how to reduce carbon emissions from deforestation or improve carbon sequestration through

reforestation. However, it also needs to be considered how climate change impacts on forests and to what kind of changes this might lead in the provision of forest ES. These changes will require specific strategies of adaptation and adaptive management of forests (Locatelli et al. 2008).

Conflicts and challenges

Managing and maintaining ecosystems, and particularly forest ecosystems, in a way that local and global benefits are ensured in an *efficient* and *equitable* manner, will have impacts at local and at global level. Provision of forest ecosystem services benefiting the local communities by providing locally supporting, regulating, or provisioning services will have to compete with other forest ecosystem services, where the benefits are often extracted by community outsiders, like in the case of forest plantations (timber production). Also, land use changes for the provision of other ecosystem services related to agricultural or biofuel production may compete with forest ecosystem services. Consequently, favouring the provision of specific ecosystem services relevant for the global community may con-

Ecosystem services and measures of climate change adaptation in the Sahel

Like many Sahel countries, Niger has faced frequent episodes of drought over the last four decades, which are one of the most dramatic demonstrations of the climate changes in the Sahel. Coupled with strong demographic growth, these climatic effects were at the root of an overexploitation of the natural resources and in particular the destruction of vegetation cover (Patecore 2005, Requier-Desjardins M. & Bied-Charreton M. 2006).

However, a 're-greening' of huge areas in Niger could be observed over the last few years, with efforts in reforestation and afforestation vis-à-vis the threat which this degradation of the soils represents (Reij C.P. & Smaling E.M.A. 2007). Combined actions of restoration and recovery of the degraded soils have been started by the local population, supported by ONG, and state development projects (CRESA 2006). First results allow for optimistic assumptions regarding soil recovery in many areas of Niger (Reij C.P. & Smaling E.M.A. 2007).

The following actions which generate provision of ecosystem services and resulting benefits and impacts could be identified:

Densification of vegetation cover

In spite of the increase in the population, recovery is spectacular in many localities, like Tahoua, Zinder and Maradi. The rehabilitation of the degraded soils was evaluated on more than 300,000 hectares in 2006. Where trees did not exist 20 years ago, anthropic formations have now settled. These anthropic formations cover more than five million hectares and an average 150,000 hectares have been rehabilitated by the local population over these 20 years.

Local benefits

Benefits for the local poor, enabled by the implementation of techniques of conservation of water and soils, and the assisted natural regeneration, are manifold:

- increase in the agricultural production of at least ten percent, which improves food security of the households and reduces households' vulnerabilities;
- availability of timber and non-timber forest products (NTFPs), like fuel-wood, fodder;
- additional income for the producers through the sale of wood and other NTFPs;
- rise in groundwater level by an estimated seven metres in specific places;
- amelioration of the microclimate: lower ground temperatures due to an improved vegetation cover.

Regional and global impacts

The importance of trees in the agricultural production systems in the Sahel has been the subject of many publications over the last decades. In Niger, case studies from 2006 showed

- carbon sequestration due to higher soil fertility and
- improvement of the biodiversity.

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flict with the provision of local benefits for food security. For example, an increasing demand for biofuels in the light of achieving mitigation aims for the global community, enhanced by policies and financial incentives, may lead to reduced resilience or total loss of forest ecosystem services needed to benefit the local people, particularly the local poor with a high dependency on often non-valued forest ecosystem services.

Another challenge for the provision and the management of ecosystem services is related to land rights and, in case of trading or consumption of ES, to the resulting benefits for the maintenance or provision of ecosystem services for consumers. Secured tenure rights for a secured provision of services at local level seems to be a precondition, but could be fulfilled by a minimum condition like excludability. However, different access to

such tenure right might favour benefits of ES for local elites and global actors (RRI 2008).

Further challenges are related to the need for global and local financial investments for maintaining ecosystem services and the implementation of adequate institutional set-ups. Continued technical innovation is required for sustaining, measuring, accounting, and monitoring of production and consumption patterns of ecosystem services. Policies and institutions need to be supported, designed or enforced for an equitable and efficient distribution of benefits and costs, and to internalise external, often non-market, values of such services. However, all of these will require institutional and political change in the related governance systems, from global climate regimes to local forest communities.

Key questions

Despite the growing international focus and increasing enthusiasm about the concept of ecosystem services in the analysis of social-ecological systems, some central questions remain:

- how to design or support functional institutions for equitable cost-benefit sharing, from a global REDD (Reducing Emissions from Deforestation and Degradation) regime to local private-public partnerships,
- how to set up efficient payer and provider schemes for payments for ecosystem services,
- how to achieve efficiency and equity under often uncertain conditions in highly complex socio-ecological systems.

Uncertainty related to

- a) the direction of change induced by external factors like climate change, and
- b) to system inherent changes in policies and institutions, e.g. rights and tenure systems, which then decide on who can sell and participate in the provision of ES.

Ecosystems, like forests, need to be managed in a sustainable and equitable way.

Answers to these key questions will have to integrate the three dimensions of technical, financial, and institutional innovation, as the subsequent contributions in this issue of Rural 21 will highlight.

However, our understanding of ecosystem services and related local benefits and global impacts (as well as global benefits and local impacts) is still very limited. The knowledge gaps in the understanding of the related social-ecological systems and the uncertainty of impacts of external drivers of change in the provision of such services, for instance drivers like climate change, are a challenge to decision-making processes at all levels to realise or enhance these potential benefits and to deal with the impacts. Ecosystem services, the benefits and the impacts themselves are subject to change over time in changing ecological, economical, and institutional landscapes.

A full list of references can be obtained from the author.



Photo: laif

Zusammenfassung

Ökosystemdienstleistungen liefern die Grundlagen für das menschliche Leben. Ihre Beiträge reichen von der Verbesserung der lokalen Lebensbedingungen bis zum globalen Nutzen aus der Klimaregulierung durch die Wälder. Durch interne und externe Faktoren wie neue Verbrauchsmuster und Interessenkonflikte bei bestimmten Dienstleistungen, demografische Entwicklung, Klimawandel und extreme Naturereignisse können sich die Bedingungen jedoch immer wieder ändern. Ökosysteme wie Wälder müssen

daher auf nachhaltige und gerechte Weise bewirtschaftet werden, damit sie der lokalen Bevölkerung nutzen und Auswirkungen auf die globale Bevölkerung durch eine gerechte, effiziente und gemeinsame Nutzung der Vorteile – und der Kosten – ausgleichen.

Resumen

Los servicios de los ecosistemas constituyen la base para el bienestar humano. Los beneficios van desde la mejora de las bases de vida locales hasta la regulación mundial del clima gracias a los bosques.

Sin embargo, existen factores internos y externos que impulsan cambios, tales como nuevos patrones de consumo y conflictos de intereses en torno a servicios específicos, la evolución demográfica, el cambio climático y los eventos extremos. En este contexto, los ecosistemas tales como los bosques requieren una gestión sostenible y equitativa para asegurar la conservación de sus prestaciones en beneficio de la población local y mitigar los impactos sobre la comunidad global mediante una justa y eficiente repartición de los beneficios – y de los costos.