Quantification of ecosystem services in forest based ecosystems

Forests and woodlands are known for their contribution to rural livelihoods through production of food, fuel wood, and medicine. However, forests and other natural ecosystem also provide less tangible goods and services that are fundamental for human life such as sequestration of carbon, biodiversity conservation, watershed protection, erosion prevention, (micro-) climate control, etc. (See Table 1). These services can broadly be divided into ecological (regulating), production (economic), supporting and social/cultural services.

To account for ecosystem services a good understanding of the ecosystem functions and process is required. Assessment and valuation of ecosystem services is a relatively new area in research because for many years people had little interest in it: ecosystem services were considered to have little or no economic value, they were not commercially marketable. However, this has changed with the increasing understanding of the importance of these services for human's daily life. The valuation is conducted both in monetary and, even more importantly, in non-monetary terms, which requires a good understanding of supply and demand relationships, as well as methods of intrinsic valuation, social and cultural preferences, multi-criteria assessment, etc..



The main threats to the services and the main drivers for change are human population pressure, leading to ecosystem degradation and modification. This has a direct impact on quality and quantity of ecosystem services.

Table 1. Services provided by forest ecosystems:

Provisioning	Regulating	Cultural	Supporting
1. Timber 2. Fuel wood 3. Food (fruits, bush meat, mushrooms etc.) 4. Medicinal resources	1. Regulation of hydrological cycles 2. Climate regulation 3. Carbon storages 4. Pollination	1. Protection of natural and cultural heritage 2. Recreation and tourism opportunities	1. Generation and preservation of habitats (biodiversity) 2. Preservation of soil fertility 3. Cycling and movement of nutrients

(Hein et al., 2006, MA, 2003, Boyd and Banzhaf, 2007)

The research problem:

Assessment and valuation of ecosystem services is complex and depends on the type of service and the objective for which the assessment needs to be done.

The research will focus on developing methods for assessment and valuation of selected ecosystem services or a group of services and comparison of the results from different stakeholder's perspectives. Ecosystems function in a variety of scales, which impacts the ecosystem services involved. Certain ecosystem services that are important in one scale may be more or less important in a different scale. This immediately means that different stakeholders may have very different ideas about the values of services. How to combine and reconcile different priorities and values over different scales? How to account for the different roles and power statuses that we find in various scales?

Research approach:

- Land cover mapping to define ecosystem boundaries, analysis of relationships between landscape structure and function, assessment of ecosystem services associated with the land-use/cover types, carbon sequestration and biodiversity services can be investigated in different spatial and temporal scales.

- Identification of criteria and indicators for valuation of a service or group of services will be developped based on the results of stakeholder questionnaires. Important is to realise that different stakeholder groups may apply different criteria.

- Spatial modelling and participatory modelling can be used to create raster layers for mapping. GIS can be used to visualize the various services and their relative values in forest or agro-forest landscapes.

Fieldwork:

Interviews in Ghana or in Europe.

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