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FACTSHEET

Erosion prevention and maintenance of soil fertility

In a nutshell

Vegetation cover provides a vital regulating service by preventing soil erosion. Soil erosion is a key factor in the process of land degradation, loss of soil fertility and desertification.

1. Role for human well-being

Various types of vegetation cover and plant roots prevent soil erosion, and they are also important to ensure soil fertility. Soil fertility is essential for plant growth and agriculture. Micro-organisms in the soil, mycorrhiza provided by fungi as well as dead organic components are helping to support plant growth. Dead organic matter in particular provides nutrients and can help to store water and make it available for plants. Some plants that grow in symbiosis with bacteria are able to fix nitrogen in the soil. The benefits of this service can range from higher agricultural yields to cost savings for hydropower producers as a result of reduced sedimentation in rivers, as was the case in Sumberjaya, Indonesia.

2. Typical threats

The type of land use and the agricultural or forest management practices applied heavily influence soils and therefore this ecosystem service as well. Many practices can lead to increased water run-off, loss of nutrients and sediments as well as the destruction of habitats that are home to beneficial soil organisms. In forest management, clear cutting and especially slash and burn have led to soil degradation and erosion. The input of reactive nitrogen for agricultural and energy production is causing nitrification which can have negative effects on soil organisms. Soil compaction due to the usage of heavy machines leads to the long term destruction of soils, especially in areas with fragile soil types. In agriculture, not only is unsustainable management of crop production an issue, livestock waste or overgrazing can also have negative impacts. Climate change impacts such as shifting rainfall patterns and extreme events increase the vulnerability of soils to degradation.

3. Example indicators

- A variety of indicators are useful for assessing the state of erosion or soil fertility. Biophysical information, such as rain intensity, topographic type and soil type, is relevant; so too are management practices, e.g. soil preparation, fertilizer and irrigation, and societal aspects, e.g. characteristics of dams and human made water canals.
- The potential erosion control of high, medium and low categories of erosion hazards can be a suitable indicator. For further information see CBD TCS No. 58 p. 103.
- The indicator 'sediment retention' measures the capacity of land cover to retain sediment (tonnes/hectare/year). For further information see CBD TCS No. 58 p. 110.
- The indicator loss of reactive nitrogen to the environment shows the loss in different regions of the world as a result of the production and consumption of food and the use of energy.



- Changes in land use or vegetation cover are often associated with a negative impact on soil cover and thus on soil erosion and fertility. Examples include the indicators forest fragmentation and the extent of forest and forest types.
- The canopy of a forest can be measured using the leaf area index.

Global sources available for national data:

- Among others, FAO's Global land cover network and the USGS provide a huge database relating to different remote sensing land cover topics.

4. Example methods

For **assessing the value** of this ecosystem service:

- Direct market price: Cost of CO_2 avoided, expressed as $/ton of CO_2
- Cost based methods such as: Avoided damage costs, replacement and restoration costs
- Contingent valuation

For **assessing the condition** of this ecosystem service

- InVEST Nutrient Retention
- The LADA toolkit provides various useful methods such as soil assessment based on direct measurements or on visual estimation and a vegetation assessment tool
- ARIES
- SWAT
- Measuring sedimentation rate of rivers and streams
- The descriptions of essential climate variables by the Global Terrestrial Observing System provide a good overview of how to measure the leaf area index or current land cover.

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5. Managing this service

Typical instruments for managing this service include:

Avoiding erosion and nutrient loss by means of appropriate soil conservation practices and the restoration of degraded land

- In Sumberjaya, Indonesia, adjustments in agricultural management practices relating to geological, topographic and climatic conditions (such as planting grass strips) have reduced soil erosion and provided co-benefits such as fodder.
- Introducing agroforestry systems can increasing this ecosystem service, among others.
- The Sustainable Land Management Sourcebook published by the World Bank describes a range of appropriate measures such as crop rotation (Ch. 3.2), nutrient management and monitoring or rehabilitation of degraded lands, as well as suggestions and examples of how to reduce slash-and-burn practices (Ch. 3.3 & 4.1).
- The WOCAT - World Overview of Conservation Approaches and Technologies provides a global open-access database containing sustainable land management practices information directly applicable to soil and water conservation. See as well the Complementary ValuES Method Profile WOCAT.
- Most PES systems, including the implementation of payments for water flow regulation by the local government improve this ecosystem service: In the case of Extrema, Brazil, payments and technical support are provided for reforestation and soil conservation for watershed protection.

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