

Science for Environment Policy

Soil erosion study brings ecosystem services approach into regional planning

How best to integrate the ecosystem services concept into regional planning? A recent study provides a practical example for an area in Germany that is faced with an increased risk of soil erosion under climate change. Researchers used a decision-support system incorporating ecosystem services to show that measures to reduce soil losses could also support a number of other services.

Ecosystems provide many goods and services, such as food, good-quality water and beautiful landscapes that support human wellbeing. Acknowledging the central importance of ecosystems for planning requires integrating an ecosystems approach into the decision-making processes, as promoted by European policy through MAES¹ and Green Infrastructure². This means considering the potential impact that any land use decision would have on ecosystem services.

This research provides a case study of how the ecosystem services approach can be incorporated into decision-making in regional planning. The researchers were involved in revising the current regional plan in a district of Saxony, Germany. When the area was part of East Germany, hedgerows and country lanes were dug up to allow large-scale, collectivised farming to take place. Conventional [soil](#) tillage, such as ploughing, is currently the dominant practice in the region.

The study focused on an 81 km² area with steep slopes and large farms. The soil type, landscape structure and agricultural practices have created flow paths for water, leading to soil erosion which may worsen under climate change.

In conjunction with regional planners and scientists, the researchers developed six soil management scenarios which combined a variety of different management practices. Using a decision support system—a software programme that evaluates the impact of alternative courses of action—they investigated the impact of each scenario on protection against soil erosion and six other ecosystem services. These included provision of food and fibre; provision of biomass; drought risk regulation; flood regulation; landscape aesthetics and ecological integrity. The latter is a concept of ecosystem health that encompasses the long-term functioning and adaptability of the network of ecological interactions necessary for the provision of ecosystem services.

Overall, the best protection of soil from erosion was provided by the scenario that combined three control measures: planting vegetation in flow paths of run off, planting hedgerows to shorten slope lengths and switching from conventional to no-till practices. Under this scenario soil losses could potentially be reduced by 92% compared with the current situation. Planting hedgerows could alone reduce soil losses by 33%. Soil losses were reduced by 88% in a scenario where tillage was stopped and ploughing was replaced by no-till soil management practices. The three other scenarios all involved greening the flow pathways; two by turning them into grassland, which potentially reduced soil losses by 2-7% and the third by planting short-rotation coppices, which reduced soil losses by 2%.

The researchers found synergies between erosion control scenarios and some of the other ecosystem services. For example, compared with present conditions, all scenarios enhanced or maintained the ecological integrity of ecosystems, the flood regulation of the area (by increasing water infiltration) and the aesthetics of the landscape. Ostensibly, the tool indicated that some ecosystem services were negatively affected by measures to prevent soil erosion. Planting hedges and no-tillage were estimated to reduce the amount of food, fibre and biomass provided. However, it should be noted that persistent soil erosion will likely reduce soil fertility, possibly negatively affecting food, fibre and biomass provision in the long term, although this was not considered in this study. Furthermore, possible valuable benefits of soil erosion prevention for pollination, recreational value and carbon sequestration were also absent from this analysis.

The researchers conclude that integrating the ecosystem services into regional planning, if done carefully, can have substantial and multiple benefits.



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Contact:
Susanne.Frank@uni-bonn.de

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1. <http://biodiversity.europa.eu/maes>
2. http://ec.europa.eu/environment/nature/ecosystems/index_en.htm