METHOD FACTSHEET

ESTIMAP

Introduction

ESTIMAP is a consistent and flexible set of spatially-explicit models each of which can be run separately for the assessment of different ES at the European scale. They are all developed following the CICES classification (Haines-Young & Potschin, 2013) and framed in the ES cascade model which connects ecosystem structure and functioning to human well-being through the flow of ES. The models are dynamically linked to LUISA, the JRC land use modeling platform (Lavalle et al 2011). This provides the opportunity to evaluate the impact of different scenarios of land use changes on ES provision.

At present eight modules are operational at the European scale:

1. Capacity of ecosystems to remove air pollutants;
2. Capacity of land cover to prevent soil erosion;
3. Capacity of coastal ecosystems to protect against inundation and erosion from waves, storm or sea level rise;
4. Capacity for retention of water in the landscape;
5. Capacity of ecosystems to sustain pollination activity;
6. Habitat quality for breeding common birds;
7. Recreational and cultural services;
8. Bird richness of pest-control providers.

ESTIMAP was originally developed to support policies at a continental scale. Nevertheless the approaches are flexible and can be easily downscaled in order to fit the specific local scale needs and local planning demands of the OpenNESS case studies. This guide explains how to apply downscaled ESTIMAP-Recreation and ESTIMAP-Pollination models which have been extensively applied in OpenNESS case studies.

Keywords

Spatially explicit models, ecosystem services, mapping.

Why would I chose this approach?

ESTIMAP provides a framework for an exhaustive and consistent spatially-explicit assessment of ES. Each model is framed in three parts: (i) an indicator of the potential capacity of the ecosystems to provide the service; (ii) an indicator of the flow of the service; and (iii) an indicator of the demand of the service. It represents an integrated but data-intensive approach, based on the application of dynamic process-based models or data models which estimate ecological production functions which are subsequently used to map potential or actual ES.

What are the main advantages of the approach?

- The GIS models and processes are relatively easy to implement, requiring only a medium level of GIS expertise, especially for the data preparation;
- Mapping and visualisation facilitate dialogue among scientists, policy-makers and the general public;
- The models allow simulation of different scenarios and evaluation of different policy options;
- The models are flexible; they can be downscaled and modified in order to fit the local needs and conditions.

What are the constraints/limitations of the approach?

- Data preparation can be quite a long and demanding task;
- The utility of the results depend on identifying a clear set of questions to be addressed.

What types of value can the approach help me understand?

Estimap is designed as a quantitative tool and produces outputs that mostly provide biophysical values for regulating services. However the recreational indicator considers both supply and demand and reflects, to some extent, socio-cultural values associated with aesthetic beauty and recreation.

How does the approach address uncertainty?

The method does not address uncertainty explicitly.

How do I apply the approach?

Cultural ES are recognised as 'physical and intellectual or spiritual, symbolic and other interactions with biota, ecosystems, and land- /seascapes [environmental settings' (Haines-Young & Potschin 2013). Examples of cultural ES are: appreciation of natural scenery; opportunities for tourism and recreational activities; inspiration for culture, art and design; sense of place and belonging; spiritual and religious inspiration; education and science. Outdoor recreation and tourism represent an important service that interests millions of people and contributes to connecting them with nature. While tourism is an occasional activity, local outdoor recreation affects the daily life of people.

ESTIMAP-recreation provides models for mapping and assessing the potential provision of nature-based outdoor recreational opportunities (Paracchini et al. 2014) (Table 1).

Table 1. An overview of the ESTIMAP-recreation model.

General meaning of the indicator	Potential opportunities provided by ecosystems for a nature-based recreation activity
Method	Composite mapping
Components at the European scale	Degree of naturalness Natural protected areas Water-related data

OpenNESS

Components at the local scale	The three components and their elements can be adapted to fit specific needs
Outputs	1. RP raster map (dimensionless) 2. ROS raster map (categories) 3. Demand (statistics)

It is framed in three parts:

- Recreation potential [RP] – capacity
  - The potential opportunities provided by the ecosystem for recreational activities (RP Map, D, in the figure below)
- Recreation Opportunity Spectrum [ROS] – flow
  - The flow of service, which combines the potential provision map (RP) with proximity map (P) (ROS Map, L, in the figure below). Proximity to roads and built areas is considered to be one of the main drivers of the service being used; people have to reach recreational sites and opportunities by transportation infrastructures. The Recreation Opportunity Spectrum (ROS), originally developed as a tool for inventorying, planning and managing recreation opportunities (Recreation Opportunity Spectrum Procedures and Standards Manual 3.0, 1998) is used to provide an indicator of recreation opportunities available.
- Estimate of potential trips – demand
  - The assessment of potential benefits: evaluates the percentage of potential trips for each ROS category (% PPB, N, in the figure below).

Figure 1 shows a flow chart of the steps within the model. Firstly, the model assesses the potential capacity of a group of identified ecosystems and other elements to provide opportunities for local outdoor recreation (D). This varies according to the presence of three key aspects: the degree of naturalness (A), the presence of natural areas (B) and the presence of water (C). In a second step, it computes Euclidean distances from urban (E) areas and from roads (F). The two maps are then combined to derive a proximity map (H), which depends on specific proximity parameters (G). A final map of recreation opportunities (ROS) (L) is then computed by a cross tabulation between the RP (D), the Proximity Map (H) using a second set of parameters (I) with thresholds for the degree of recreation opportunities provided by nature and the degree of proximity and remoteness. Parameters (G and I) can be derived from a literature review.

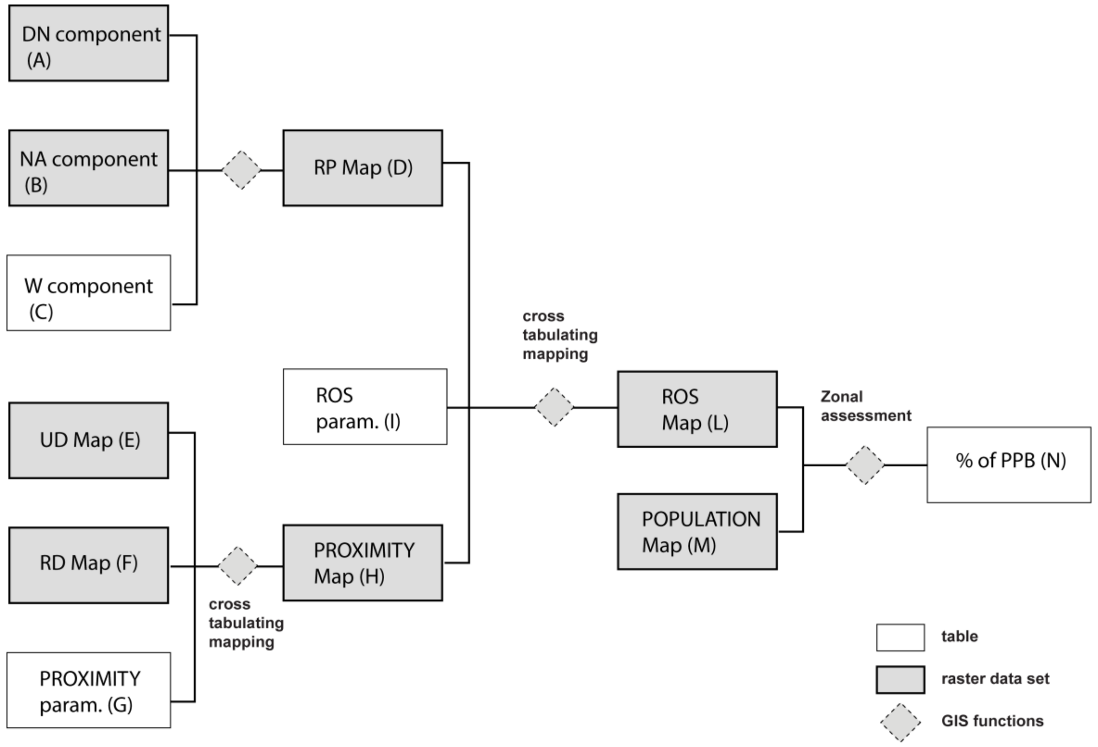

Fig. 1 Flow chart of the ESTIMAP-recreation model.

This model configuration represents the original model developed to fit the continental scale. To downscale the model to the local context, the first step is to determine the main questions to be addressed (see examples in table 2 below).

Table 2. Examples of different problems addressed in the OpenNESS case studies.

OpenNESS cluster	Example questions
Sustainable urban management	• What is the relative amount of recreational opportunities available per capita? • Is the local provision equally distributed? • Does the local management of urban parks and play grounds, and the local transportation network, fit citizens needs?
Management of mixed rural landscapes	• How are the opportunities for nature-based recreation spatially distributed inside the park? In terms of quality and accessibility? • Where are the most important conflict areas between nature conservation and recreation?
Integrated river basin management	• What is the value of the lake to local tourism and recreation? • Is this value affected by the water quality of the lake (link to the Water Framework Directive)?

Requirements

Data	☐ Data is available ☑ Need to collect some new data ☑ Need to collect lots of new data	
Type of data	☑ Qualitative ☑ Quantitative	Spatially-explicit datasets (vector or raster) and additional information are needed.

Expertise and production of knowledge	☑ Work with researchers within your own field ☑ Work with researchers from other fields ☑ Work with non-academic stakeholders	
Software	☑ Freely available ☐ Software licence required ☐ Advanced software knowledge required	The models can be computed using any types of GIS software, licensed (ArcGIS) or open source (GRASS, QGIS, R, etc)
Time resources	☑ Short-term (< 1 year) ☑ Medium-term (1-2 years) ☐ Long-term (more than 2 years)	Time and economic resources strictly depend on the expertise of the researchers and GIS specialists
Economic resources	☐ < 6 person-months ☑ 6-12 person-months ☐ > 12 person-months	
Other requirements		

Where do I go for more information?

Paracchini, M. L., Zulian, G., Kopperoinen, L., Maes, J., Schägner, J. P., Termansen, M., … Bidoglio, G. (2014). Mapping cultural ecosystem services: A framework to assess the potential for outdoor recreation across the EU. Ecological Indicators, 45, 371–385. http://doi.org/10.1016/j.ecolind.2014.04.018

Zulian, G., Paracchini, M.-L., Maes, J., & Liquete Garcia, M. D. C. (2013a). ESTIMAP: Ecosystem services mapping at European scale. Retrieved from http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/30410/1/lb-na-26474-en-n.pdf

Zulian, G., Paracchini, M.-L., Maes, J., & Liquete Garcia, M. D. C. (2013b). ESTIMAP: Ecosystem services mapping at European scale. (E. U. R.-S. and T. R. Reports, Ed.). European Commision. Retrieved from http://publications.jrc.ec.europa.eu/repository/bitstream/111111111/30410/1/lb-na-26474-en-n.pdf

Zulian, G., Maes, J., & Paracchini, M. (2013c). Linking Land Cover Data and Crop Yields for Mapping and Assessment of Pollination Services in Europe. Land, 2 (3), 472–492. http://doi.org/10.3390/land2030472

Factsheet Prepared by Grazia Zulian