

11th Iberian Grid Conference Faro, 10th – 13th October 2022

Ecosystem Services modelling in mountain systems

Nuria Pistón, Javier Martínez-López, Ricardo Moreno, Andrea Ros-Candeira, Carlos Navarro, Manuel Pacheco, A. Sofía Cardoso, A. Sofía Vaz & Domingo Alcaraz-Segura

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Ecosystem Services modelling in mountain systems Evaluation of ecosystems structure, function and services



MAIN OBJECTIVE:

To identify, evaluate and map the biophysical aspects of Ecosystem Services relevant for the scientific, manager and public communities of mountain National Parks.









1. Most studied Ecosystem Services (Sierra Nevada)

Literature review of ~1,870 articles and book chapters from which we selected those that meet two requirements:

a) referred to the Sierra Nevada Mountain, Spain;

b) referred to Ecosystem Services.

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2. Most relevant Ecosystem Services (Mountain National Parks of Spain and Portugal)

Questionnaire on perceptions and threats distributed to ~3,150 stakeholders from three groups:

- a) researchers;
- b) decision makers and managers;
- c) residents.









3. Building land-use change scenarios for Sierra Nevada

A <u>Bayesian Network model</u> developed based on stakeholders' preferences and expert knowledge (interviews and workshops) to model and project land-use changes from multiple drivers spatially.









Our <u>Land-Use Change Model</u> combined with climate change scenarios will allow to compute future scenarios (social, economic, climatic, etc.) for all modeled Ecosystem Services.









4. Provisioning services: Grazing

The model computes available metabolic energy for goats and sheeps. Inputs:

- a) NDVI (Normalized Difference Vegetation Index) used to compute the grassland cover for each pixel;
- b) annual precipitation;
- c) land cover;
- d) bioclimatic zones computed dynamically using temperature and precipitation data.







5. **Provisioning services: Agricultural production**

Based on available <u>yield statistics</u> data for several crop types (irrigated and rainfed trees and crops),correlated with time series of precipitation and temperature.











6. Regulating services: Snow and water provision

Based on the WIMMED hydrological model, which is already calibrated for the Sierra Nevada Mountains.

- 1. Total erosion avoided;
- 2. Fluvial erosion avoided in relation to reservoirs (related to water supply, flood lamination, hydroelectric power, recreation, etc.);
- 3. Total flow contributed by the basin;
- 4. Aquifer recharge;
- 5. Evapotranspiration;
- 6. Avoided flood events;
- 7. Contribution of snow to the water balance.







Ecosystem Services modelling in mountain systems Assessment of cultural ES in Mountain National Parks



7. Cultural services: aesthetic value and recreation

"Earth observation of cultural ecosystem services in Protected Areas: a tool for monitoring climate change effects" (EarthCul ref. PID2020-118041GB-I00).

We will predict future hotspots of CES based on climate change scenarios.



The previously mentioned questionnaires are also meant to validate AI results and assess the demand of CES.









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Thanks for your attention!

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