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Conference Abstract

Stakeholder - centered replacement of crosswalks with a knowledge graph: the case of ecosystem services

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Abstract

Ecosystem services (or nature's contributions to people) is an utilitarian concept for positives or disadvantages from ecosystems to humanity. Their complexity across scales resulted in a number of classification attempts. Significant differences in understanding them led to the emergence of several international and regional initiatives for adopting valid normative nomenclatures.

Crosswalks are a traditional approach to bridging the diversity of nomenclatures as expert curated, machine unreadable lists of correspondences where each class in one classification is linked to one or more classes in another, maintained by international expert groups and approved by different governing bodies. With the emergence of Semantic web and related AI and ML technologies for big data analysis, this approach is no longer feasible. It, furthermore, is not user-friendly to non-scientific stakeholders , such

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as policymakers and businesses without ecology background; elderly, less educated or socially vulnerable people lacking motivation and knowledge to internalise and use scientific terminology. The transition to machine actionable crosswalks is also non-trivial.

To bring practical understanding of ecosystem services to stakeholders, we adopt a stepwise approach:

- structured stakeholder interviews and brainstorming on needs identified by users;
- analysis of the information on the identified local situation, stakeholders' needs and priorities to build a knowledge graph (based on Fuzzy cognitive mapping) presenting sailient environmental, economic and legal components that form the local socio-ecological system;
- linking the knowledge map to Standard observations conducted in the LTER sites positioned within the future LTSER;
- linking the knowledge map to the Bulgarian Methodological Framework (Bratanova-Doncheva 2017), which is based on the eLTER Whole system approach. Through the crosswalks identified in it, we also link to ecosystem, habitat and species information in the environmental side, along with ecosystem services classifications and other relevant ontologies and to cover the economic, social and legal side of the knowledge graph.

We present this approach practiced in the development of two future long-term ecosystem research platforms (LTSER) in Bulgaria – Belasitsa (home of *Castanea sativa* forests) and Valley of Roses (the historical heart of essential oil production from *Rosa d amascena* and in the last decades also from lavender). Located in very different ecosystems, their varying land-use resulted in distinct long-term monitoring objectives and corresponding data collection. The iconic Valley of Roses is an agro-industrial landscape based on essential oil monocultures, the Belasitsa region has a diverse mountain landscape to the north of Belasitsa Nature Park and various cultural and economic links with the adjacent territories containing two more of the LTER-BG sites (Mesta river and Parangalitsa in Rila mountain). Accordingly, the knowledge maps produced in Phase 1 of setting up the Valley of roses LTSER (Fig. 1) and the one under preparation for Belassitsa vary hugely in their composition and links between the specific ecosystem functions and services / disservices, as well as in human perception of nature's value and the implied semantic and ontological links.

Keywords

Stakeholder engagement, structured interview, fuzzy cognitive mapping, knowledge map, ecosystem services, crosswalks between nomenclatures, ontologies

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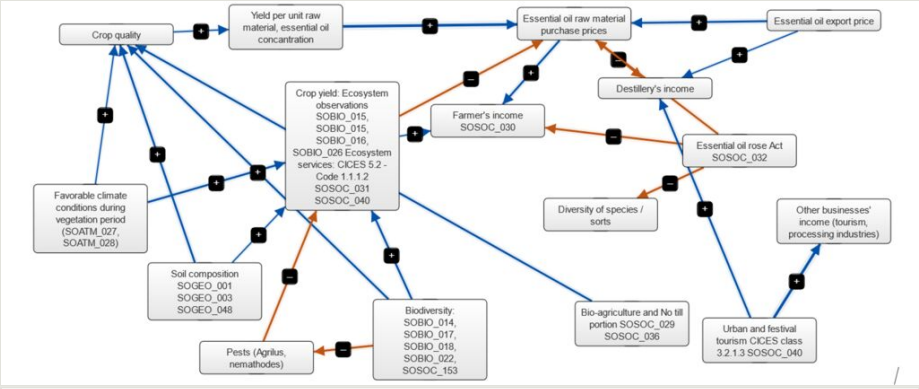

Figure 1. doi

Fuzzy cognitive map (Valley of Roses, future LTSER) linking standard observations and ecosystem services nomenclatures. Different scales of interlinking – from the farmer's field to global essential oil prices, and the need of adding corresponding nomenclatures are implied in this map.

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Conflicts of interest

The authors have declared that no competing interests exist.

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