

## Conference abstract

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## Evaluation of Urban Areas Providing Ecosystem Services using Urban Land Use Data

### Case study cities Lyon (France) and Karlsruhe (Germany)

With the increased urbanization and the corresponding urban expansion natural ecosystems are being degraded or destroyed and biodiversity is being threatened. At the same time city dwellers depend on services ecosystems provide. To close the resulting gap urban ecosystems play a more important role than ever before [1, 2]. Urban ecosystems provide city dwellers with a variety of services, e.g. water regulation or noise reduction referred to as “urban ecosystem services” (uES) [2, 3]. One advantage of the concept of uES is the ability to quantify benefits in terms of natural capital and to integrate ecological knowledge into urban planning [3, 4, 5].

In order to achieve such a quantification, areas that provide uES are being identified. This can be done by linking uES to land use classes, assuming that land use influences ecosystem services (ES) as described by Burkhard et al. (2009). In their work they propose a “matrix model” that focuses on the dualism of supply versus demand on ES on regional scale [6, 7, 8, 9]. The talk focuses on the supply side only. We propose to adapt the matrix model to the city context. The methodology aims to:

- be applicable for the majority of the cities of the European Union;
- use open source data with higher resolution;
- link urban land use data with uES;

In a first step of the adaptation we (1) identified relevant uES and combined them with (2) relevant urban land use classes. (1) Based on an exhaustive literature review an initial selection of uES was determined. In a next step a methodology was designed to identify relevant uES and related urban land use classes. (2) The open source data Urban Atlas has been identified to provide a standardized set of land use classes on for Europe, including e.g. more differentiated classes on the urban fabric compared to CORINE Land Cover (CLC) [10]. But we argue that the data set on Urban Atlas class 2 “agricultural, semi-natural and wetland areas”, aggregates too diverse ecological information. Therefore the Urban Atlas class 2 is replaced by the descriptive more detailed data of CLC.

In a second step expert elicitation has been conducted to identify the cities capacity to provide uES based on land use data. For this purpose an online questionnaire was designed and conducted. 41 participants answered the questionnaire. The majority of the participants exhibit the following profiles: professors, researchers, employees of public authorities or planning offices. The participants have been asked to evaluate the capacity of cities to provide uES in semi-quantitative units within in a range of 0 (= no relevant capacity) to 5 (= very high relevant capacity). This allows comparison and analysis across uES and land use classes [6, 8, 9].

The resulting matrix has been applied to the test cases of the cities and city regions of Lyon, France, and Karlsruhe, Germany by using ArcGIS. Results will be shown in the talk.

As part of the conclusion selected challenges, limitations will be highlighted and discussed. These include e.g. (a) the generalization by linking uES and Urban Atlas data and (b) the location of the areas in space. A short excerpt is given in the following:

(a) Identification by land use classes only ignores other necessary information e.g. groundwater levels or soil quality.

(b) The location of the areas in space clearly “constrains” or “improves” their potential and likeliness in providing the uES the method makes them accounting for.

We believe that the method provides a primary analysis of cities that can serve as a basis for further in depth discussion on the examination of urban areas providing uES due to the ease of application and the “mapable” results. In a next step the integration of other data sources should be studied. Additionally further expert interviews should be conducted and linked to collected data to increase the reliability of the capacity estimations.

## Literature

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