

Maps of European Biodiversity Typology

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Abstract:

This paper focuses on innovative methods for creating and visualizing a comprehensive typology of European regions in the context of biodiversity and socioeconomic development, including areas such as social wellbeing, economic wellbeing, level of technological development, and work with innovations. The main emphasis is on cartographic aspects and the development of interactive web applications. The entire research and subsequent implementation are taking place within the international GoDigiBioS (Biodiversity loss mitigation and adaptation measures: Policies Governance and tools to foster transformative change) project, which focuses on transforming digital information on biodiversity into practical tools for natural resource management and decision-making support. The aim of the project is to create a robust, data-driven system for classifying areas based on complex interactions between ecosystem status, social dynamics, economics, and technological progress. Part of this system is a web-based cartographic application that allows users to view data, compare different typology systems, or create specific classifications of regions. The process of creating the typology and web application begins with the detailed identification and selection of datasets that describe both static and dynamic biodiversity, as well as socioeconomic prosperity and the level of public administration. The NUTS (Nomenclature of Territorial Units for Statistics) administrative boundaries at the NUTS 2 level are used for the spatial delimitation of the analysis. This level of detail allows regional specifics to be captured. A key stage in the development is the harmonization of these heterogeneous data, including verification, metadata completion, consolidation, imputation of missing values, and normalization. Advanced statistical methods and a hybrid approach based on principal component analysis (PCA) are used for subsequent clustering. The methodology includes a comparison of the Elbow and Silhouette methods to identify the optimal number of clusters and the subsequent use of hierarchical (Ward's method) and non-hierarchical clustering (K-means) and mixed-types clustering. The result is a division of European regions into specific groups, such as innovation leaders, stable developing countries, or tourism-oriented areas, which forms the basis for the effective creation of thematic maps.

From a cartographic point of view, the focus of the work is the development of an interactive tool, Data Explorer, which visualizes the acquired data and supports decision-making processes in nature conservation. This application, technically based on the framework previously developed for the PoliRural project, functions as a standard map portal allowing the comparison of statistical data with the created typology. The dominant means of expression are thematic maps, which are generated dynamically based on user requests. A unique feature is the ability to create your own user typology from selected data sets, allowing the portal to explore specific relationships between biodiversity and specific areas of human activity. In designing the application and its graphical user interface (GUI), great emphasis is placed on the heterogeneity of end users. This diversity directly influences the choice of data sets offered and the map outputs themselves, including color scales, cartographic interpretation methods, legend keys, and the selection of base maps, so as to ensure maximum comprehensibility for both experts and the general public.

The entire modular framework is designed for gradual optimization and addition of new data. The initial phase of development is currently underway, and the conference paper will present the current version of the map application and the methodological procedures that led to its implementation within the topic of web cartography and map services.

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