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Comparing periurban patterns of Greek cities using spatial metrics to measure urban sprawl

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Résumé / Summary

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The study compares periurban land use patterns in six Greek cities to identify and evaluate recent sprawling processes. Using recent data from the Urban Atlas database, a set of spatial metrics is estimated in order to quantify the characteristics of urban patterns in a selected set of periurban subareas. Land use intermixture as well as geometrical characteristics of the patches are examined and compared, while the degree to which the patterns appear to be clustered or dispersed is evaluated. As the drivers of development in each case study area appear to be varying, the discussion relates the results to issues such as population suburbanization, spatial planning policy, development in coastal zones, accessibility and infrastructure.

The aim of the paper is to analyze the form and structure of periurban areas of Greece by estimating spatial metrics related to urban land use distribution, and to present a way of using these metrics to measure and evaluate urban sprawl. The hypothesis is that sprawl is related to low density development, fragmented and dispersed land use pattern, land use intermixture etc. These attributes could be quantified by using metrics such as Contagion, Euclidean Nearest Neighbor Distance, Patch and Edge Density, Mean Patch Size, Fractal Dimension etc. Therefore a concrete methodology is needed on how to set out an analysis based on those metrics and how to evaluate the results.

In the present study six case study areas are selected, each one located on the outskirts of one of the six largest Greek cities: The Mesogeia plain in Athens, the Thermi-Mikra area in Thessaloniki, Rio in Patras, Gazi in Herakleion, Platykampos-Nikaia area in Larisa and Agria-Portaria area in Volos. All of these areas present a certain degree of periurban development, with urban land use expansion in agricultural and natural areas, during the past two or three decades.

In terms of methodology, ten basic land use classes are identified using data from the Urban Atlas database and statistics are estimated for their distribution in all case study areas. From these classes only five referring to: a) medium to dense urban fabric, b) low dense to medium dense urban fabric, c) low dense urban fabric d) industrial/commercial uses and e) green urban/sport areas, are used to estimate spatial metrics. At a first step certain transformations are applied to the original Urban Atlas data, so that patches of the same land use class are identified and the arbitrary separation imposed by the local road network is eliminated.

At a second step, spatial metrics are estimated using the FRAGSTATS software (McGarigal et al., 2012) while the fractal dimension is estimated using the Fractalyze software. Spatial metrics have been used extensively to describe the aggregation, dispersion and proximity patterns of the different land uses in an urban area. Applications on the use of metrics for urban analysis include Herold et al. (2002), Ji et al. (2006), Huang (2007), Weng (2007), Ramachandra et al. (2012), Schwarz (2010), Pham et al. (2012), Prastacos & Lagarias (2016) among others.

At a third step the results are evaluated and a comparison between the different periurban areas is established. The results are related to other factors that act as drivers of sprawl, such as the lack of strict planning regulations, accessibility and infrastructures, population suburbanization, geomorphology and development in coastal zones.

These issues appear to be of major importance in Greek cities and therefore the results are expected to be valuable in assessing the current situation regarding periurban development in Greece. As the drivers of sprawl in each case study area appear to be varying, the discussion tries to point out these differences and to provide an explanation regarding the patterns observed. Land use policy and spatial planning issues are also discussed and ways of containing sprawl are proposed.

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