



Fractal dimension of European Cities: A comparison of the spatial distribution of artificially sealed areas between the urban core and the periurban ring

Apostolos Lagarias ¹# and Poulicos Prastacos ¹

¹ Institute of Applied and Computational Mathematics, Foundation for Research and Technology - Hellas, Heraklion Crete, Greece

Presenting author: Apostolos Lagarias, email: lagarias@iacm.forth.gr

* Corresponding author: Apostolos Lagarias, email: lagarias@iacm.forth.gr

ABSTRACT

This study compares the urban form of large European cities using fractal dimensions. Data from the Imperviousness High Resolution Layer are used, providing information on the spatial distribution of the soil sealing degree of the urban areas. Fractal dimensions are estimated using two different methodologies; the binary approach (developed/non-developed) and the grayscale approach in which the built-up intensity is explicitly taken into account, by categorizing the soil sealing degree into 10 different classes.

Fractal dimensions are estimated for the 58 European cities with population exceeding one million. Using boundaries defined in Urban Atlas a differentiation is made between the core of urban area, the peripheral/peri-urban ring and the whole functional area and fractal dimensions are computed for each of these spatial levels. Results show there are differences on the fractal dimensions of the various cities and also that there is a strong correlation between the fractal dimension and the overall percent of built-up area. For all cities, the fractal dimension of the urban core is significantly higher than the corresponding dimension of the peri-urban ring. A comparison of cities across regions (UK-Ireland, Scandinavia, South, West, East) is made, however regional differences are more evident in the peri-urban areas with cities of Eastern Europe forming a distinct group of lower fractal dimension values, and cities of UK-Ireland a group of higher values.