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Demographic, Economic and Physical Data Integration: Measuring Hillside's Urban Occupation in Metropolitan Region of São Paulo (Brazil)

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Hirye, M. C. D. M.; **McPhearson, T.**; **Filardo, A. S., Jr.**; **Alves, D. S., Sr.**

Geospatial data are crucial to urban science research and to support policy and decision making. However, analysis of urban geospatial datasets must overcome differences due to measurement, spatial unit and resolution. Concerning the demographic data, the smallest area of data recollection - census tract - is often delimited based on operational criteria. Temporal comparison is affected by differences in tracts limits that may vary between decennial censuses. This configures a Modifiable Areal Unit Problem (MAUP), in which conclusions may not possess any validity independent of the units which are being studied. On the other hand, physical variables have their own representation, depending on the way they are measured. This work proposes to overcome MAUP and different spatial representations with the usage of a cellular space, defined as a regular lattice of two dimensions. The Metropolitan Region of São Paulo (MRSP) is presented as a study case. In a cellular space, we represent population, income data and slopes to analyze urban occupation in hillsides, from 1990 to 2010. Population and income information were distributed using, as auxiliary data, a land cover map obtained from Landsat imagery. Slope, calculated from topographic maps, was also distributed in cellular space. Two different lattice resolutions were used: 1km x 1km, as a final resolution to visualize and analyze hillside's occupation, and 30m x 30m, a higher resolution, to perform calculations and data integration, preventing inaccurate conclusions. Results showed the preponderance of steep slopes in the north of MRSP, while population have grown in all directions from downtown. Integrated analyses revealed an intense process of low income hillside's occupation in southeast and northwest of MRSP. With less intensity, northern hillsides are occupied by high income population. This methods enables to measure and characterize urban occupation in hillsides, contributing to understand risks and support sustainable occupation.

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