

## **Europe, The Mediterranean and the World Economy**

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### **Built-in or build-out: Exploring residential density dynamics in the Netherlands**

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The development of urban areas over time is a complex process that is characterized by substantial variation in both spatial and temporal dynamics. Growing cities and declining urban areas may coexist in the same region. Residential growth processes can lead to different paths: the construction of new dwellings within existing urban areas (intensification) or the development of new urban areas on lands that were formerly rural or open-spaces (urban extensions). Regional demand for new houses typically leads to urban extensions but combinations of opposite trends can be found within short distances of each other; a decline in residential density in the centre of a city, for example, may occur in parallel with new developments at its fringe.

Studies on urban densities as a function of distance from the city core are abundant in urban economics literature, as well as methods intended to detect particular density patterns that can be interpreted as urban sub-centres or sprawling zones. This type of models generally refers to the existing residential stock at a fixed point in time. However, there is a paucity of studies aimed to understand residential intensity changes over time and their spatial implications in terms of detailed urban land use. This last aspect is especially important in physical planning, since the likelihood of a certain area to be urbanized, or the potential for urban intensification is a crucial issue when forecasting future city development. Understanding the basic principles that steer spatial residential dynamics has become especially relevant because the planning context is changing: top-down restrictive zoning policies and urban concentration goals are being abolished making it ever more uncertain how urban development processes will unfold.

Using detailed geographical data about land-use changes and built-up areas densities from 2000 onwards, residential spatial developments and density changes are analyzed. In particular, the processes of urban intensification and urban extension are quantified. The results are presented at different spatial aggregation levels such as municipalities and NUTS-3 zones. The observed changes are statistically linked to economic and social indicators (regional GDP, population growth rates and dwelling demand), and to geographic and policy parameters, such as the availability of developable land and the presence of restrictive or stimulating spatial policies. The result of the analysis is a conceptual urban population density model that can be applied for exploring future urbanization trends under different policy and economic scenarios.

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