

## A GIS-Supported Framework for Transforming Suburban Areas into Resilient 15-Minute Districts

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### Abstract:

Suburban zones, characterized by dispersed development and heavy dependence on car mobility, require new tools that support their transition toward more resilient and human-scale urban environments. This study introduces a GIS-supported analytical framework designed to evaluate the transformation potential of existing suburbs in line with 15-minute city principles.

The proposed framework, implemented as an open-source extension for QGIS, integrates multi-source spatial data and enables users to map accessibility, service distribution, pedestrian connectivity and ecological structures. Its modular structure supports adaptation to diverse planning contexts and allows municipalities, planners and local communities to identify spatial deficits and opportunities for suburban retrofitting.

Pilot tests carried out in selected low-density districts demonstrate the tool's capacity to facilitate evidence-based decision-making, while offering clear visual outputs that help communicate planning scenarios and support local participation processes. The framework advances the operationalisation of the 15-minute city in suburban environments by connecting ecological, social and functional criteria within a transparent and replicable GIS tool. The development of the tool was funded through the Argentum Triggering Research Grant.

### Keywords:

15-minute city, suburban retrofitting, GIS, ecological transformation, accessibility analysis, open data, QGIS, spatial planning, resilience, sustainable urban development.