

## Integrating Open Big Data into Urban Planning Education: A GIS-Based Analytical Curriculum for Smart City Development in Gdańsk

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### Abstract

Since 2021, a new two-semester, data-driven GIS programme has been implemented within the Spatial Management curriculum at the Faculty of Architecture, Gdańsk University of Technology. The programme was developed in consultation with the City of Gdańsk, represented by the Municipal Architect's Office, to address the growing municipal need for evidence-based analytical support in district-scale planning. The curriculum integrates Poland's rapidly expanding open-data ecosystem—including high-resolution LiDAR point clouds, numerical terrain models, demographic datasets and municipal spatial layers—into a structured workflow for geospatial education. The first semester (GIS I) focuses on tutorial-based training, enabling students to independently process, transform and visualise multi-source geospatial data. In the second semester (GIS II), these competencies are applied in team-based analytical projects for selected districts of Gdańsk. Students conduct a comprehensive suite of thematic analyses encompassing functional-spatial structure, infrastructure, housing and tourism dynamics, protected areas and heritage, environmental conditions and demographic patterns. These multi-layer analyses form the basis for integrated spatial syntheses supporting early-stage masterplanning. The analytical packages developed in GIS II function as the initial diagnostic phase for district masterplans, and the long-term aim of the programme is to generate a complete analytical base covering all districts of Gdańsk, creating a city-wide foundation for evidence-based strategic and spatial planning. Each cohort publishes its outputs on publicly accessible project websites, creating a cumulative open archive of urban analytical work. Final results are presented to the Municipal Architect's Office and the Gdańsk Development Office, embedding academic analyses within municipal planning workflows. The paper evaluates this pedagogical model, demonstrating how the integration of open big data, LiDAR-derived terrain analytics and demographic modelling enhances analytical rigour, methodological transparency and data literacy in undergraduate planning education, while strengthening academic-municipal collaboration in developing smart, data-informed approaches to urban transformation in Gdańsk.

### Keywords

Open data, big data analytics, GIS education, urban planning, spatial analysis, evidence-based planning.

