

ENGLISH ABSTRACTS

SPECIAL SECTION: Regionalism in the Strategic Spatial Plan 2050 –
Alternative Approaches to Creating Affinity Areas in Regional Planning

Division into Affinity Areas: Critique of Existing Approaches and Proposed Network Methodology Based on Cluster Analysis for Division into Communities

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ABSTRACT

Israel is divided into various spatial units by many agencies for operational and planning purposes. At the planning level, decomposing space into functional regions can help break a large planning problem into smaller, more tractable sub-problems. Several relevant partitioning schemes exist—CBS metropolitan areas (2014), functional urban areas (FUA, 2025), and planning regions from the National Spatial Strategic Plan (2024). Each relies on different data sources, processing methods, and underlying assumptions.

This paper critically evaluates these existing approaches, highlighting their weaknesses—including assumptions about monocentric structure, the primacy of commuting as the sole defining criterion, the use of aerial distances, and requirements for spatial contiguity. We then propose a new partitioning framework based on community-detection and cluster-analysis algorithms that seeks to overcome these shortcomings.

The evaluation is conducted using an origin-destination matrix from Israel's national cellular mobility survey (2018–2019), a national road network, and a derived travel-time matrix. Four algorithms are applied: Louvain, Leiden, Walktrap, and hierarchical clustering. Partitions are assessed using two independent metrics: modularity (Q) and silhouette score (s). Results show that the Walktrap algorithm at 13 steps yields the best balance between modularity and silhouette, producing a stable 7-region partition that outperforms all existing administrative divisions on both metrics. The paper concludes with a discussion of methodological limitations and open questions for future research.

Keywords: functional regions, community detection, modularity, silhouette, origin-destination matrix, cellular survey, Israel.

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