Midterm-Project: Walkability Assessment of Graz, Austria

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Paper: Open Data Supporting GIS-based Walkability Assessment: Case Study for City of Zagreb, Croatia (Kevic et al. 2024)

- QGIS Plugin OS-WALK-EU with
  open datasets (e.g., OSM, national open data)
- Calculated walkability using
  two differently weighted perspectives:
  - Leisure-oriented (free-time activities)
  - Daily-use oriented (everyday tasks and amenities)
- Environmental indicators (population density, green/blue areas)
  and Accessibility measures (distance to multiple POI categories)
- Spatial walkability maps to visualize patterns across the city

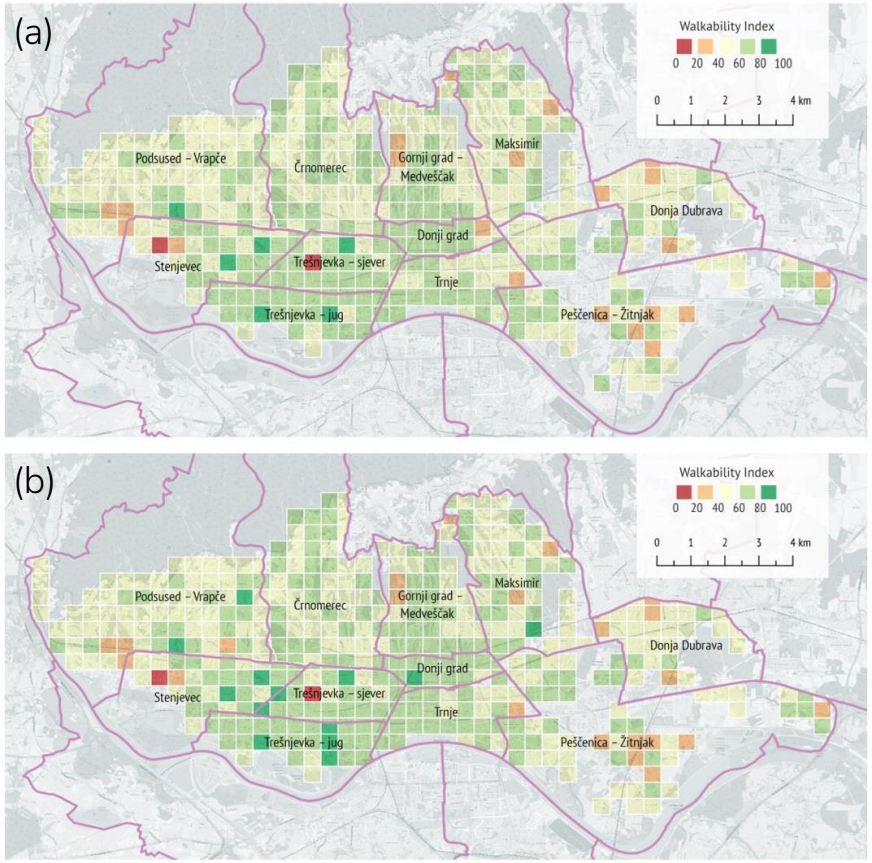


Figure 1: Walkability index for the (a) 'enjoying free time' and (b) ,daily obligations and commitments' user perspective
across eleven districts in the city of Zagreb, Croatia. (© Kevic et al. 2024: 27)

Data:

- POI categories and walking network from OSMnx
- District boundaries from Overpass Turbo
- Green and blue areas from Urban Atlas (Copernicus)
- DEM from OpenTopography
- Population data from the City of Graz

Analysis – Jupyter Notebook

- Git repository: https://github.com/bernadettesophia/GAT2_group1_midterm_project.git

Results: Old Version

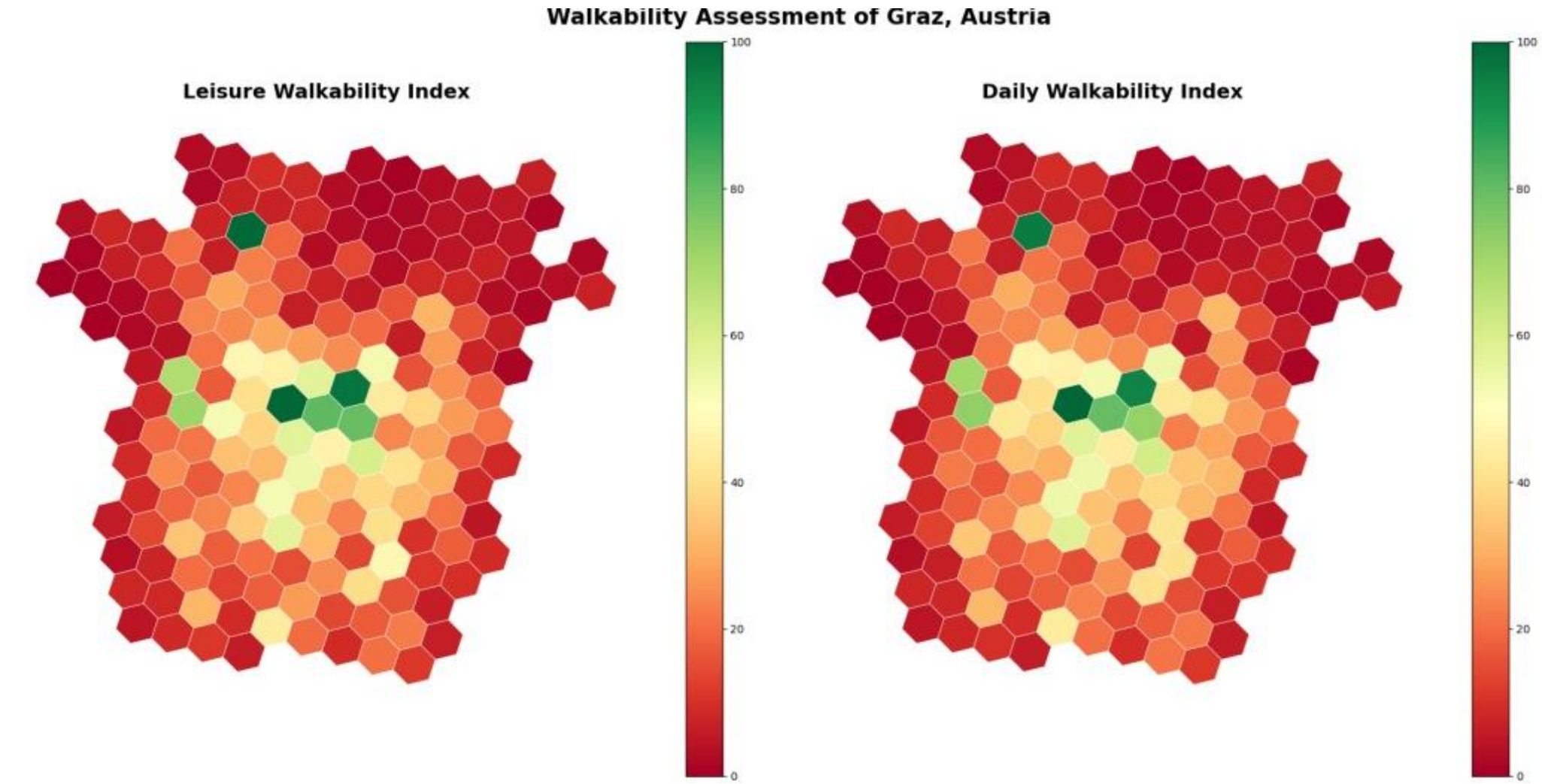
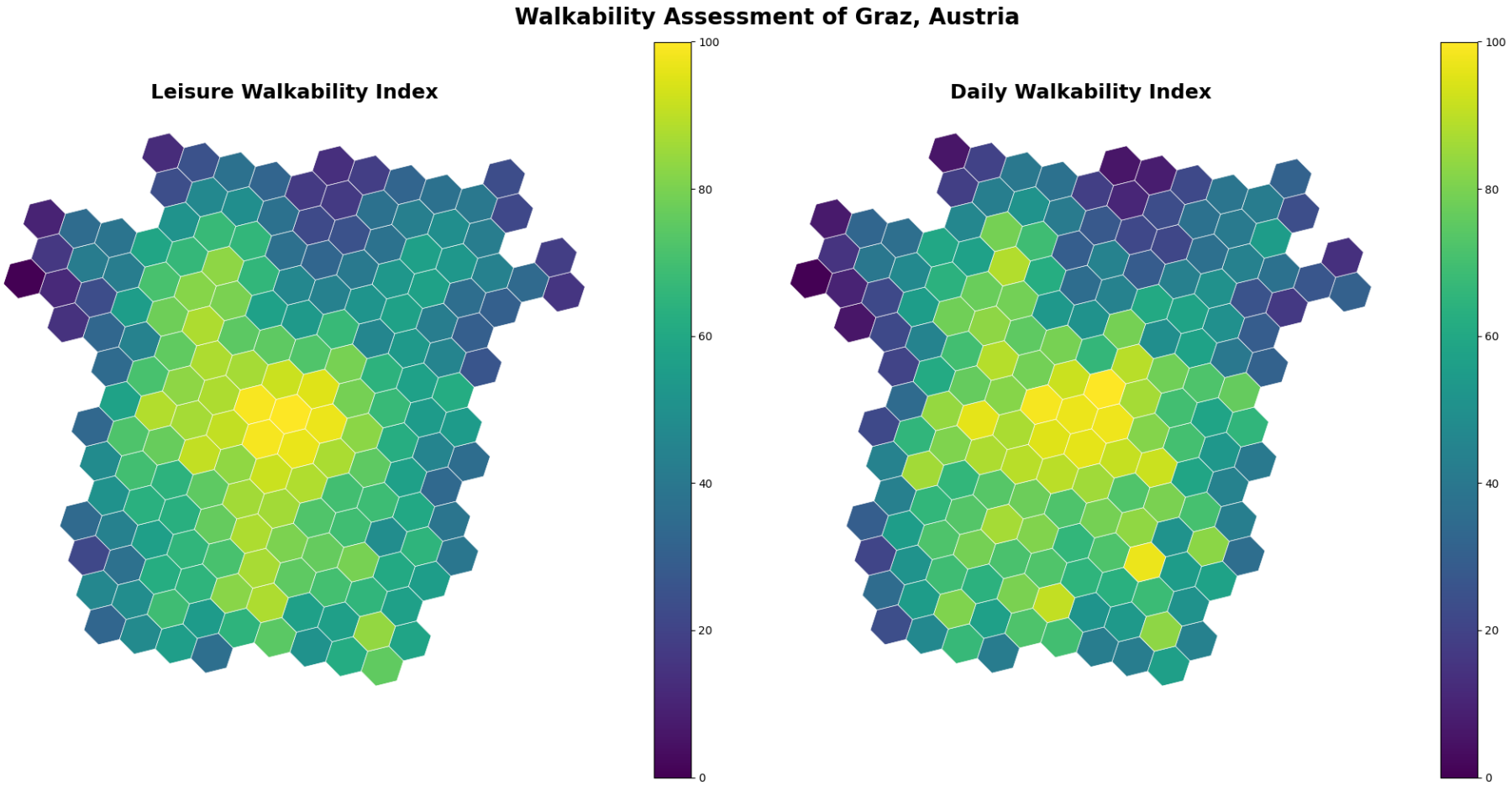


Figure 2: First Attempt on Walkability Assessment of Graz, Austria, comparing Leisure and Daily (© group1 2025)

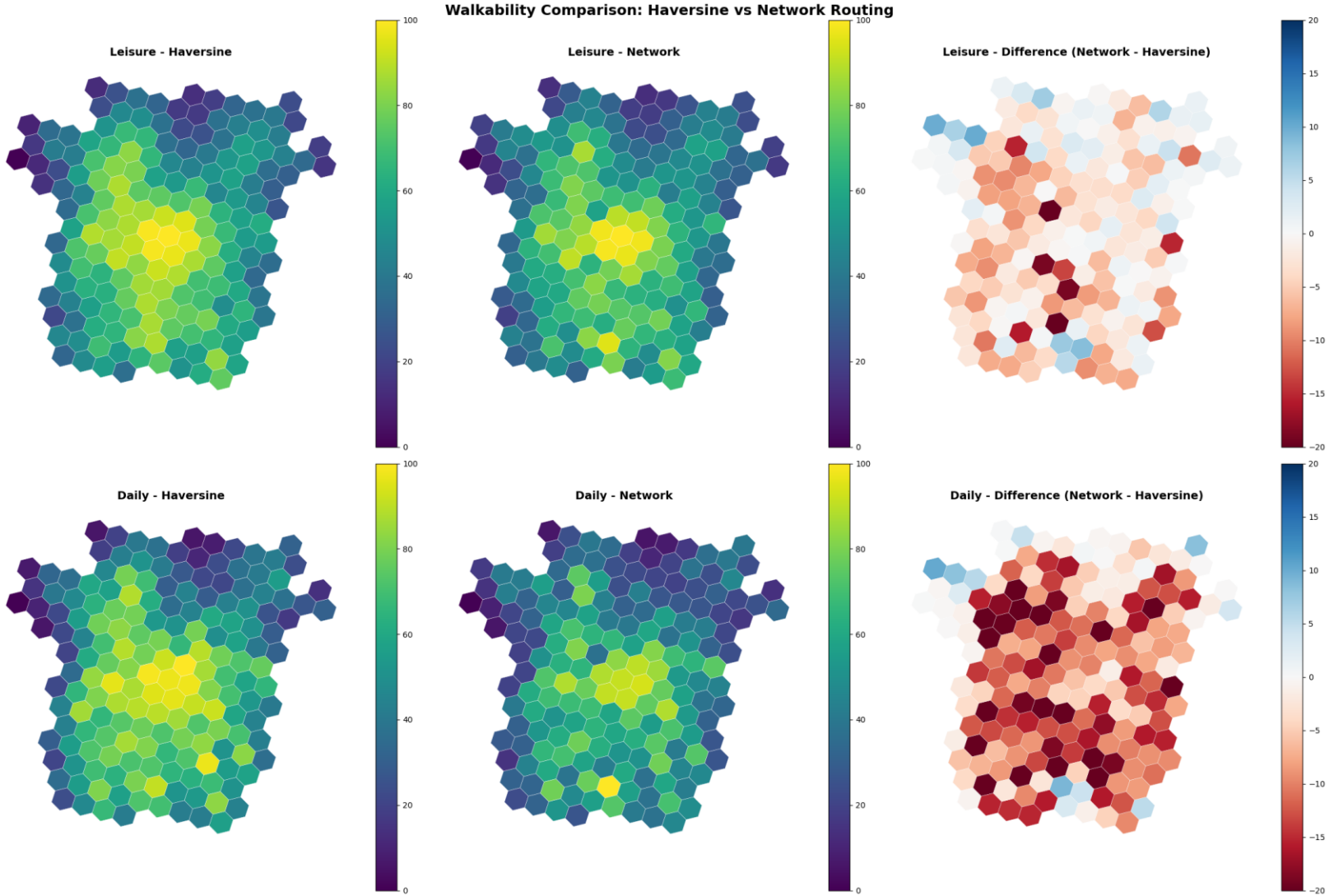
Results: Normalized Walkability Scores (0-100)



- Daily:
  - Mean: 55.85
  - Median: 56.61
- Leisure
  - Mean: 56.35
  - Median: 56.34

Figure 3: Adapted Results of Walkability Assessment of Graz, Austria, comparing Leisure and Daily (© group1 2025)

Results: Comparison Haversine vs. Network Routing



Correlation > 0.94 confirms both methods identify the same walkable areas; network scores are 2–9 points lower

-> actual walking routes are longer than direct distance.

Figure 4: Comparison of computing methods Haversine vs. Network Routing of Walkability Assessment of Graz, Austria, comparing Leisure and Daily (© group1 2025)

Results: Comparison Kevic et al. 2024 vs. own Results

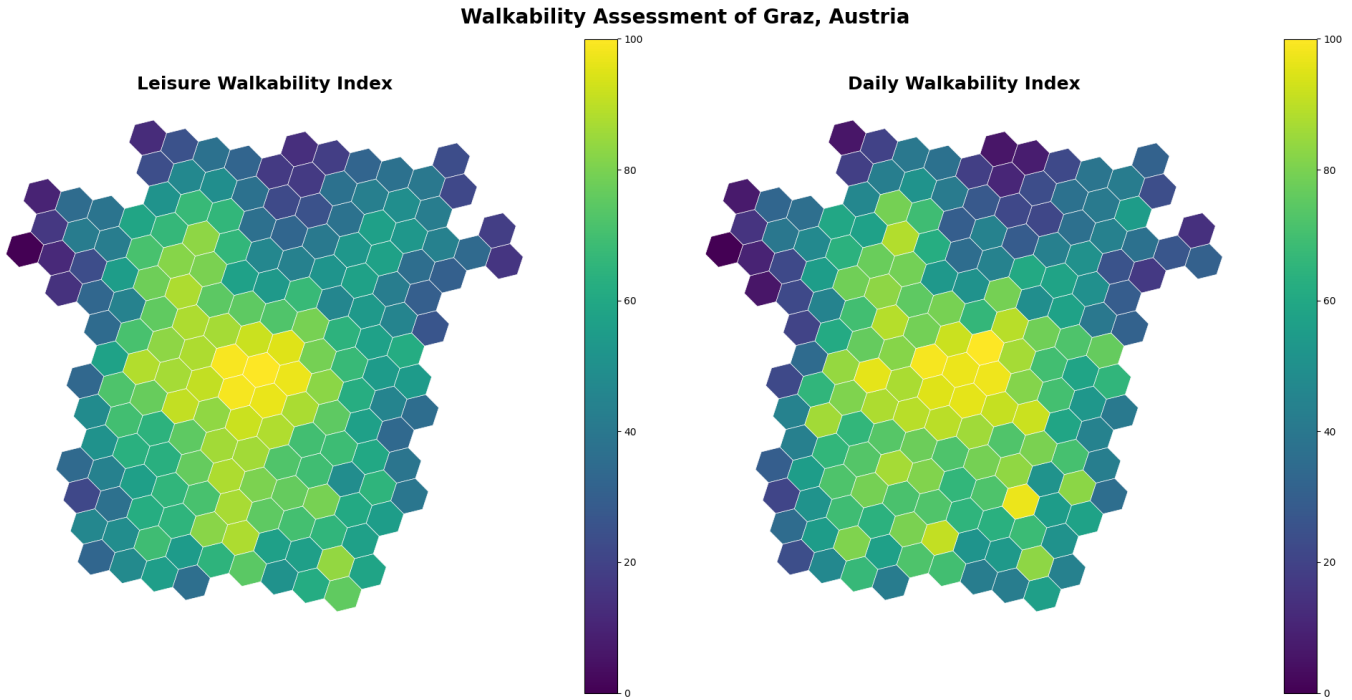


Figure 5: Adapted Results of Walkability Assessment of Graz, Austria, comparing Leisure and Daily (© group1 2025)

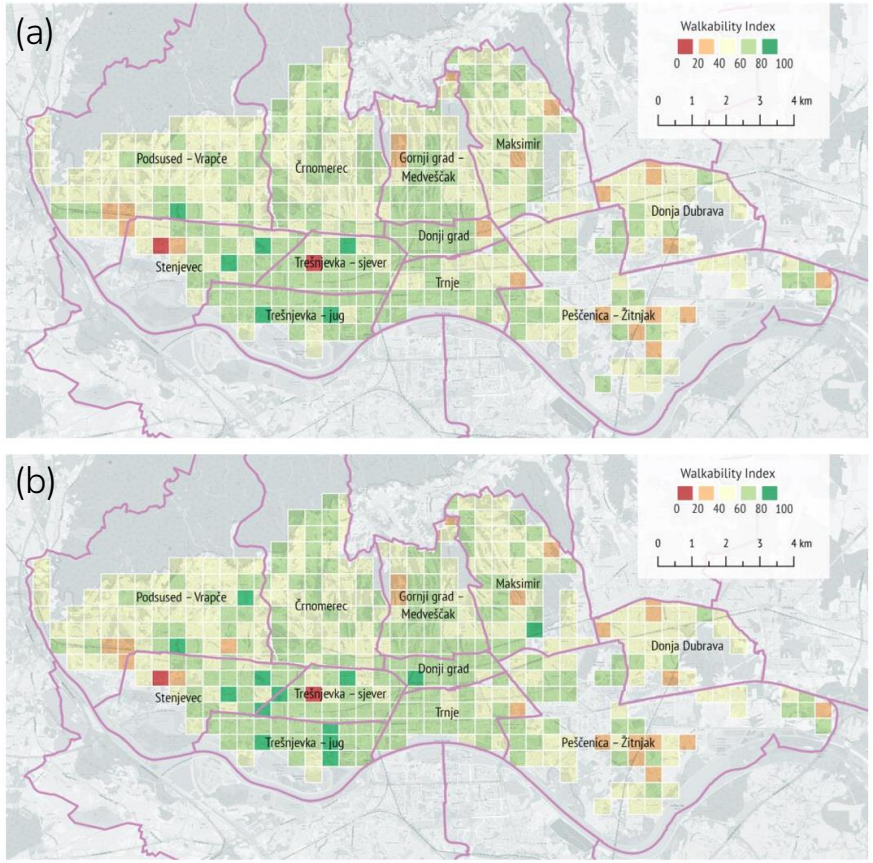


Figure 6: Walkability index for the (a) 'enjoying free time' and (b) ,daily obligations and commitments' user perspective
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Reproducibility insights

- All steps in Python code -> workflow reusable for other cities with minimal changes
- Open data only -> no proprietary software or datasets required, every data source can be audited
- Parameters explicit in script -> assumptions visible, easily modifiable
- Adjusted POI weighting to create a clearer separation between leisure and daily indices, because original weights produced only minor differences between the two perspectives.
- Implemented network routing alongside Haversine; high correlation ($r > 0.94$) -> similar spatial patterns, but network scores systematically lower (more conservative).

Limitations

- Population uniformly distributed within districts—ignores local density variation
- POI quality depends on OSM; some categories under-mapped
- Weighting scheme customized, not validated against actual walking behaviour
- Code performance: loops over hexagons/POIs create long runtimes, especially for network routing
- Kepler.gl rendering issues reduce reproducibility across environments
- Haversine vs. network routing differ significantly; network snapping can favor peripheral areas
- Network approach more complex; Haversine more practical for reuse

References

- Kevic, K., Kuveždic Divjak, A., Zrno, K., and Vilicic, M. (2024). Open Data Supporting GIS-based Walkability Assessment: Case Study for City of Zagreb, Croatia, Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLVIII-5-2024, 23–29, https://doi.org/10.5194/isprs-archives-XLVIII-5-2024-23-2024.
- District boundaries (Overpass Turbo (n.d.). Overpass API web interface. https://overpass-turbo.eu/ (Accessed December 2, 2025))
- Overpass Code for district boundaries: [out:json][timeout:25]; area["name"="Graz"]->.g; relation(area.g)["boundary"="administrative"]["admin_level"="10"]; out geom;
- Population statistic (Stadt Graz (2025). Zahlen + Fakten: Bevölkerung, Bezirke, Wirtschaft, Geografie. https://www.graz.at/cms/beitrag/10034466/7772565/Zahlen_Fakten_Bevoelkerung_Bezirke_Wirtschaft.html (Accessed December 2, 2025))
- POIs and walking network (OpenStreetMap via OSMnx)
- Green and blue spaces (Copernicus Land Monitoring Service (n.d.). Urban Atlas Land Cover / Land Use 2018 (vector). https://land.copernicus.eu/en/products/urban- atlas/urban-atlas-2018 (Accessed December 2, 2025))