

PRAGUE MAPPED BY PEOPLE AND SATELLITES

DIPLOMA THESIS

- PPGIS
- REMOTE SENSING
- URBAN QUALITY OF LIFE
- BIVARIATE MAPPING
- SPEARMAN CORRELATION
- INTERACTIVE GEOVISUALISATION

GOAL

Can citizen perception of urban quality be spatially correlated with measurable physical conditions from remote sensing data?

BACKGROUND & MOTIVATION

Urban environments are both physical and perceptual spaces. Environmental indicators such as vegetation cover, land surface temperature, nighttime light emission, and imperviousness measured by satellite cannot alone tell us how people experience the environments they live in.

Participatory mapping bridges this gap. Through PPGIS, citizens act as sensors (Goodchild, 2007), contributing spatial knowledge that complements expert-generated datasets. Correlating these two data streams allows researchers to test whether objective environmental conditions correspond to subjective citizen experience with both theoretical significance for environmental psychology and practical relevance for urban planners identifying spatial priorities for investment.

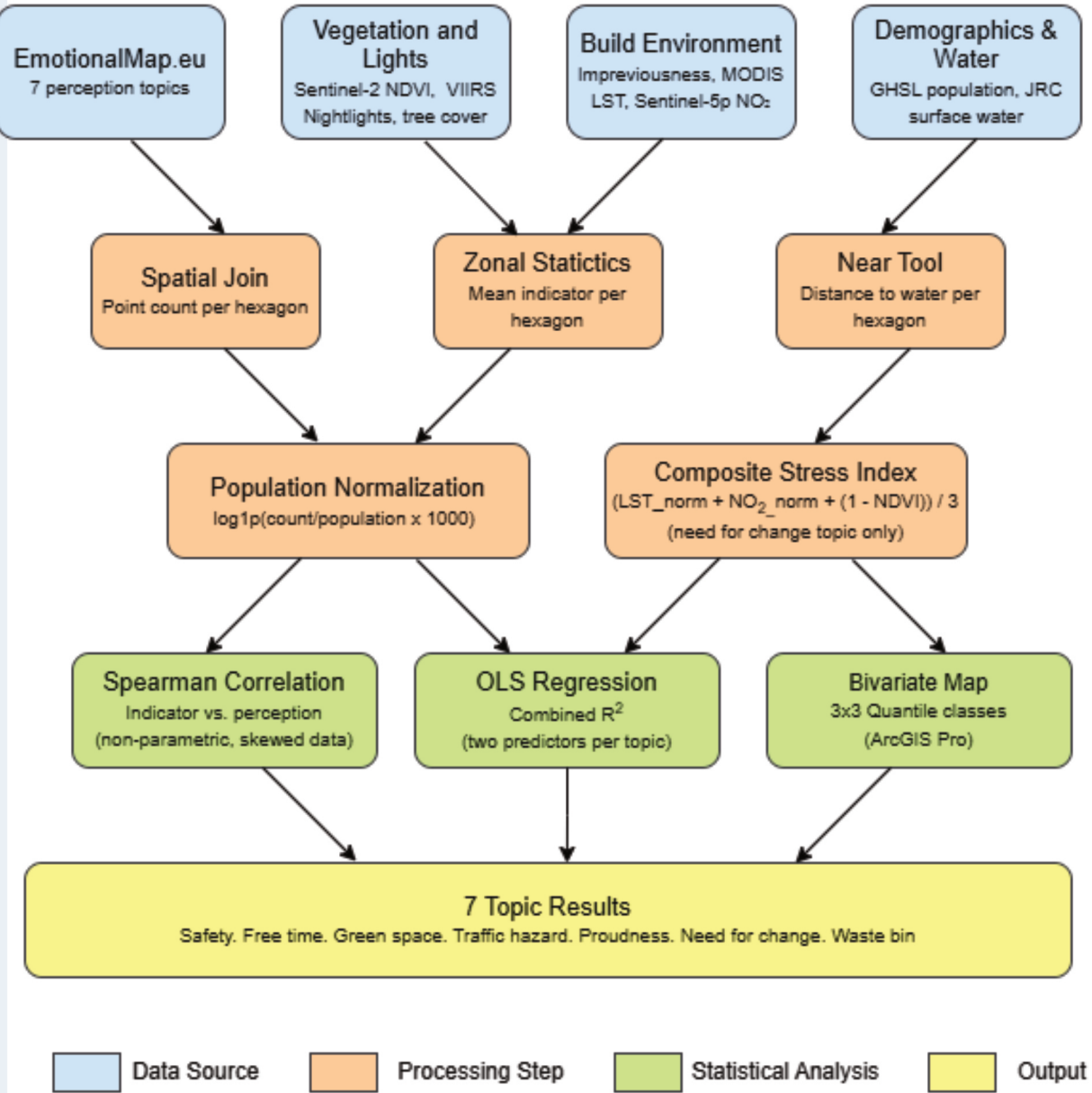
This study uses the Emotional Map of Prague (Pánek et al., 2021), covering seven topics: safety, leisure, green space demand, traffic hazard, civic pride, environmental dissatisfaction, and waste bin adequacy.



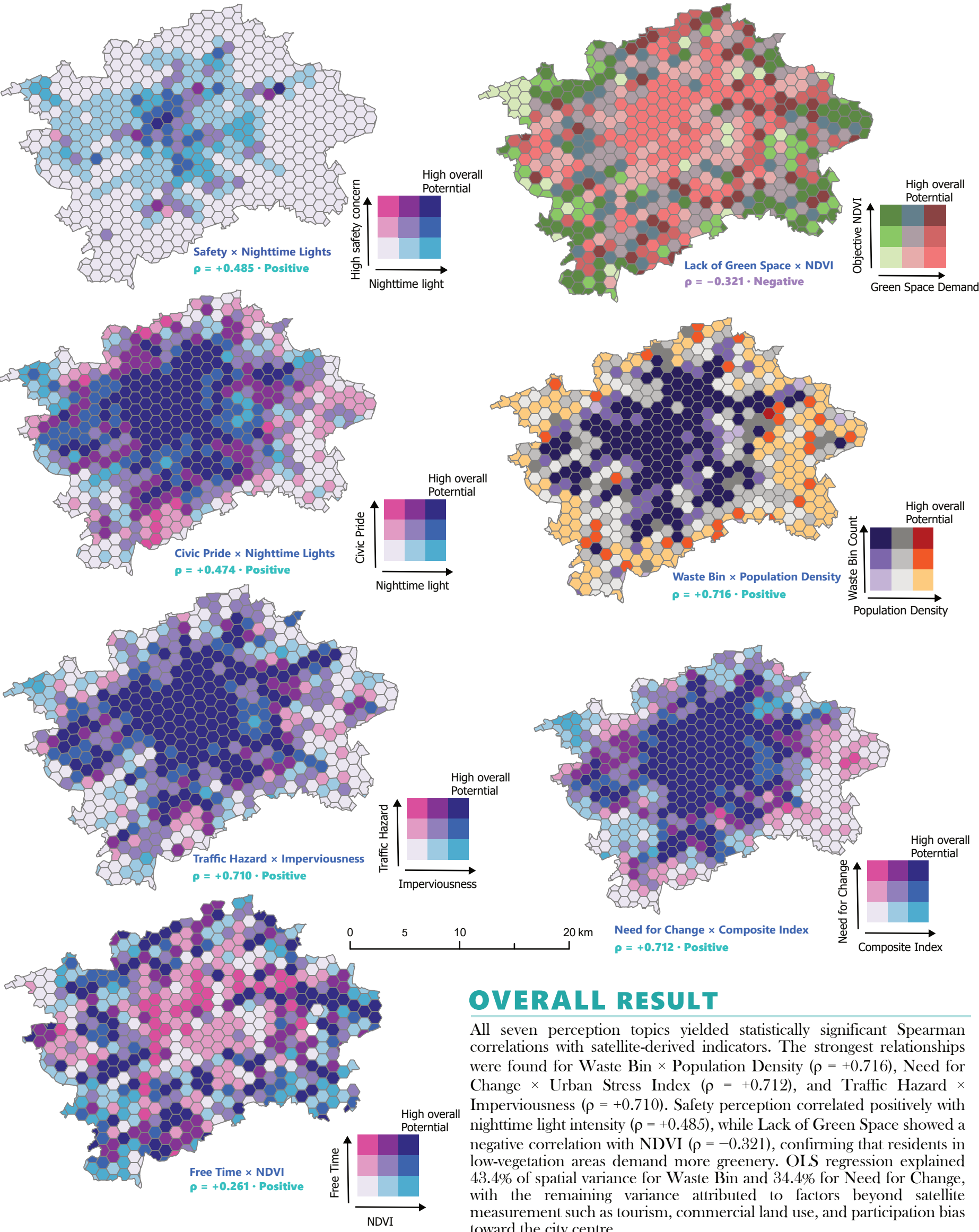
METHOD & WORKFLOW

Citizen perception data from EmotionalMaps.eu and six satellite-derived indicators from Copernicus were spatially aggregated into a 1 km² hexagonal grid across Prague. Spearman correlation and OLS regression were applied to measure the relationship between citizen marks and environmental conditions for seven topics. Results were visualised as bivariate choropleth maps and presented through an interactive Streamlit dashboard, evaluated via usability testing.

Overall Analytical Framework Prague Mapped by People satellite



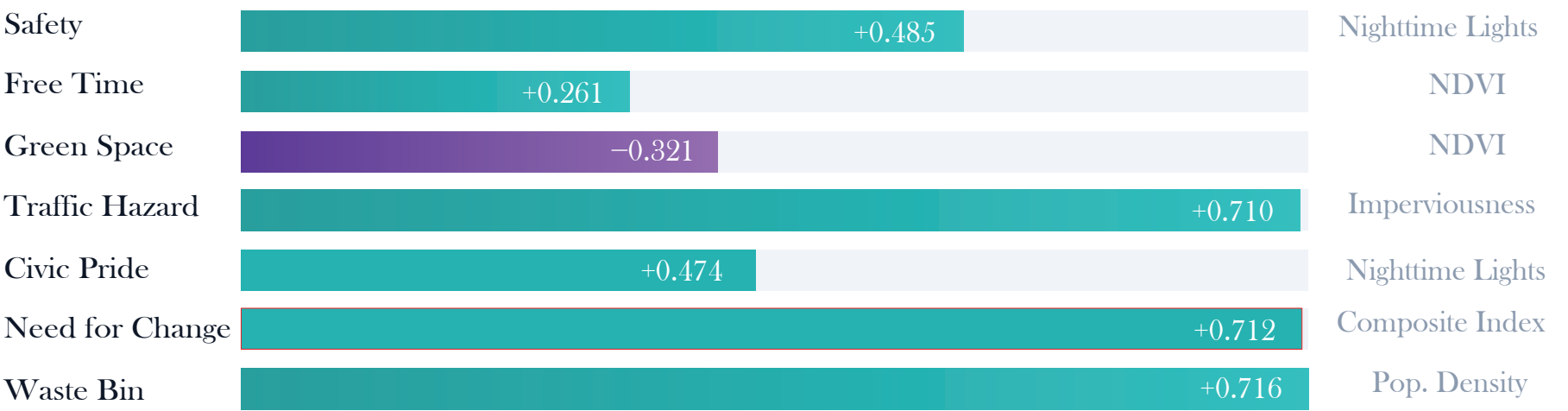
BIVARIATE CHOROPLETH MAP FOR ALL PERCEPTION TOPIC



OVERALL RESULT

All seven perception topics yielded statistically significant Spearman correlations with satellite-derived indicators. The strongest relationships were found for Waste Bin × Population Density ($\rho = +0.716$), Need for Change × Urban Stress Index ($\rho = +0.712$), and Traffic Hazard × Imperviousness ($\rho = +0.710$). Safety perception correlated positively with nighttime light intensity ($\rho = +0.485$), while Lack of Green Space showed a negative correlation with NDVI ($\rho = -0.321$), confirming that residents in low-vegetation areas demand more greenery. OLS regression explained 43.4% of spatial variance for Waste Bin and 34.4% for Need for Change, with the remaining variance attributed to factors beyond satellite measurement such as tourism, commercial land use, and participation bias toward the city centre

SPEARMAN CORRELATION PER TOPIC



Positive correlation Negative correlation

CONCLUSION

PPGIS data can be meaningfully connected to satellite-derived indicators at city scale. The spatial framework was successfully applied across all seven topics, confirming that citizen perception and physical environmental conditions are spatially correlated. This combination provides a more complete picture of urban quality for planners, researchers, and policy-makers. Future work includes multilingual comment analysis, composite indicator extension, and machine learning-based spatial modelling.

Goodchild, M.F. (2007) 'Citizens as sensors: the world of volunteered geography', *GeoJournal*, 69(4), pp. 211–221. Pánek, J. (2019) 'Emotional maps: participatory crowdsourcing of citizens' perceptions of their urban environment', *Cartographic Perspectives*, 93, pp. 4–17. European Environment Agency (2018) Copernicus Land Monitoring Service, Imperviousness Density. Available at: land.copernicus.eu, Brown, G. and Kyttä, M. (2014) 'Key issues and research priorities for public participation GIS (PPGIS)', *Applied Geography*, 46, pp. 122–136.



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COPERNICUS MASTER
IN DIGITAL EARTH



Co-funded by
the European Union

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Olomouc, 2026
Attachment to diploma thesis no. 1