

# Sensors, image processing and psychology-based methods for smart city research

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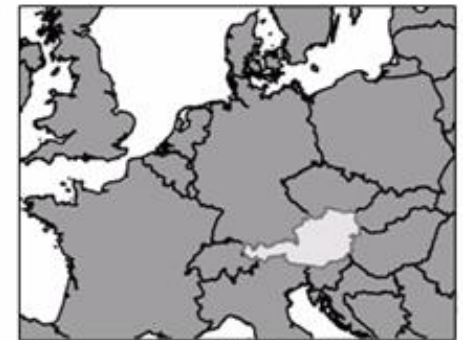
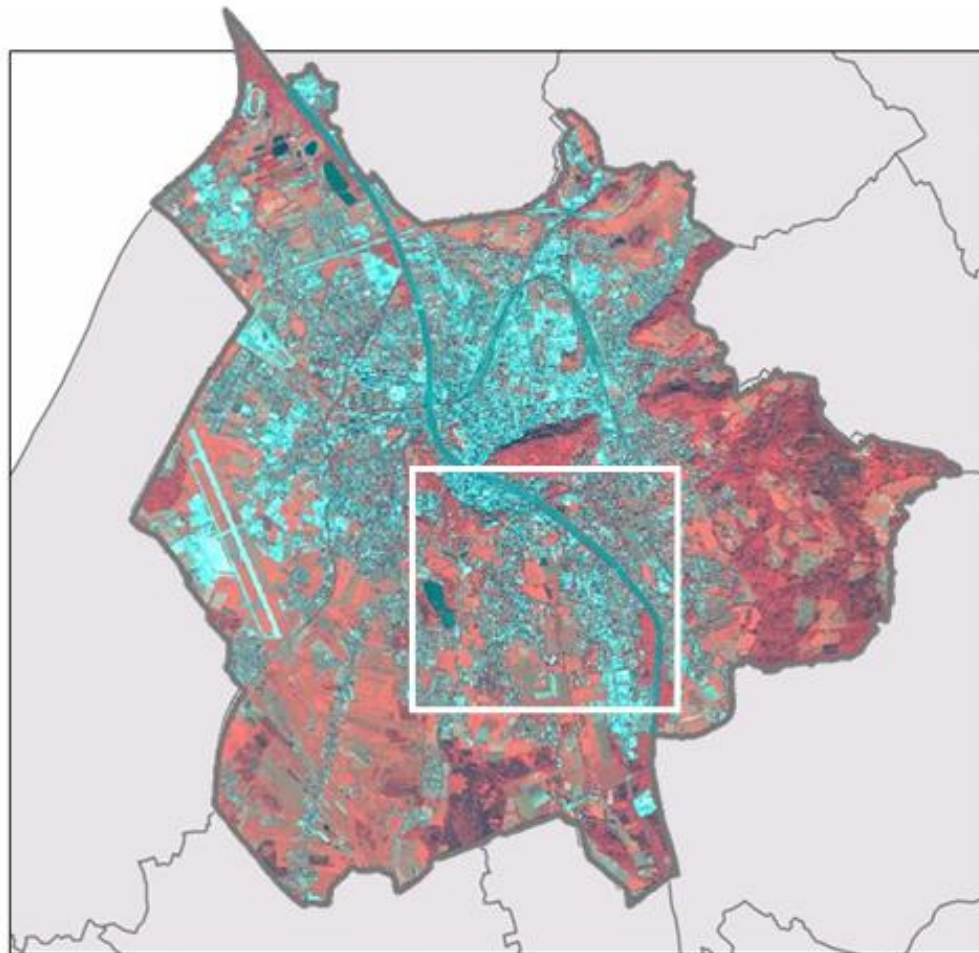
# Mapping quality of (urban) life

Quality of life, well-being is always RELATIVE to one's expectations.



Courtesy: A. Keul

# Study area: Salzburg, Austria



**Europe, Austria**



**Austria, Salzburg**



## Aerial view of detached and multi-storey houses



## Ground view of detached and multi-storey houses

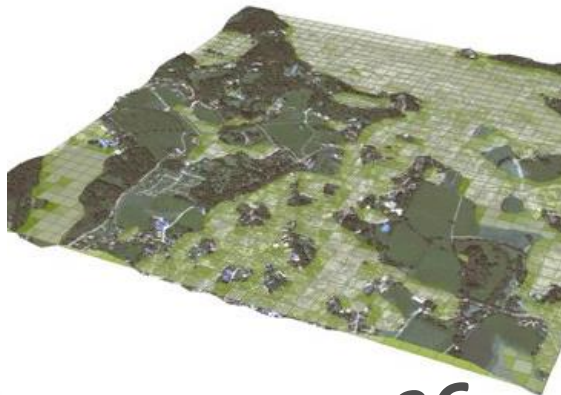
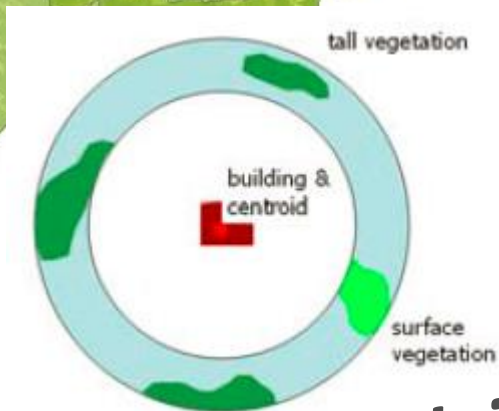
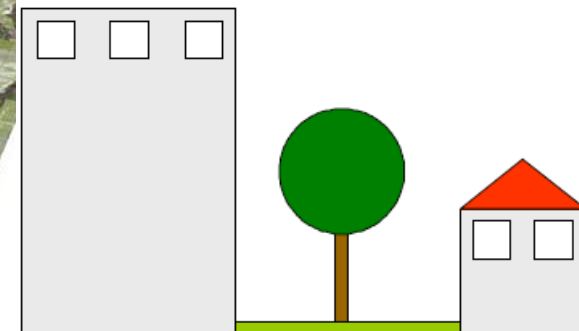
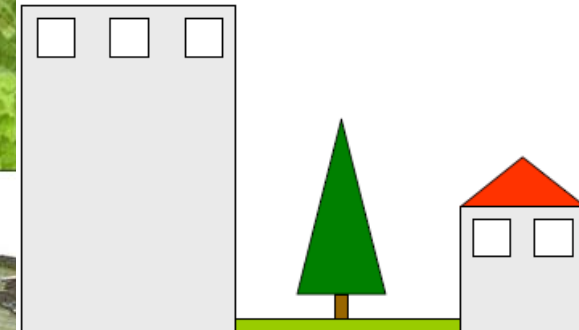
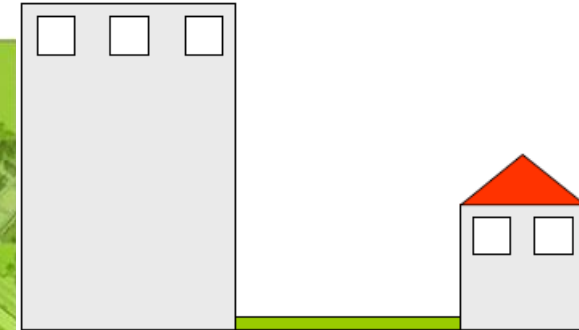




# How to reflect the perception with RS/GIS?

approaches tested:

- Perceived green
- FSV
- UVI ....



Work in 2004 - 2006





# ,classic' LU/LC classification as a starting point for QoL analysis

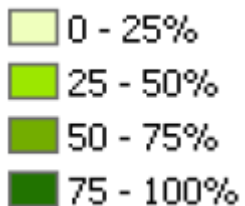
Results for a subset in the southern part of Salzburg





→ ,classic way: remote sensing-based percentages (*green or sealed etc.*)

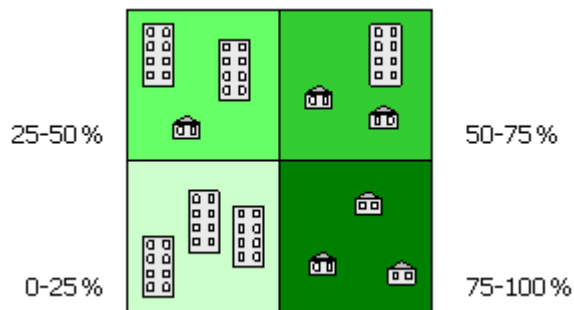
Greenness expressed as  
100\*100m raster cells



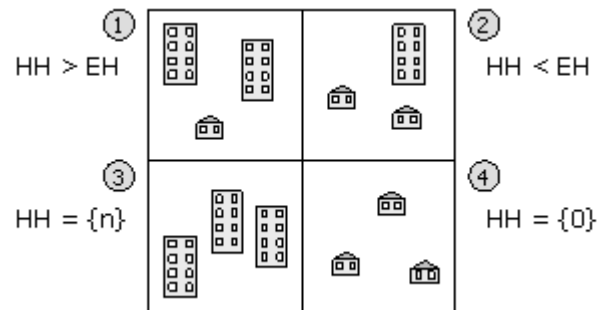


# Factors contributing to ‚perceived green‘

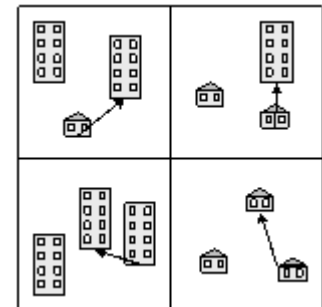
## green index



## percentage of multi-storey buildings



## distance between buildings







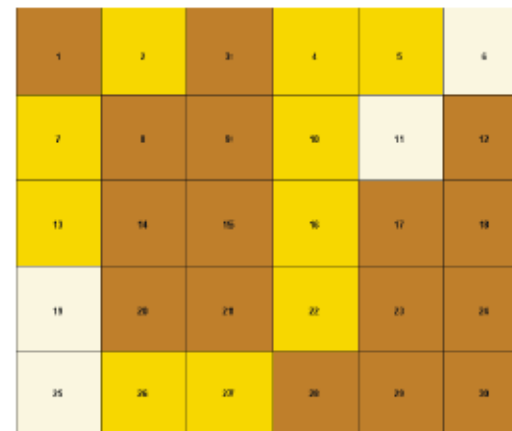
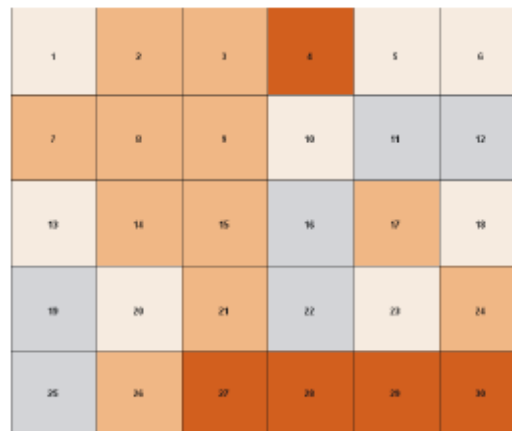
LANG, S., MÖLLER, M., SCHÖPFER, E., JEKEL, T., HÖLBLING, D., KLOYBER, E., BLASCHKE, T., 2008. Quantifying and qualifying urban green by integrating remote sensing, GIS and social science methods. In: PETROSILIO, I. et al. (eds.): Use of landscape sciences for the assessment of environmental security, Springer, Berlin, New York, 90-102.




# green index & weighted green index (*perceived*)



## Correction factors shown for this subset

-  low density
-  moderate density
-  high density
-  no multi-storey building



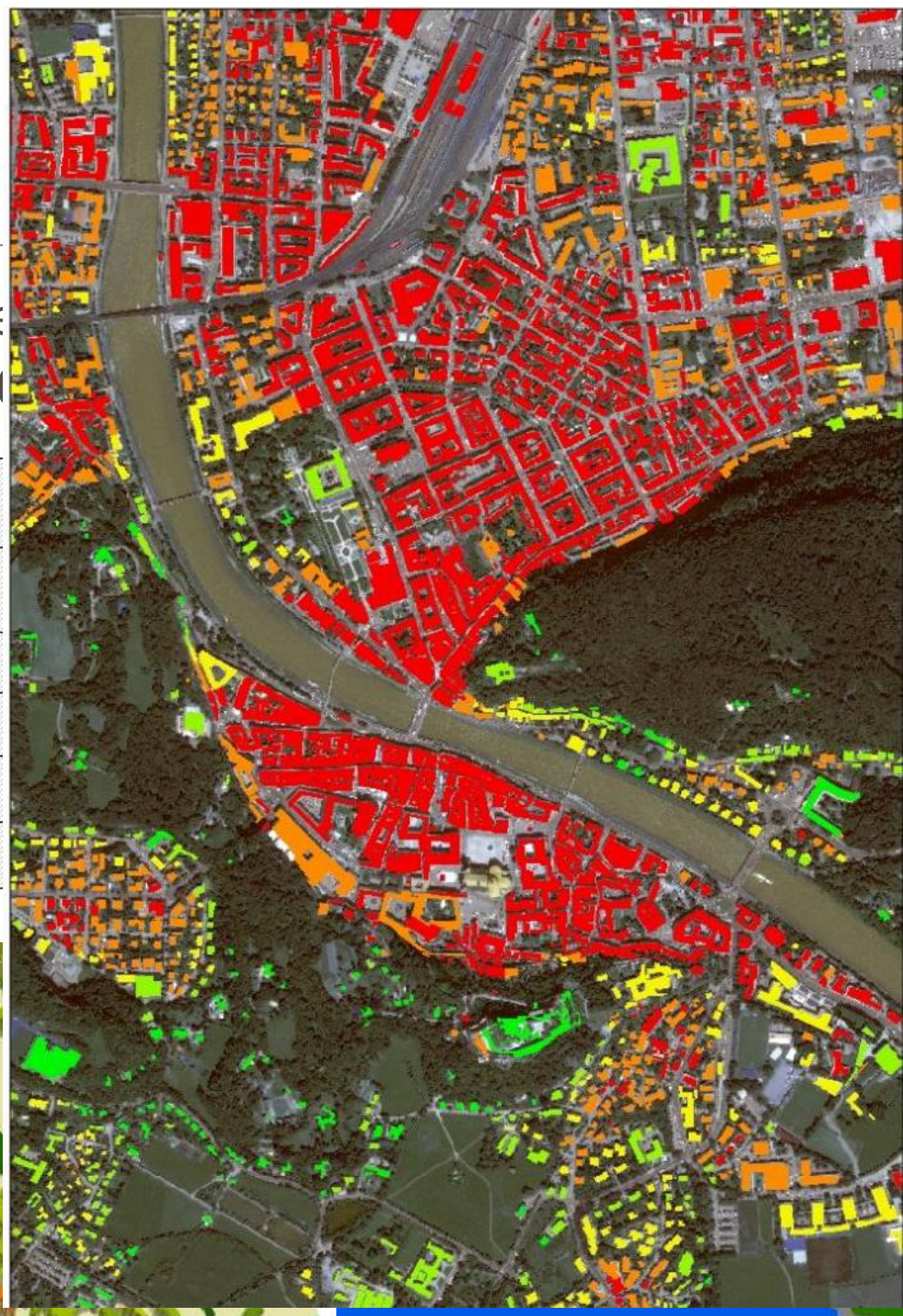
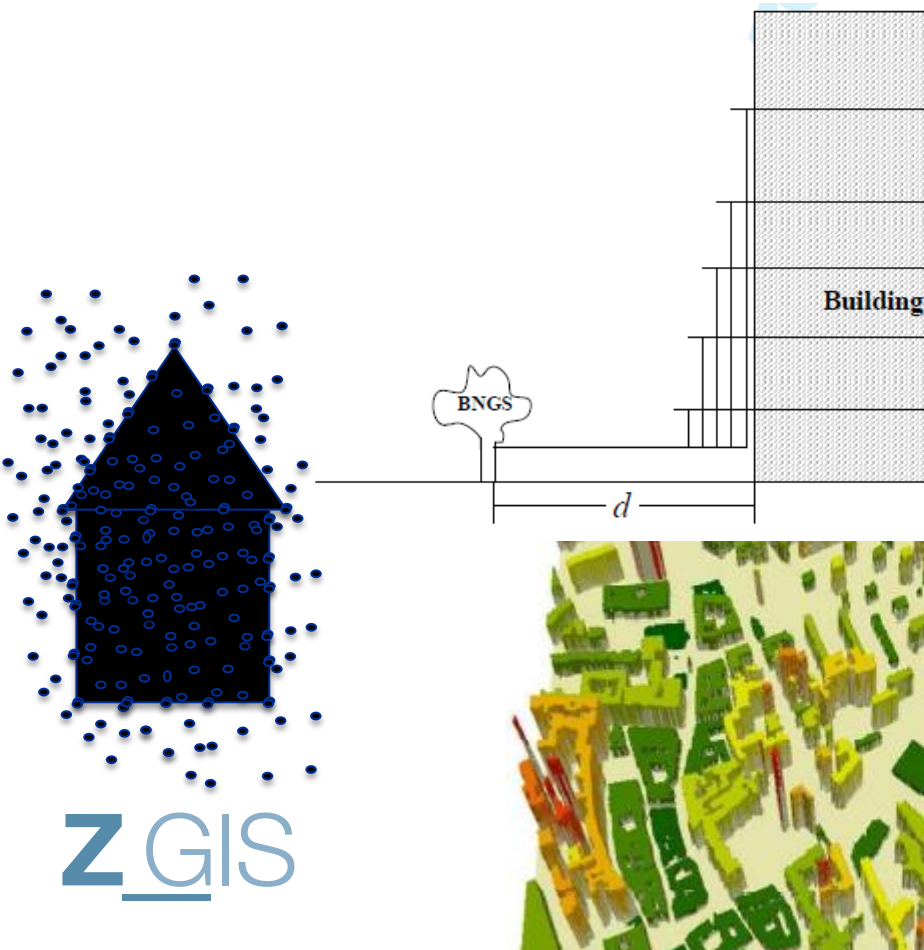
-  low influence
-  moderate influence
-  high influence





# 3d vegetation

LiDAR data cover ~ 62% of the  
Indices calculated for ~ 13,000





# „urban emotions“



**Resch, B.,** Sudmanns, M., Sagl, G., Summa, A., Zeile, P. and Exner, J.-P. (2015) Crowdsourcing Physiological Conditions and Subjective Emotions by Coupling Technical and Human Mobile Sensors. In: T. Jekel et al. (Eds.) *GI\_Forum 2015 - Geospatial Minds for Society*, Wichmann, *pp. pending*.



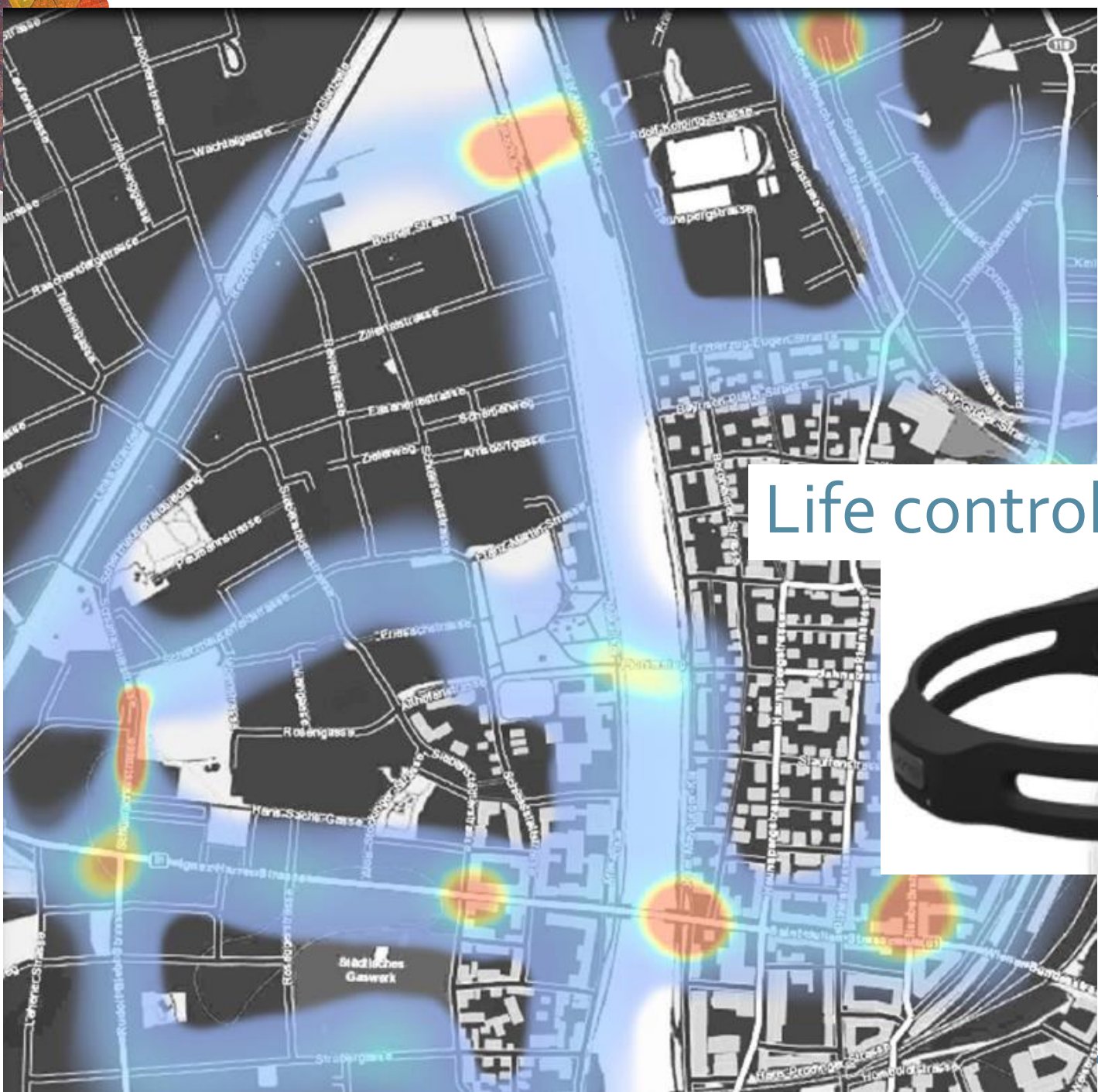
# Urban Emotions ::: Emotion Sensors

- Wristband or chest belt
  - Measurands: skin conductance, body temperature, additional heart rate, heart rate variability, ...
  - Detection of emotional spikes and stress levels → calibration!
- ➔ Just benchmarking sensors









ABIOS GmbH

# Life control



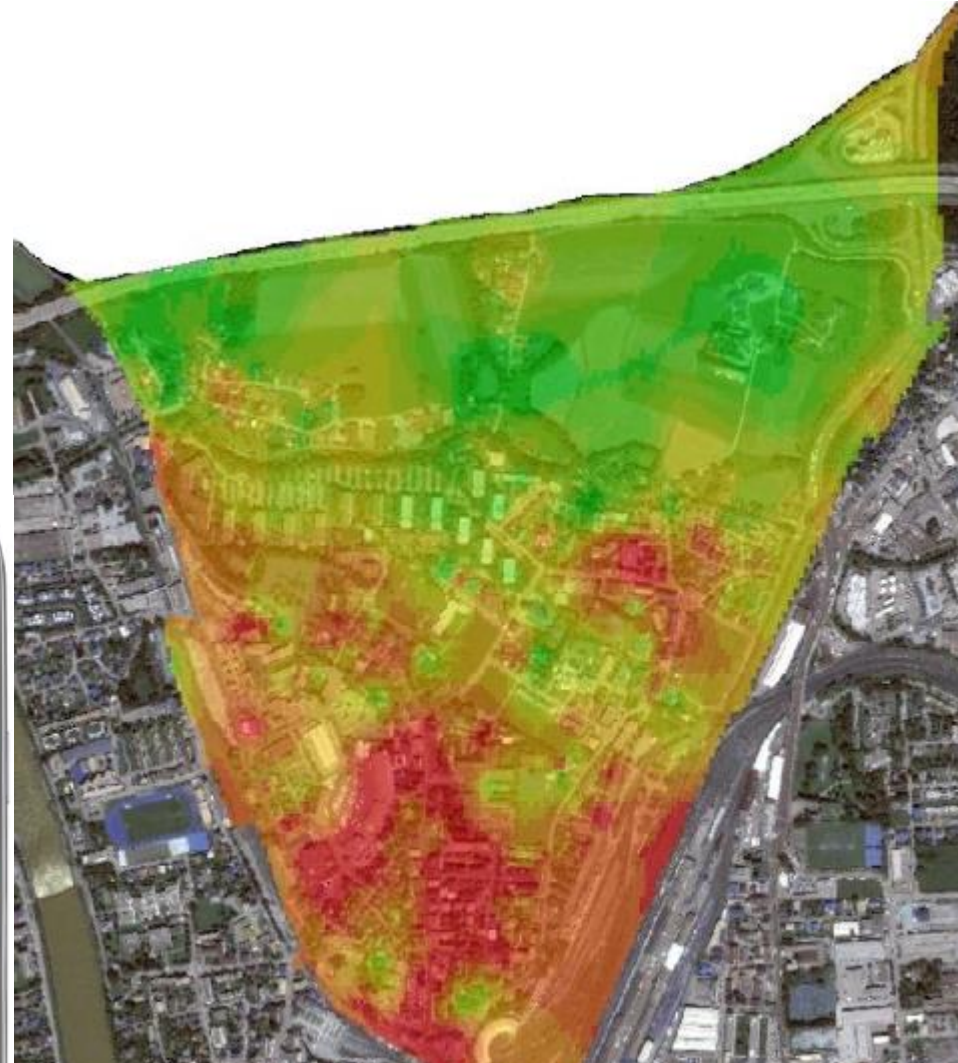
GIScience Lab

# Recent analysis

How ,green' do people feel? How happy are they?



Z\_GIS







- Different 'citizen-based' approach?
- The particular combination of quantifiable information and transparent and repeatable spatial analysis with interview-based – subjective information
- Just starting to understand urban green