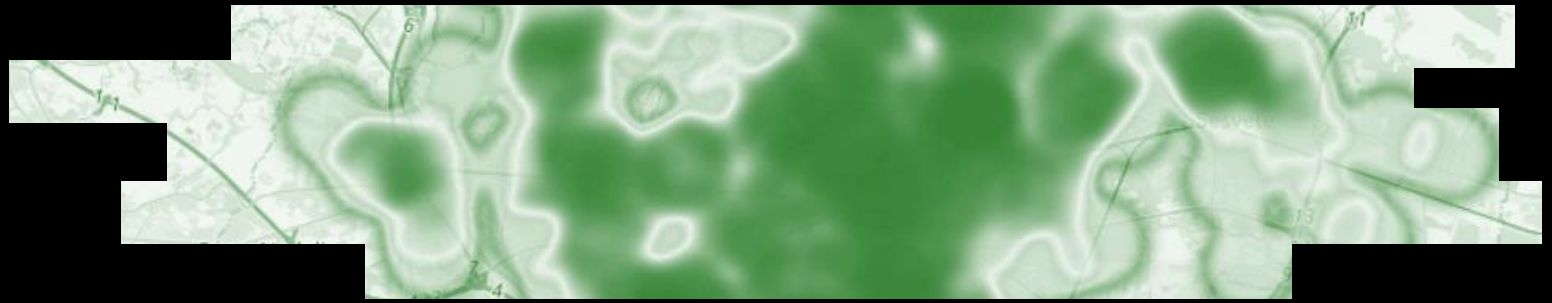
Natural resources green technology & sustainable development /4

BEST STUDENT PRESENTATION CONTEST

ASSESSING HOTSPOTS OF CULTURAL ECOSYSTEM SERVICES AND DISSERVICES IN THE CITY OF ZAGREB



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HRZZ Croatian Science Foundation

CLEARINGHOUSE 中欧城市森林应对方案

URBAN POPULATION

WORLD

> 50%

EUROPE

~ 75%

CROATIA

58%

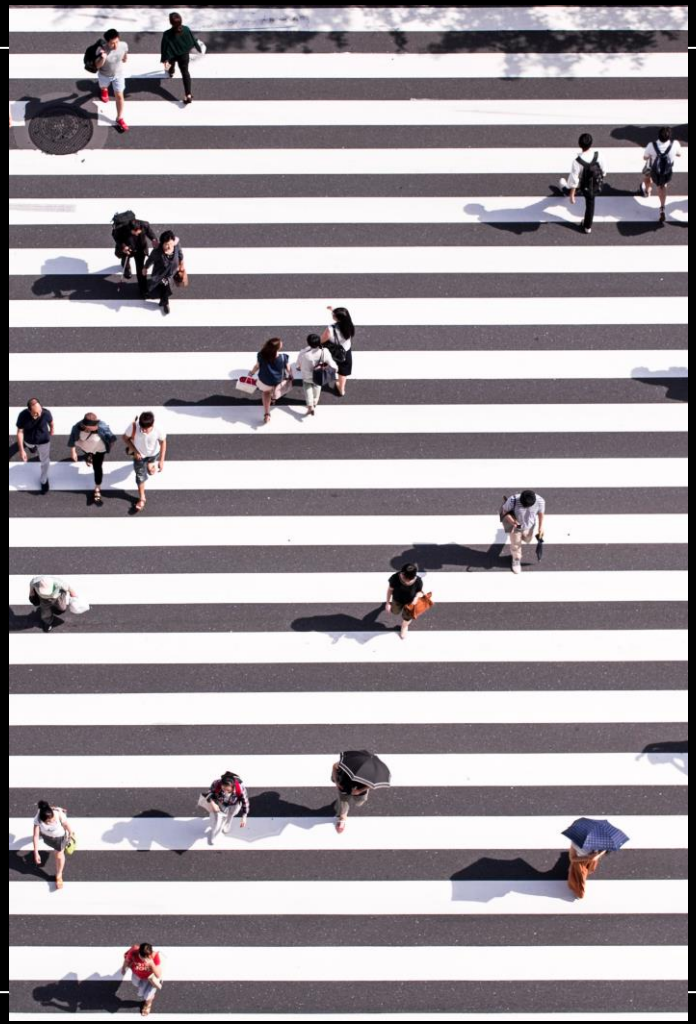
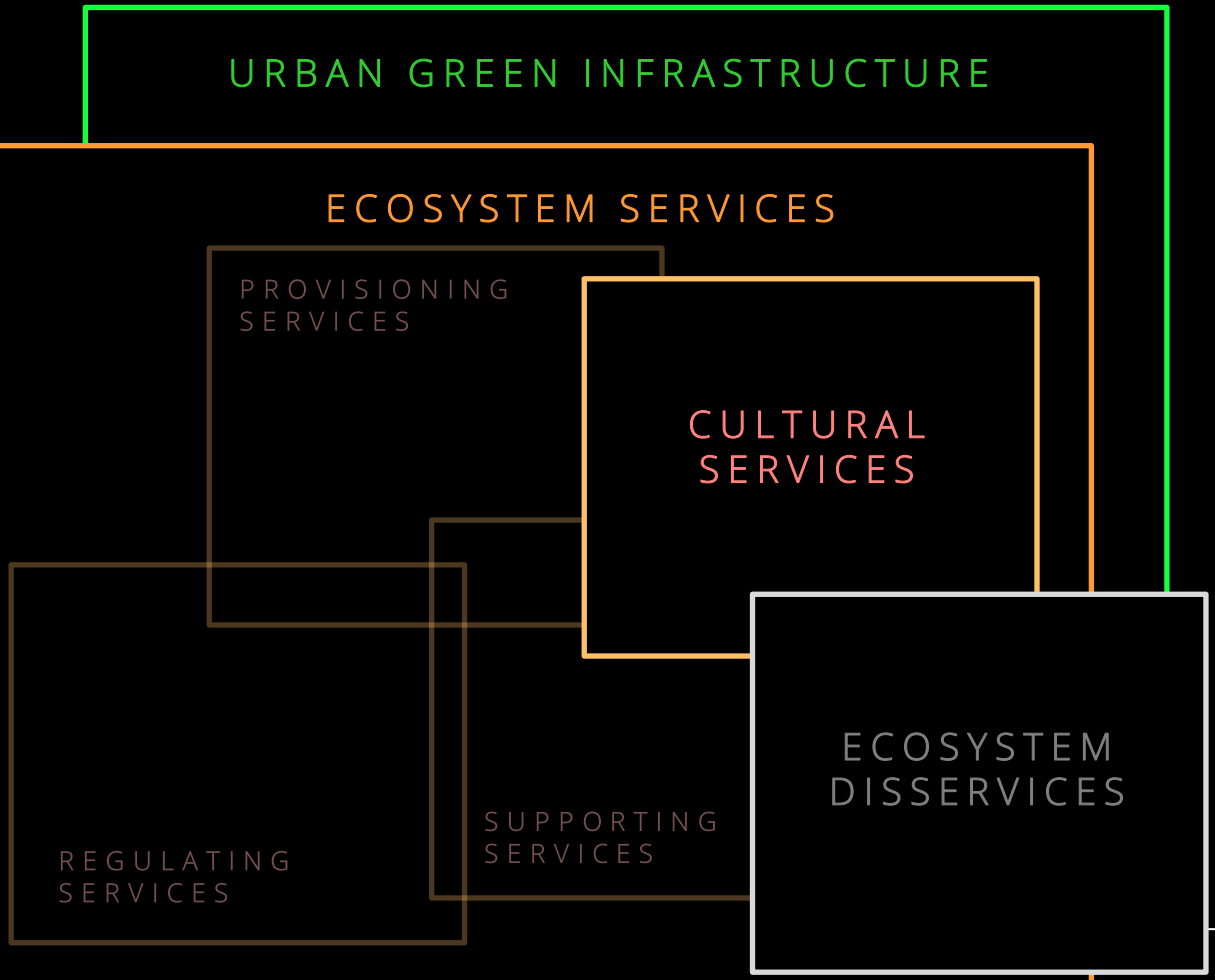


Photo by Ryoji Iwata on Unsplash



Strategically planned network of natural and semi-natural areas designed and maintained to provide **ECOSYSTEM SERVICES**

ECOSYSTEM SERVICES are all benefits people obtain from ecosystems – provisioning, regulating, supporting and **CULTURAL**

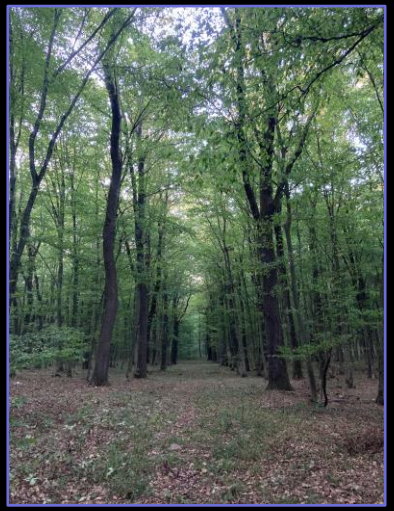
CULTURAL ECOSYSTEM SERVICES (CES) are nonmaterial benefits people obtain from ecosystems

ECOSYSTEM DISSERVICES are ecosystem functions perceived negative for human well-being

CASE STUDY AREA

CITY OF ZAGREB

769,944 citizens
641.32 km²
17 city districs
~ 9,500 ha of protected areas



base map - digital orthophoto obtained from Croatian Geodetic Administration, city district boundaries are extracted from Land Use 2020 dataset obtained from City of Zagreb

RQ1: How is the perception of cultural ecosystem services and disservices spatially distributed in urban green infrastructure in the city of Zagreb? What are the characteristics of spatial distribution?

RQ2: Can we utilise data collected with participatory mapping approach for enhancing planning and management practices in the city of Zagreb?

- PPGIS - PUBLIC PARTICIPATION GEOGRAPHIC INFORMATION SYSTEM

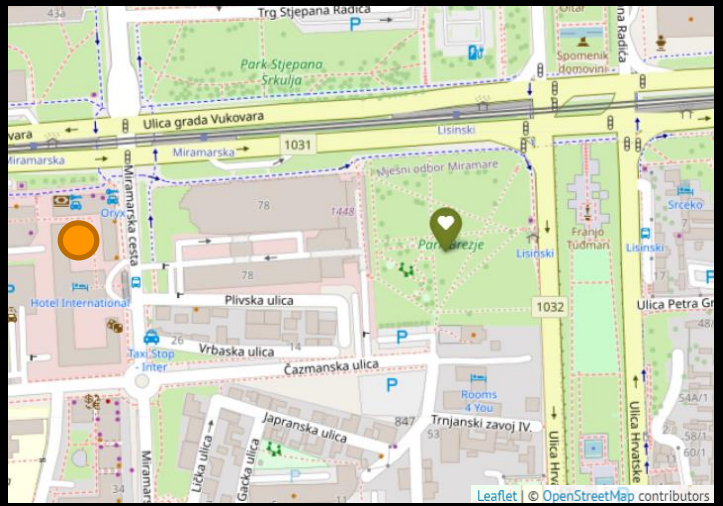
  An approach for **collecting spatial data** from **non-experts** about the perception and use of (surrounding) landscape for planning and management purposes Brown & Fagerholm (2015)

- Never employed before in Zagreb

- PPGIS questionnaire *MyDynamicCity* Zagreb conducted in 2021 (June-November) with citizens of Zagreb – empirical knowledge about perception and use of CES and disservices - kartirajzelenilo.sumins.hr

  PLACE ATTACHMENT
  RECREATION (8 attributes)
  AESTHETICS (4 attributes)
  DISSERVICES (4 attributes)
  EDUCATION
  CULTURAL IDENTITY

We all have our favourite urban green spaces in city. They are our favourite because various of reasons. Please think about your favourite green spaces and mark up to 3 favourite urban green spaces in Zagreb



KERNEL DENSITY HOTSPOT

Rall et al., 2017; Baumeister et al., 2020; Xu et al.; 2020

VISUALISATION

Kernel density estimation is a technique for estimating the density function of a random variable based on observed point locations

600 m radius and 50 m output pixel size

Chosen based on reported analyses in similar spatial extent in scientific literature - Rall et al., 2017; Xu et al., 2020

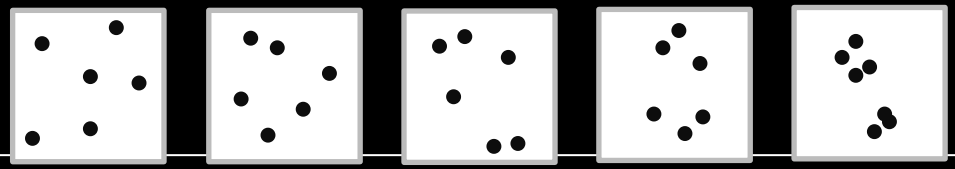
NEAREST NEIGHBOUR (NN) INDEX

Fagerholm et al., 2016; Xu et al.; 2020

STATISTICAL CONFIRMATION

NN statistic compares the calculated distances between collected points and hypothetical randomly distributed point shape within the case study are to detect possible patterns

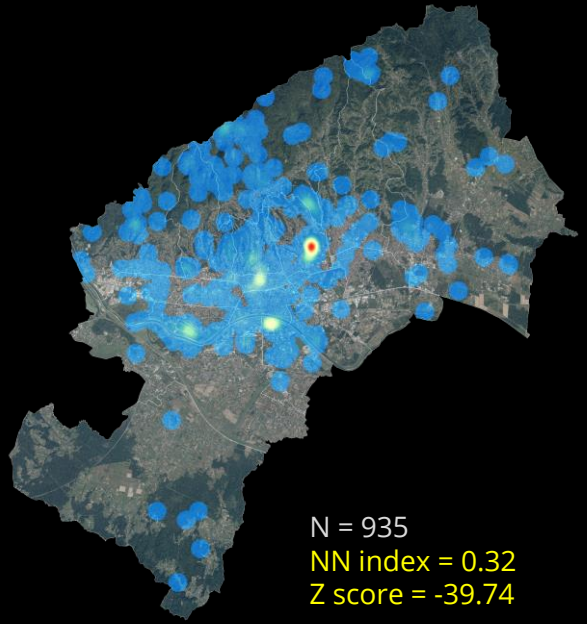
NN index > 1
trend towards dispersion



NN index < 1
trend towards clustering

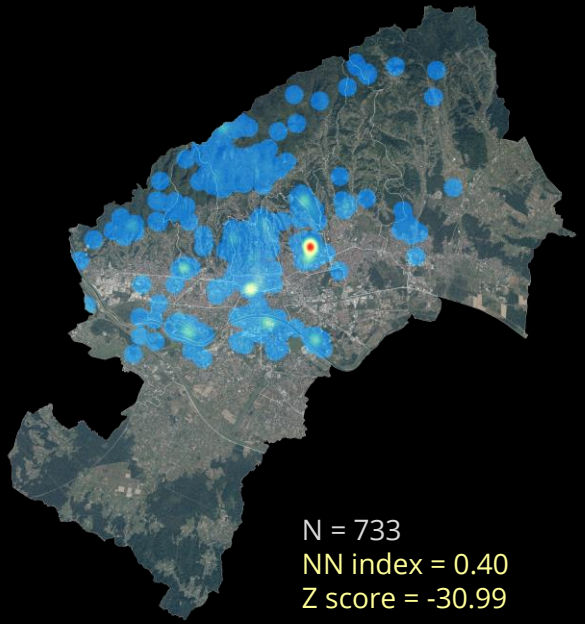
adapted from ESRI documentation

5,757 spatial markers included in the analysis, mapped by **384** citizens of Zagreb



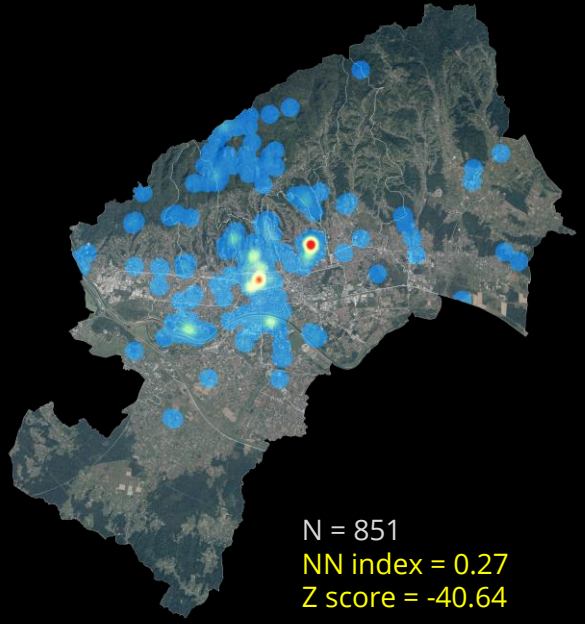
N = 935
NN index = 0.32
Z score = -39.74

PLACE ATTACHMENT



N = 733
NN index = 0.40
Z score = -30.99

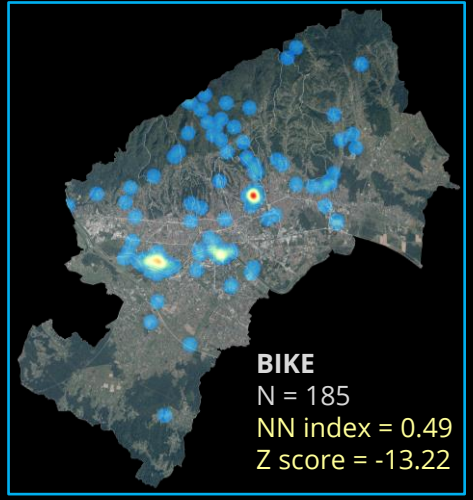
EDUCATION

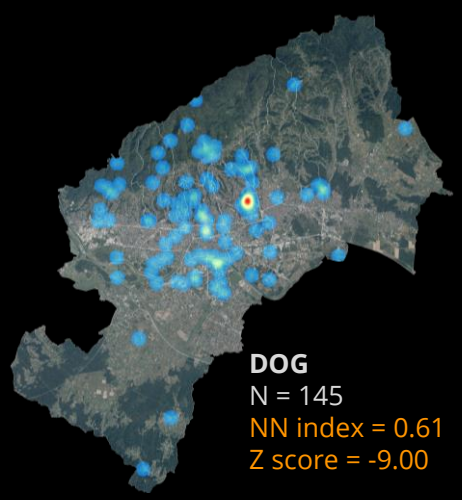


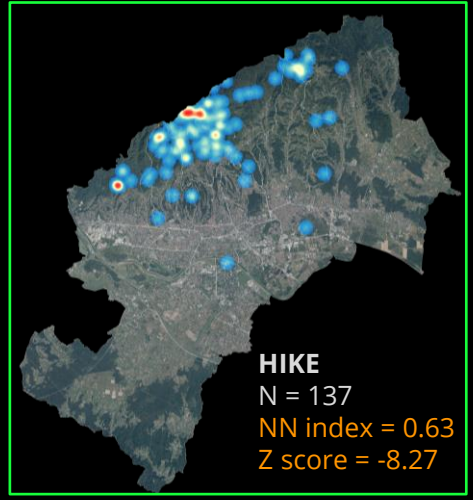
N = 851
NN index = 0.27
Z score = -40.64

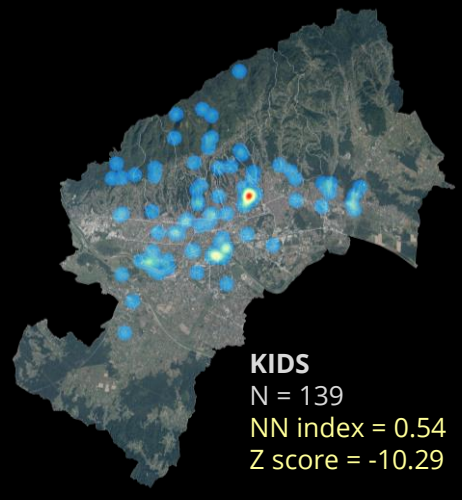
CULTURAL IDENTITY

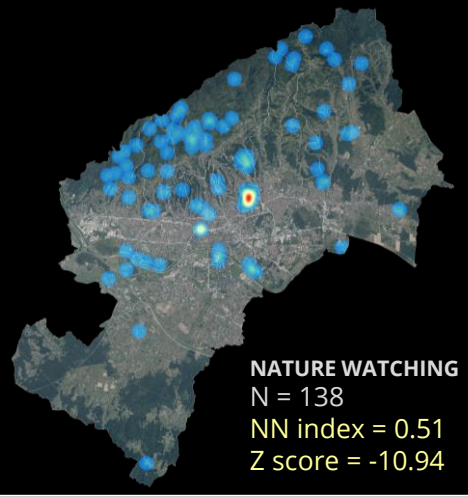
dispersed — clustered

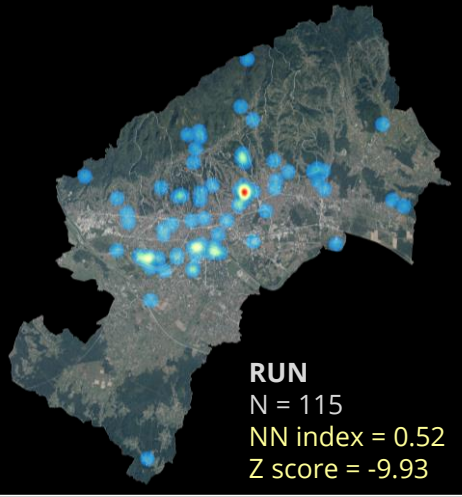

BIKE
N = 185
NN index = 0.49
Z score = -13.22

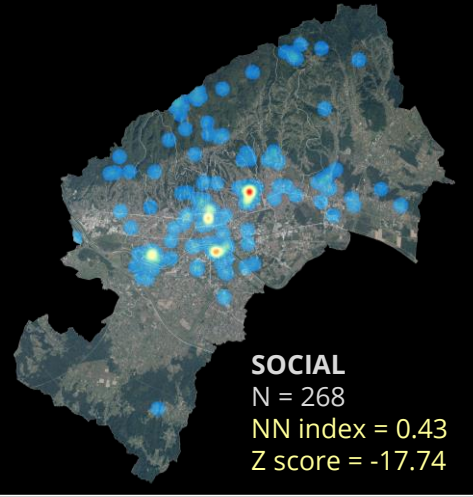

DOG
N = 145
NN index = 0.61
Z score = -9.00

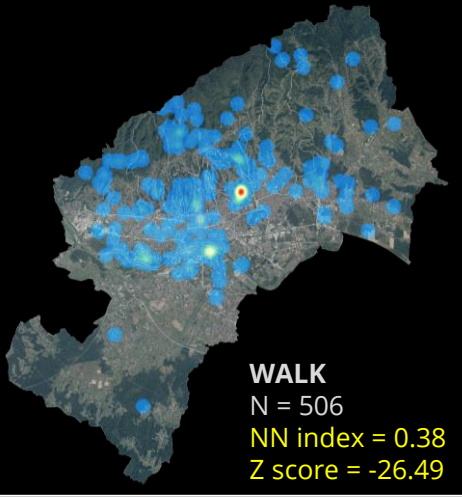

HIKE
N = 137
NN index = 0.63
Z score = -8.27

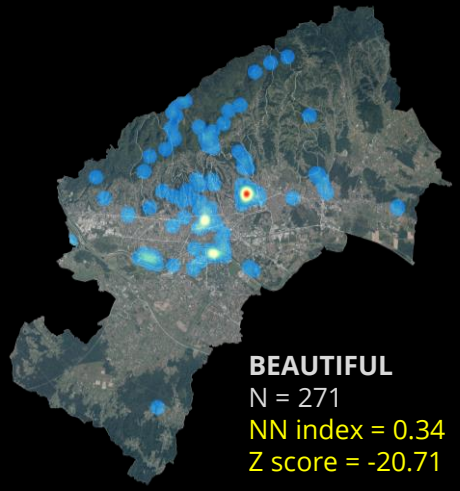

KIDS
N = 139
NN index = 0.54
Z score = -10.29


NATURE WATCHING
N = 138
NN index = 0.51
Z score = -10.94

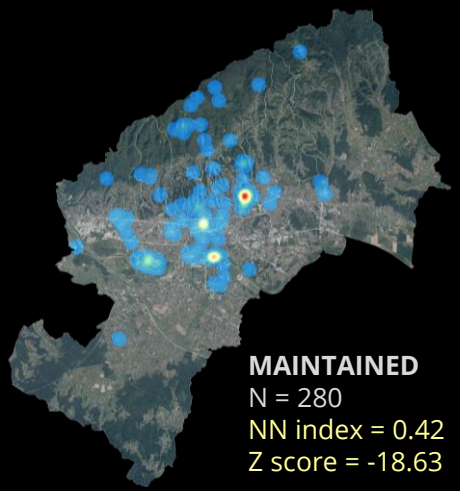

RUN
N = 115
NN index = 0.52
Z score = -9.93


SOCIAL
N = 268
NN index = 0.43
Z score = -17.74

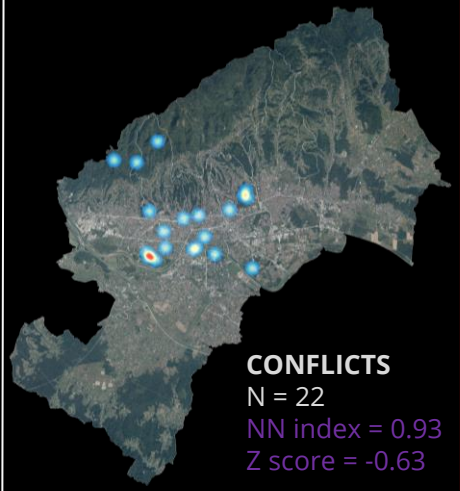

WALK
N = 506
NN index = 0.38
Z score = -26.49



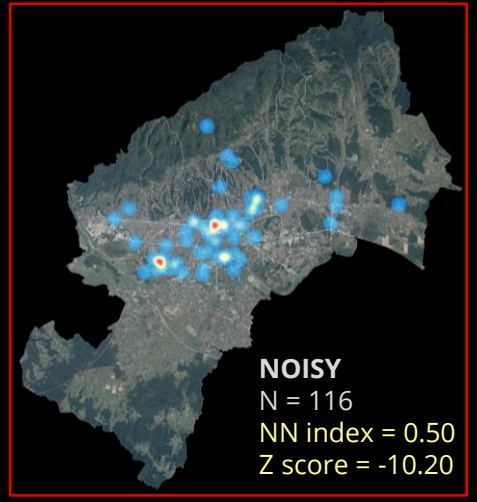
BEAUTIFUL
N = 271
NN index = 0.34
Z score = -20.71



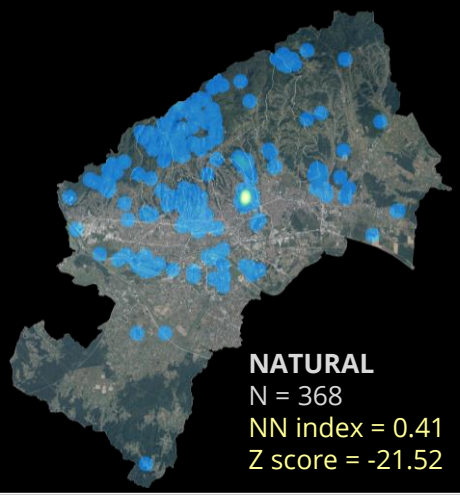
MAINTAINED
N = 280
NN index = 0.42
Z score = -18.63



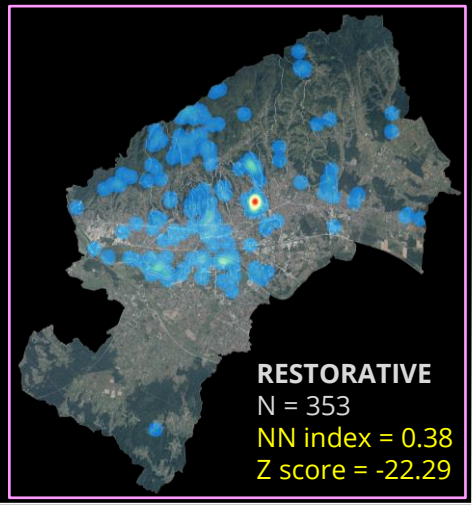
CONFLICTS
N = 22
NN index = 0.93
Z score = -0.63



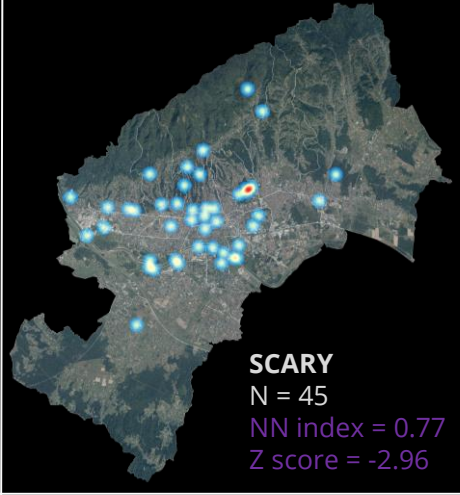
NOISY
N = 116
NN index = 0.50
Z score = -10.20



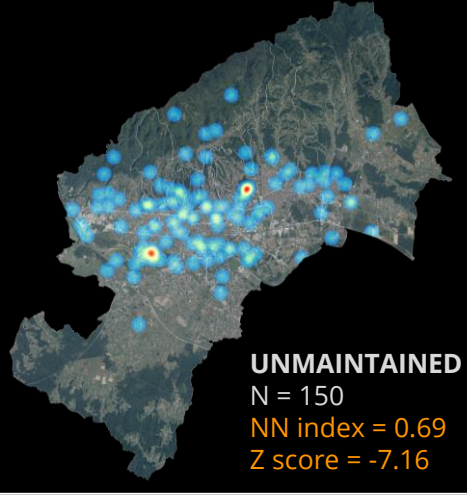
NATURAL
N = 368
NN index = 0.41
Z score = -21.52



RESTORATIVE
N = 353
NN index = 0.38
Z score = -22.29



SCARY
N = 45
NN index = 0.77
Z score = -2.96



UNMAINTAINED
N = 150
NN index = 0.69
Z score = -7.16

AESTHETICS

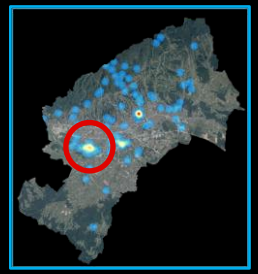
dispersed

clustered

DISSERVICES

ADDED VALUE

BIKE



HIKE

RESTORATIVE

NOISY

- As presented citizens of Zagreb were **very precise** when mapping locations perceived/used in relation to cultural ecosystem services and disservices

- Producing hotspot maps is part of PPGIS exploration phase which can revel important locations **(hotspots),** but also highlight **coldspots** – both important for planning and managements practices

- **However**, hotspot boundaries presented on a map are not an **actual** boundaries of provision because of subjectivity when deciding on search radius and pixel size in data analysis

Classical data analysis can only get you so far...

- **Data visualisation** can present **hidden relationships** in the data that would otherwise be lost in generalization on green space type providing new information for planning and management

- Calculating **NN index** further enhances interpretation of maps by providing **statistical significance** of degree of clustering but also strength of that clustering

- Hotspot maps are **attractive**, **engaging**, and **easy to comprehend** when presenting collected spatial data to a broader public and stakeholders

This work is supported by Croatian Science Foundation, project „Improving green infrastructure planning and management through participatory mapping of cultural ecosystem services (CULTUR-ES), grant number UIP-2017-05-1986

This project has received funding from the European Union's Horizon 2020 Research and Innovation Program under Grant Agreement 821242.

THANKS!

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