ZGIS
DEPARTMENT OF GEOINFORMATICS

UNIVERSITY of SALZBURG

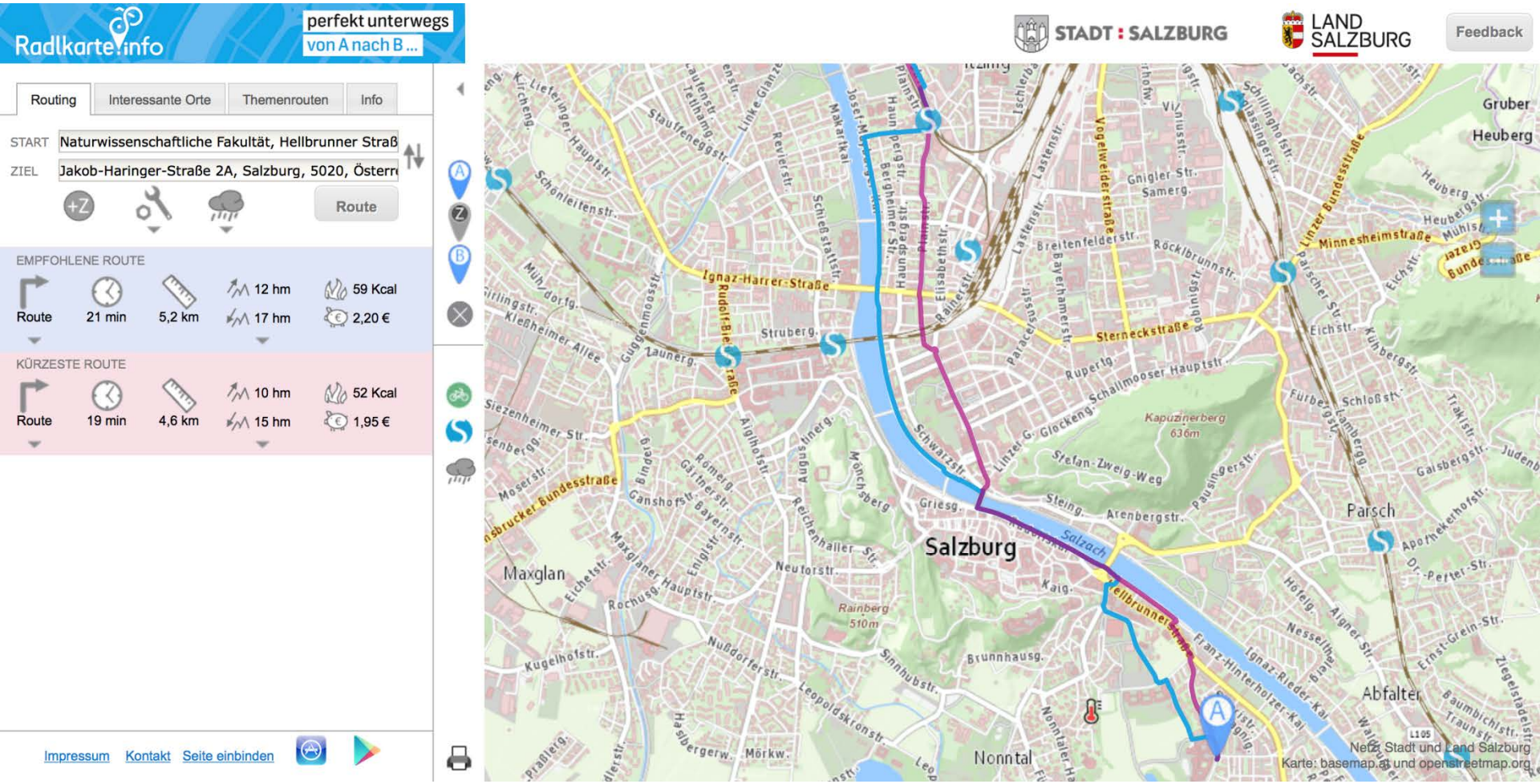
Interactive Network Assessment Tool

GIS-based Bicycle Safety Assessment

Esri European User Conference
Salzburg, 15.10.2015

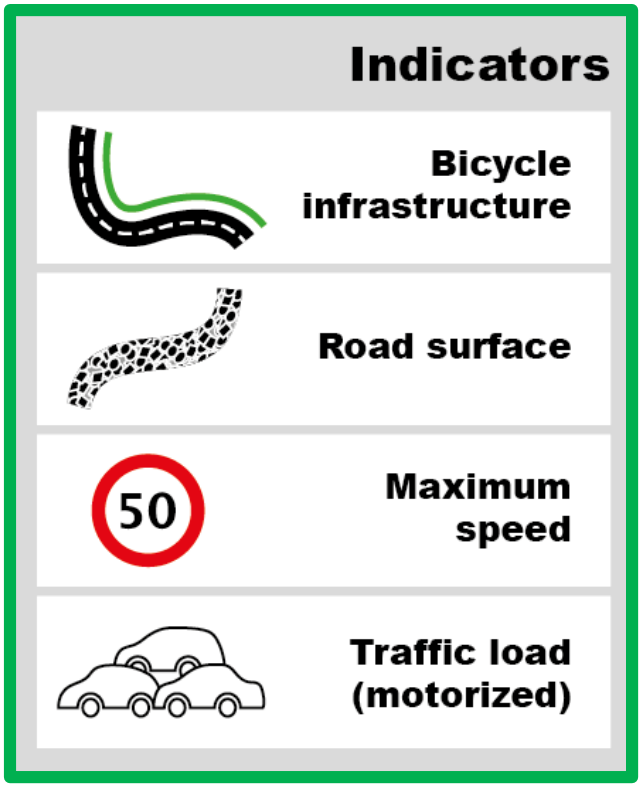
Robin Wendel | robin.wendel@sbg.ac.at

Radlkarte Salzburg



www.radlkarte.info

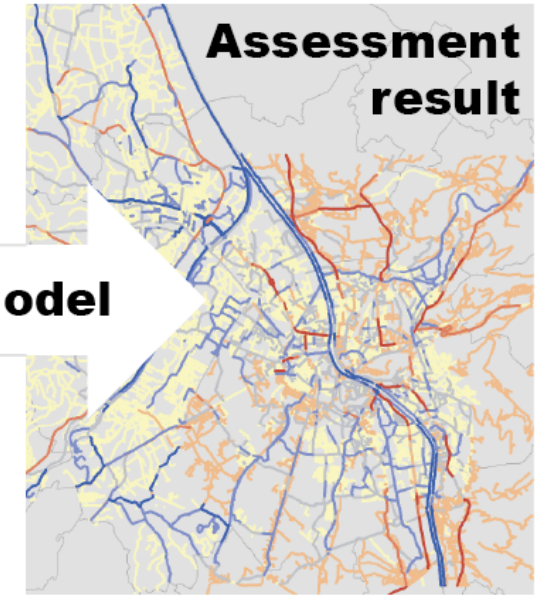
Indicator-based Assessment Model



gicycle.wordpress.com

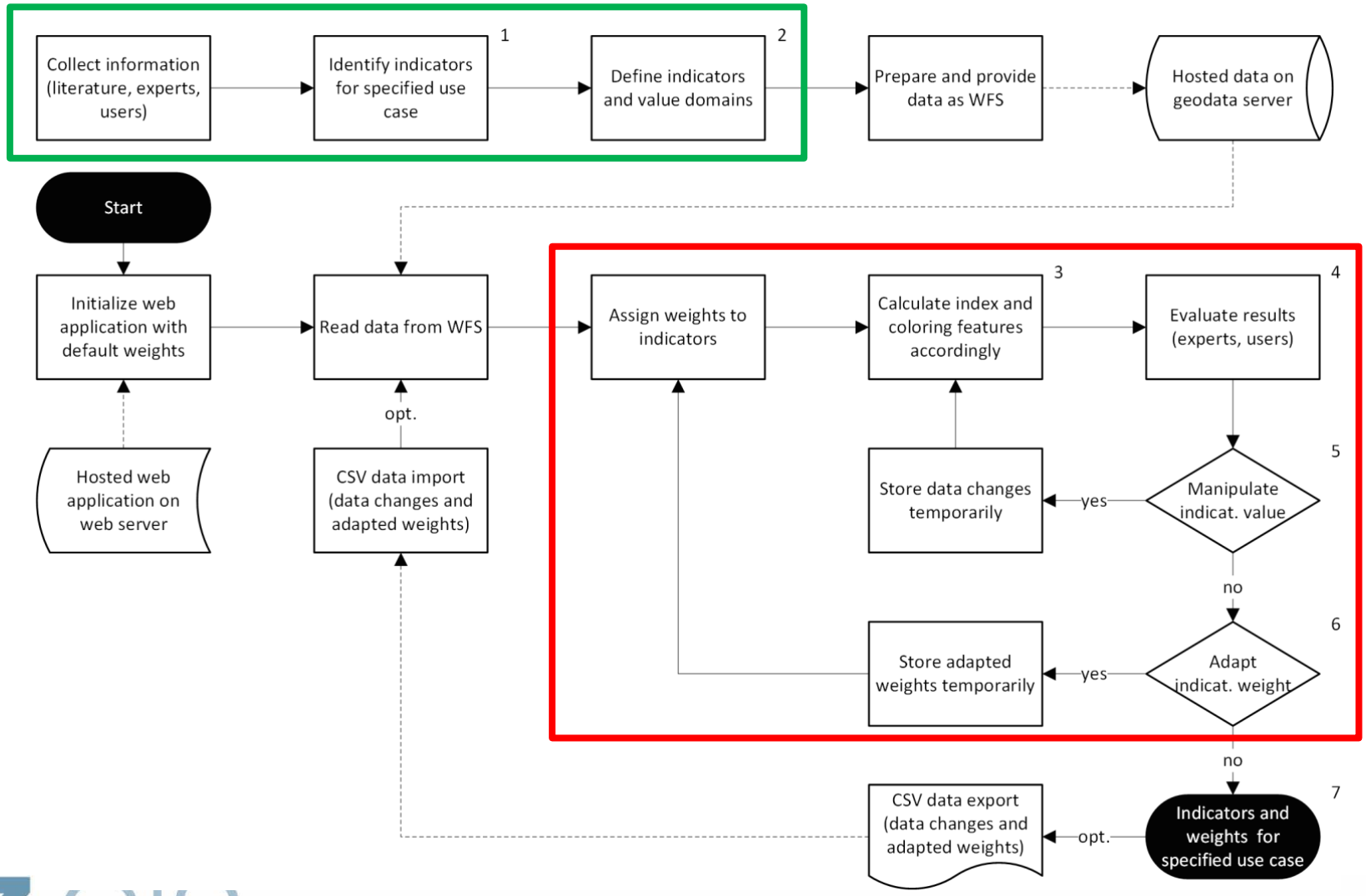
Calibration

GIS Model



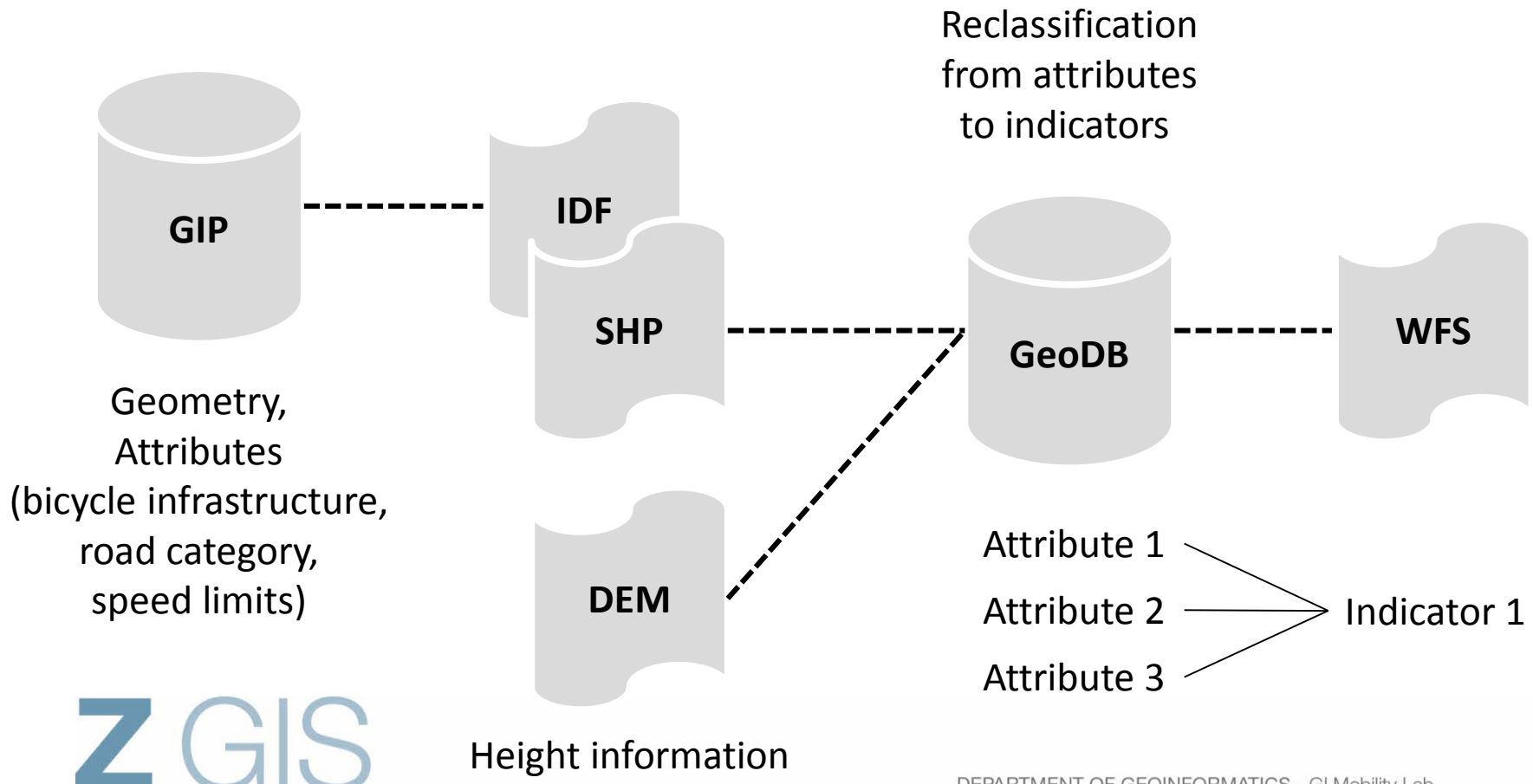
Black box!

Interactive Network Assessment Tool



Case Study on Bicycle Safety

- In an foregoing research 13 indicators were found to be relevant to the use case



Case Study on Bicycle Safety

- Reclassification from attributes to indicators
- Weighting accordingly to bicycle friendliness

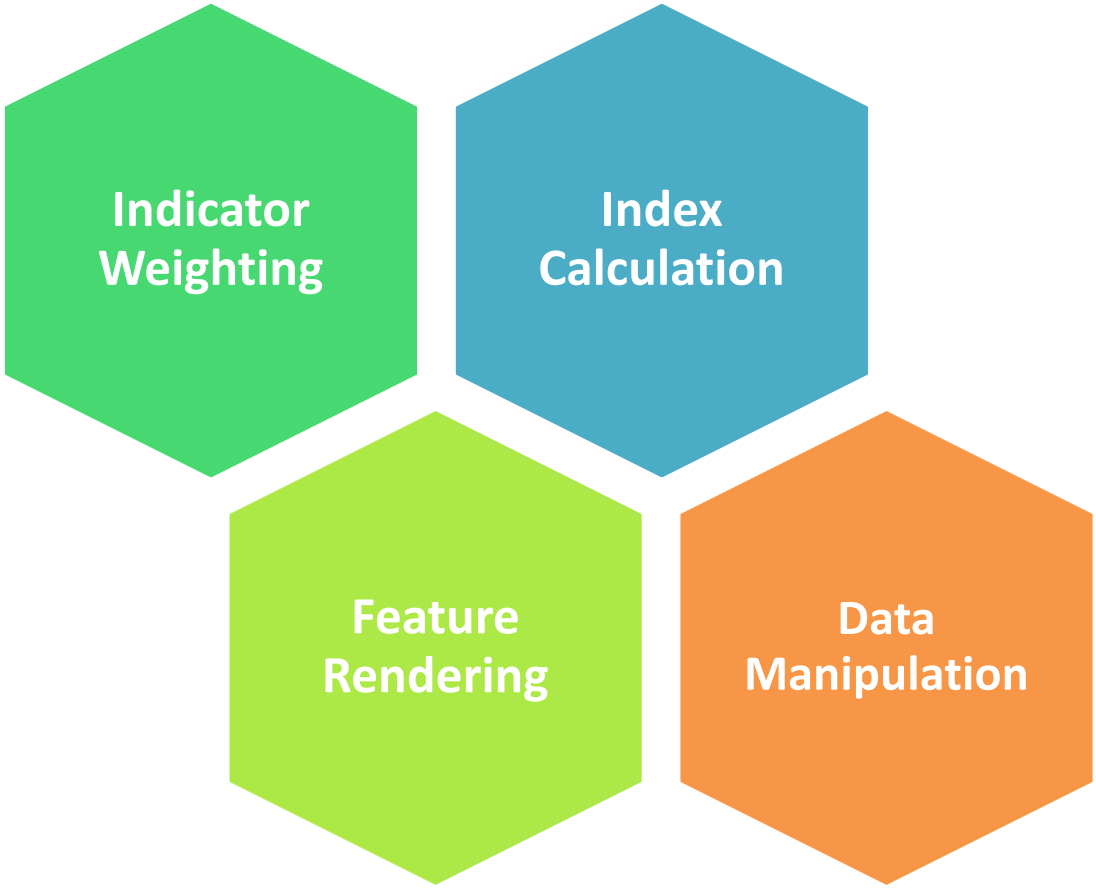
Indicator	Value domain	Weighting
Bicycle infrastructure	Bicycle way Bicycle and footway Bicycle or bus lane No bicycle infrastructure	Best = 0 Better ≈ 0.25 Good ≈ 0.5 Worst = 1
Road category	Primary road Secondary road Residential road Calmed road No road	Worst = 1 Worse ≈ 0.75 Good ≈ 0.5 Better ≈ 0.25 Best = 0

Case Study on Bicycle Safety

- Esri ArcGIS API for JavaScript
  - + Bringing GIS functionality to a web browser
  - + No ArcGIS installation needed
  - – Runs client-side
- Esri ArcGIS Online
  - + Easy data hosting and provision as web service

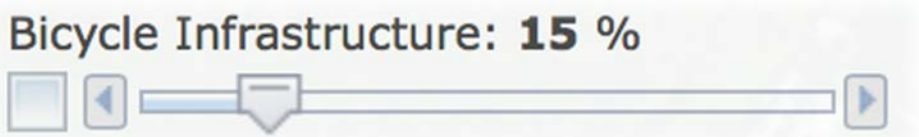
- Dojo JavaScript Framework
  - + Provides widget library (buttons, sliders)
  - + Making the application independent from browser quirks

Application Development



Application Development
Indicator Weighting

- For every indicator one slider is initialized



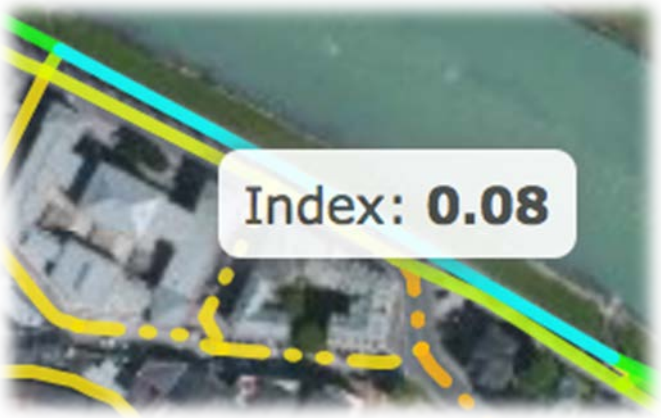
- Each slider has a value between 0 and 100 %
- The sum of all weights must always be 1
- If one slider is moved, the others are adjusted accordingly
- On every slider move, the index is recalculated and the features colored accordingly

Application Development
Index Calculation

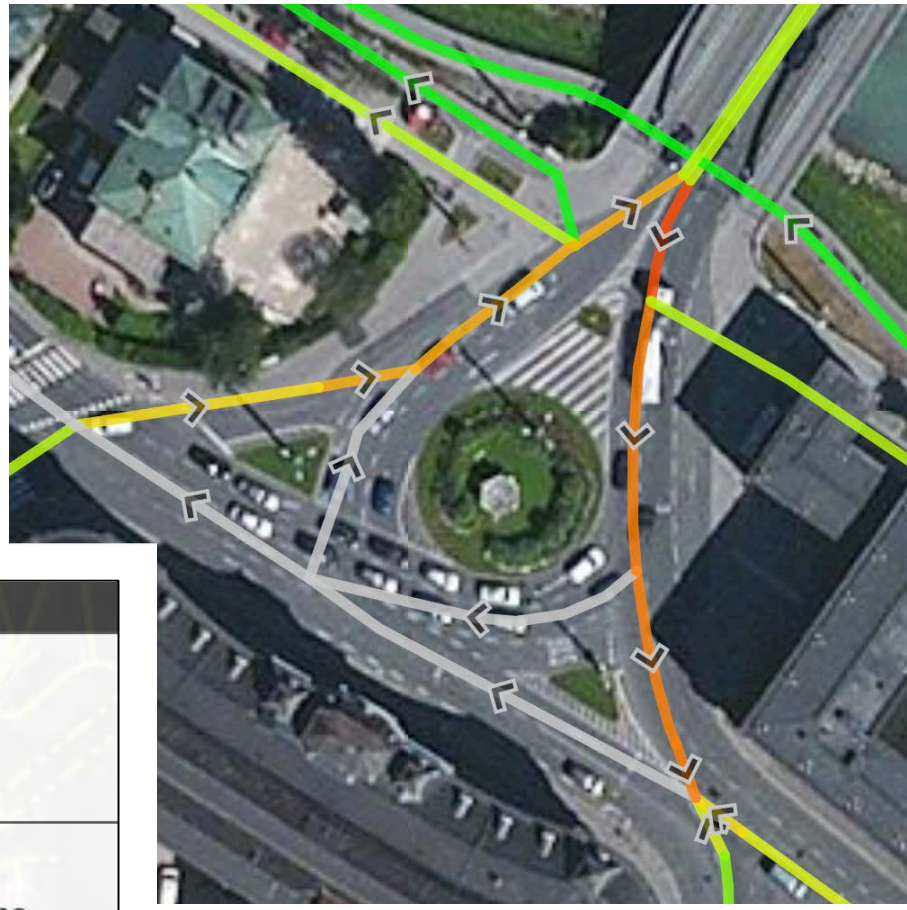
- The index is calculated for every feature within the visible extent of the map with the following formula:

$$index = \frac{\sum_{i=1}^{n} indicator_i * weight_i}{\sum_{i=1}^{n} weight_i}$$

- Missing values are only excluded for affected road segments



Application Development
Feature Rendering



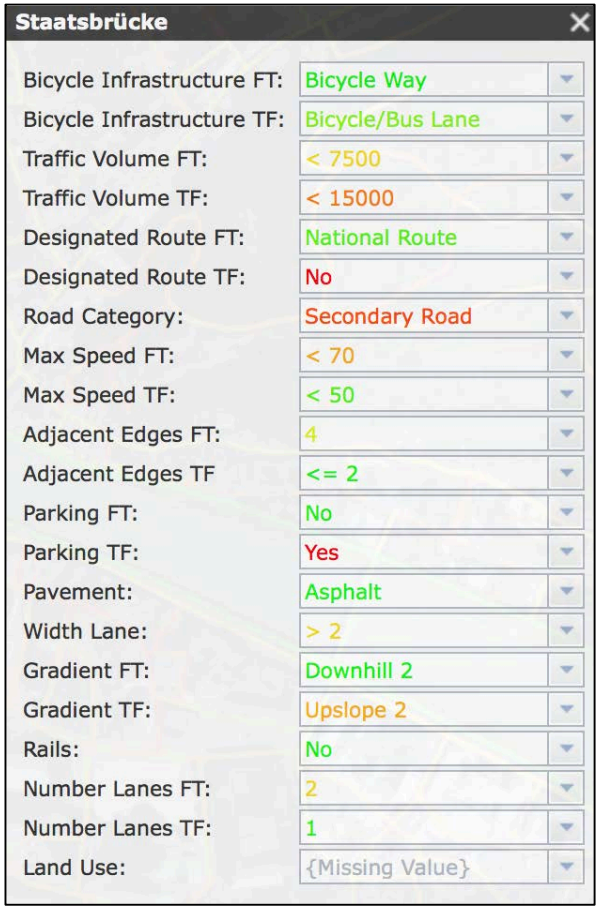
Options

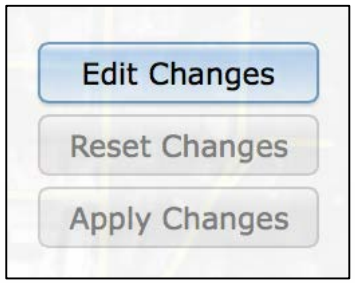
- Index
- Index FT
- Index TF

- Oneways
- Restrictions

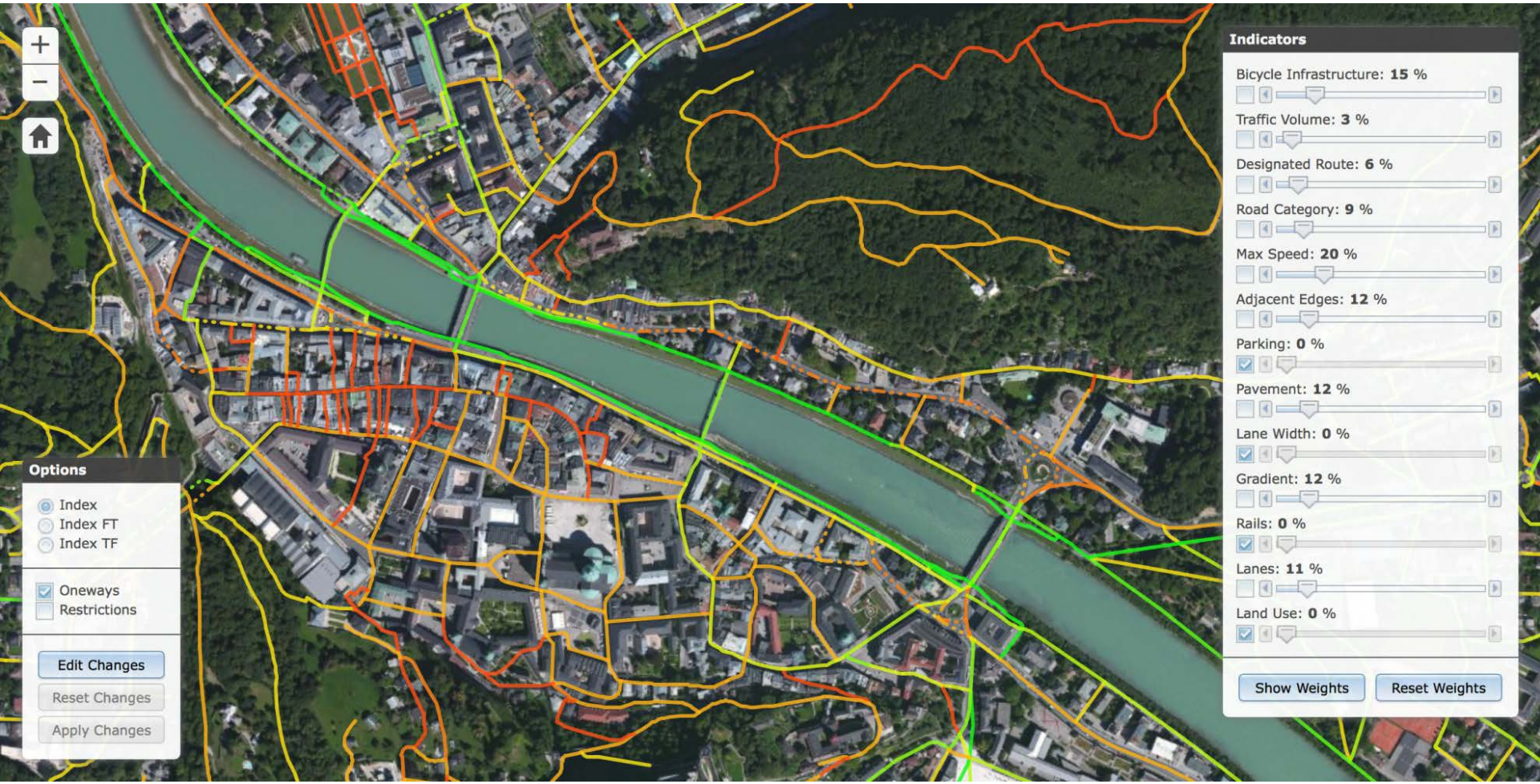
Application Development
Data Manipulation

- Overview of the available indicators and values → Popup window
- Coloring based on the color scheme of the road network → Positive or negative contribution to bicycle safety
- To change indicator values → Drop-down list
- Whenever a value is change, the index is recalculated and colored accordingly





Live Demo


Options
Index
Index FT
Index TF
Oneways
Restrictions
Edit Changes
Reset Changes
Apply Changes
Indicators
Bicycle Infrastructure: 15 %
Traffic Volume: 3 %
Designated Route: 6 %
Road Category: 9 %
Max Speed: 20 %
Adjacent Edges: 12 %
Parking: 0 %
Pavement: 12 %
Lane Width: 0 %
Gradient: 12 %
Rails: 0 %
Lanes: 11 %
Land Use: 0 %
Show Weights
Reset Weights

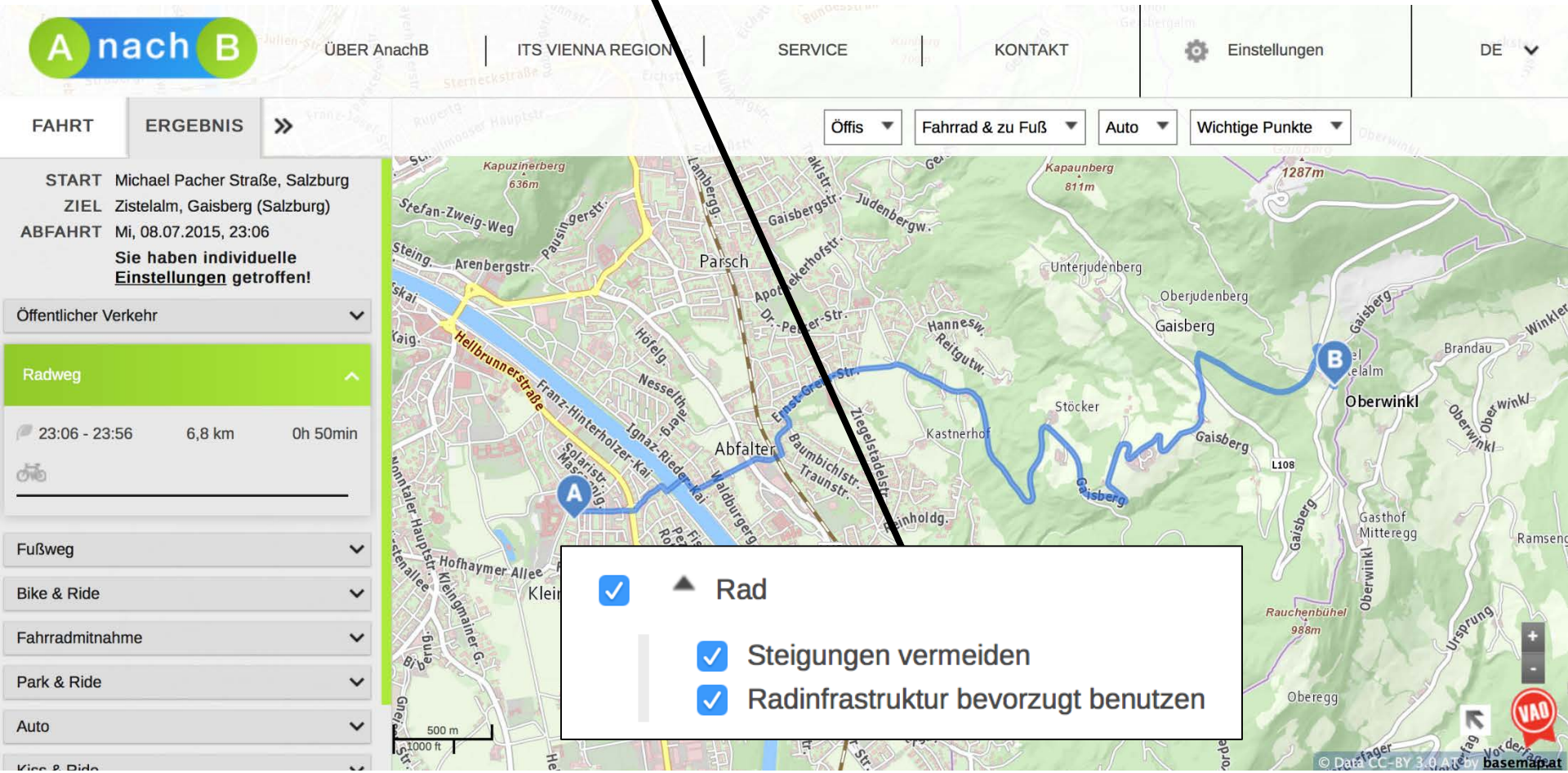
Outlook

- Dynamic weighting of the indicator values
- Integration of live geoprocessing into the application
  - Routing
    - Optimized profiles or personalized preferences
    - Immediate visual feedback on every slider change
- Subsequent geoprocessing based on the assessment result
  - Location Analysis
  - Spatial Analysis

Routing

Common bicycle routing options:

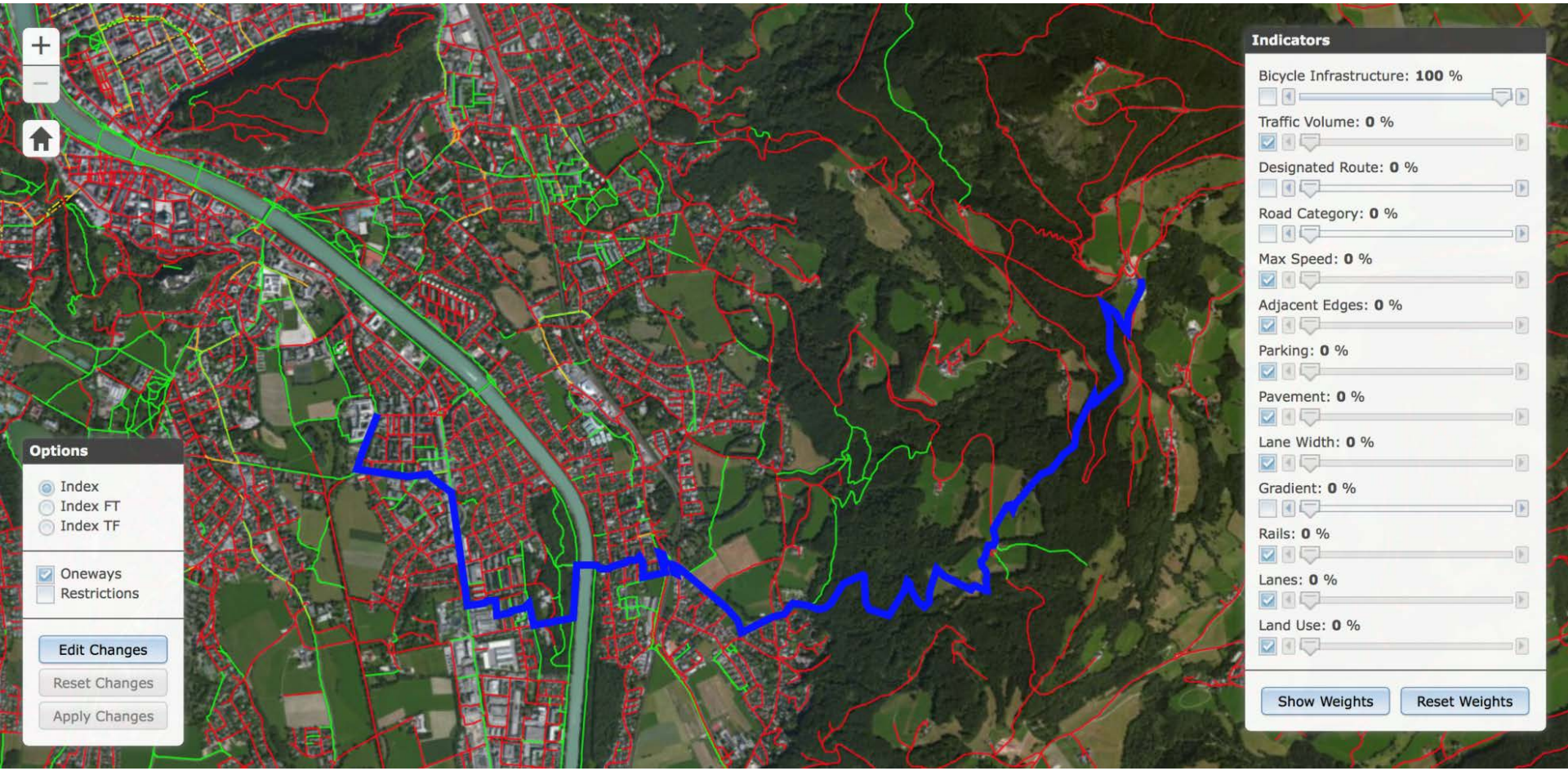
- Avoid gradient
- Prefer bicycle infrastructure



www.anachb.at

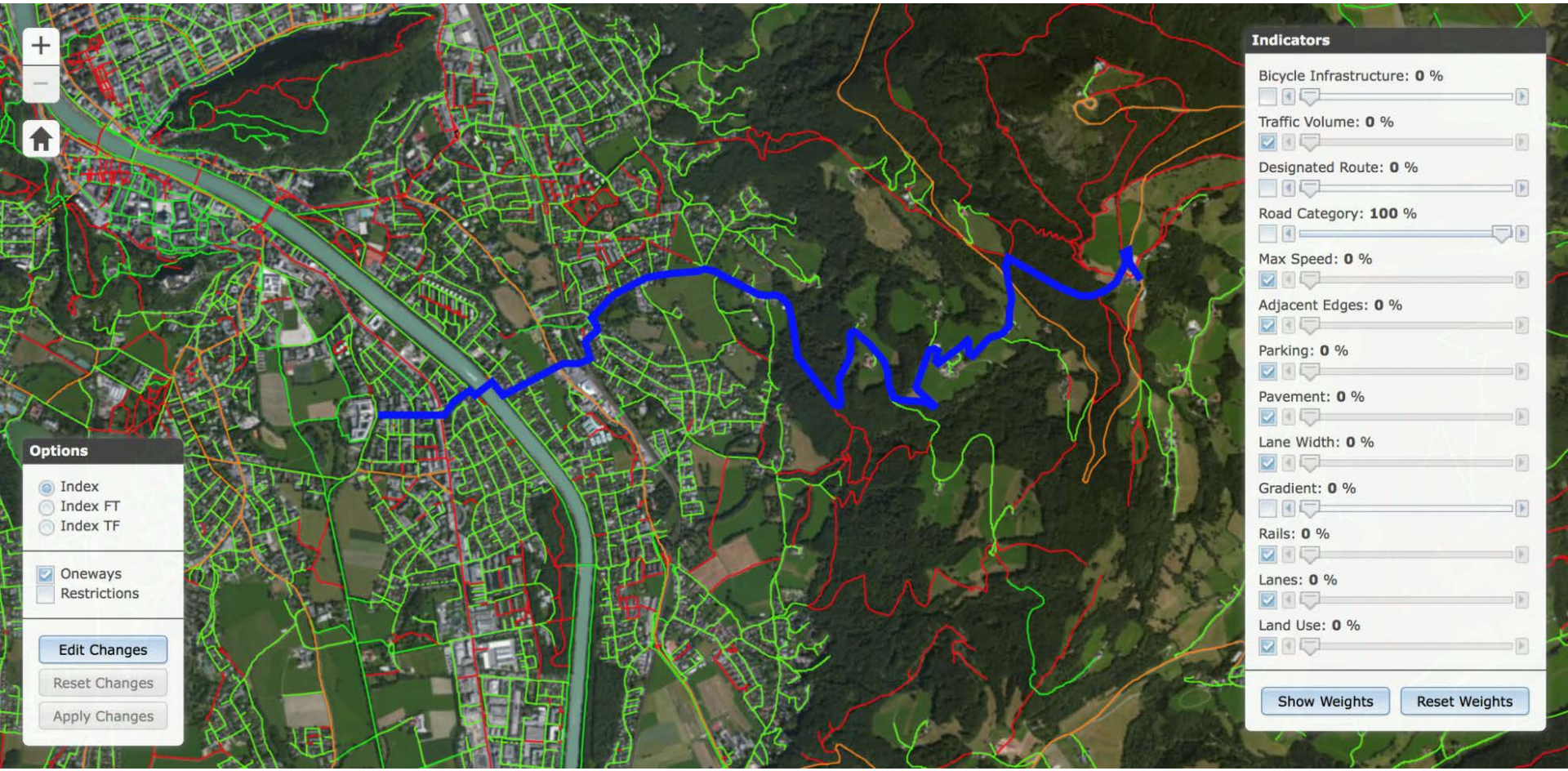
Routing

Bicycle Infrastructure: **100 %**



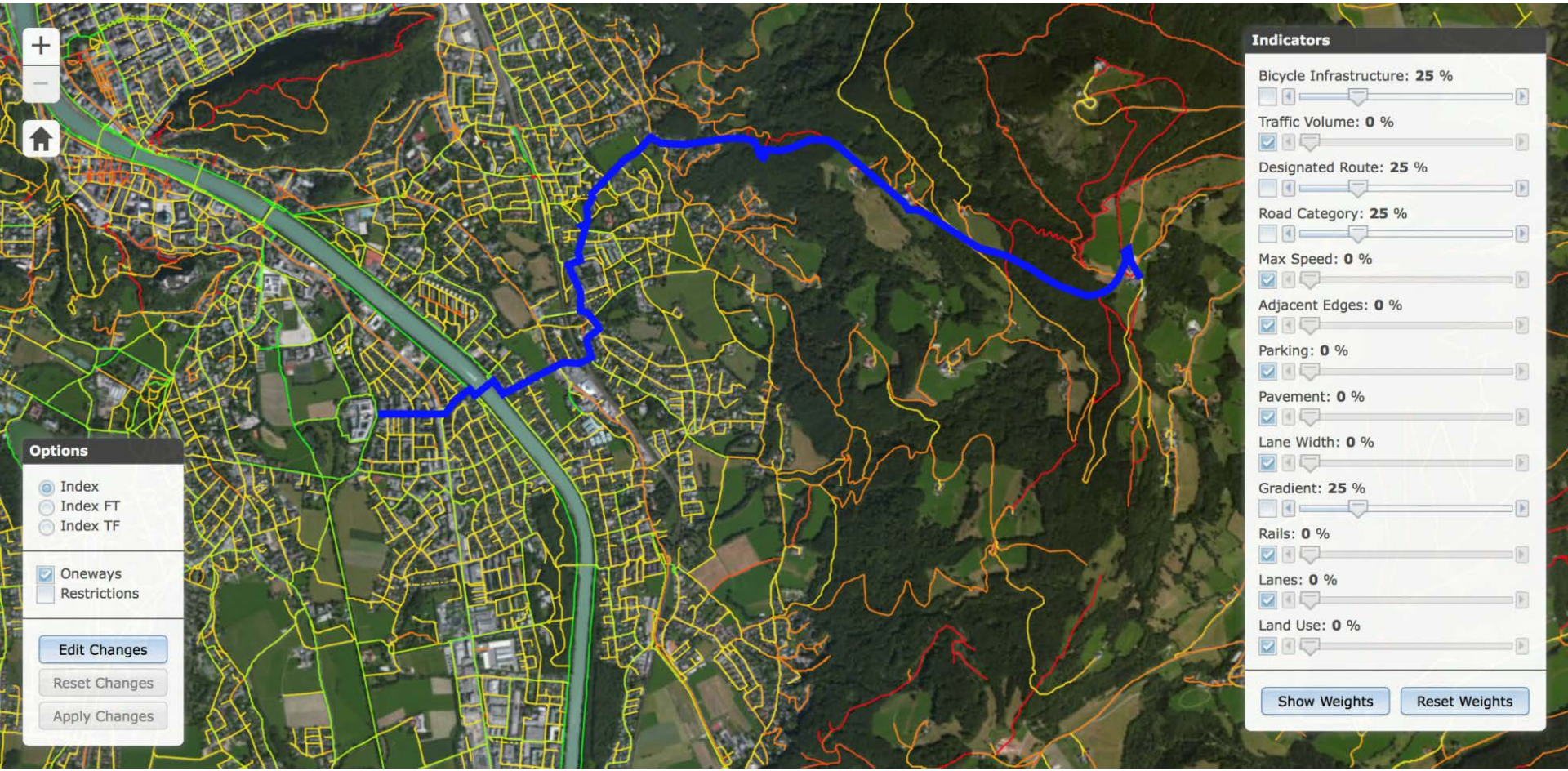
Routing

Road Category: **100 %**

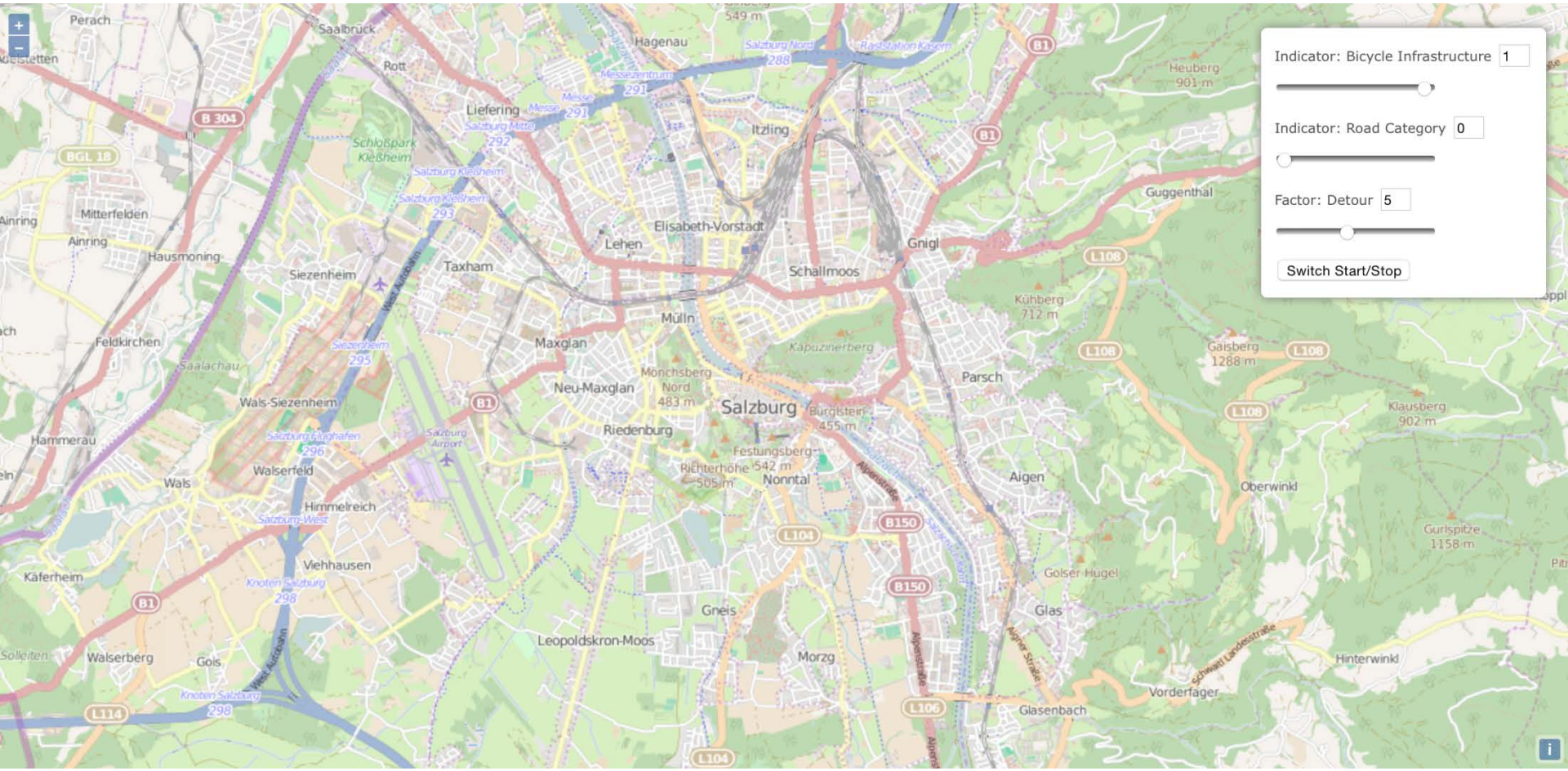


Bicycle Infrastructure: **25 %**
Designated Route: **25 %**
Road Category: **25 %**
Gradient: **25 %**

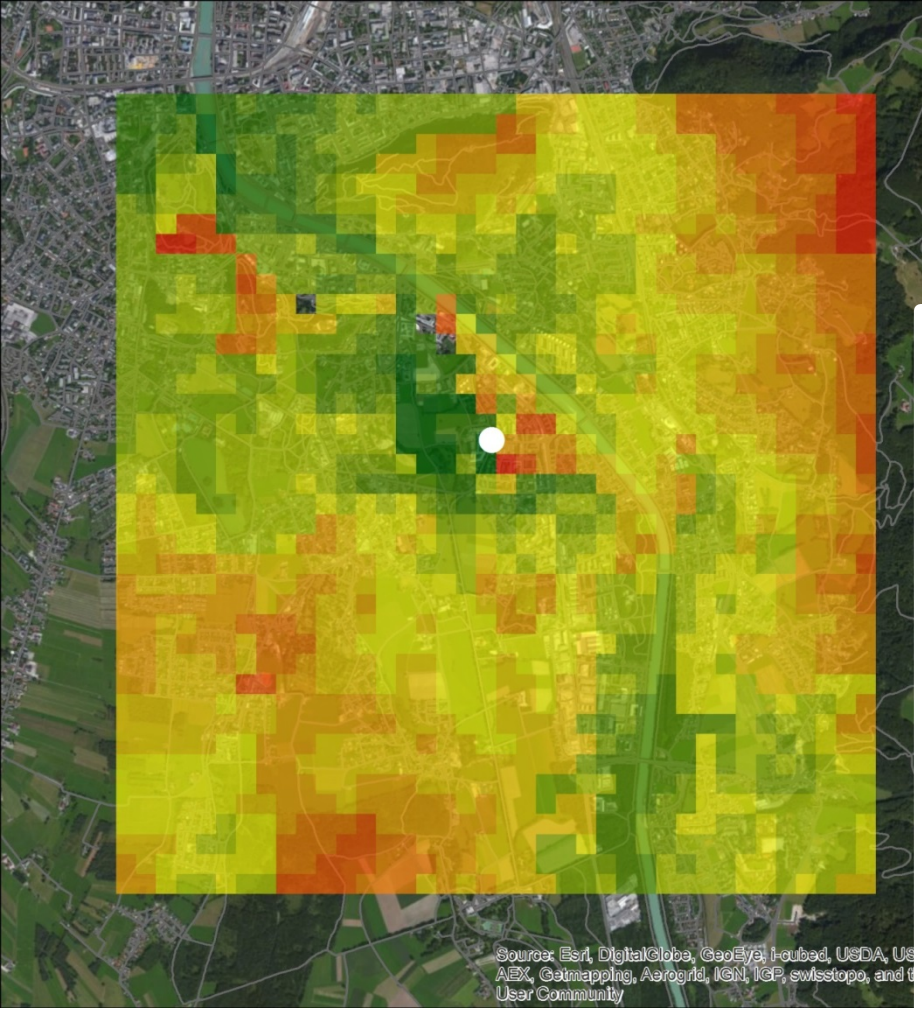
Routing

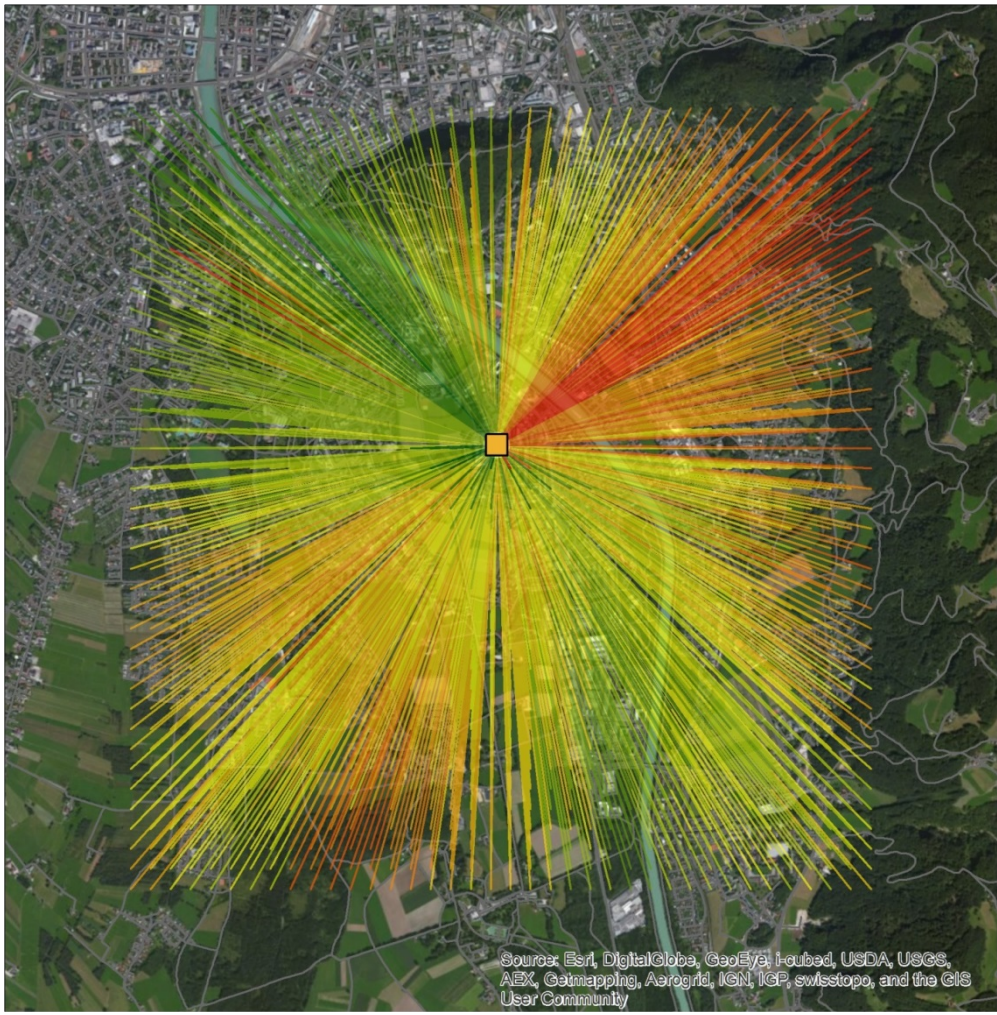


Prototype: Indicator-based Routing



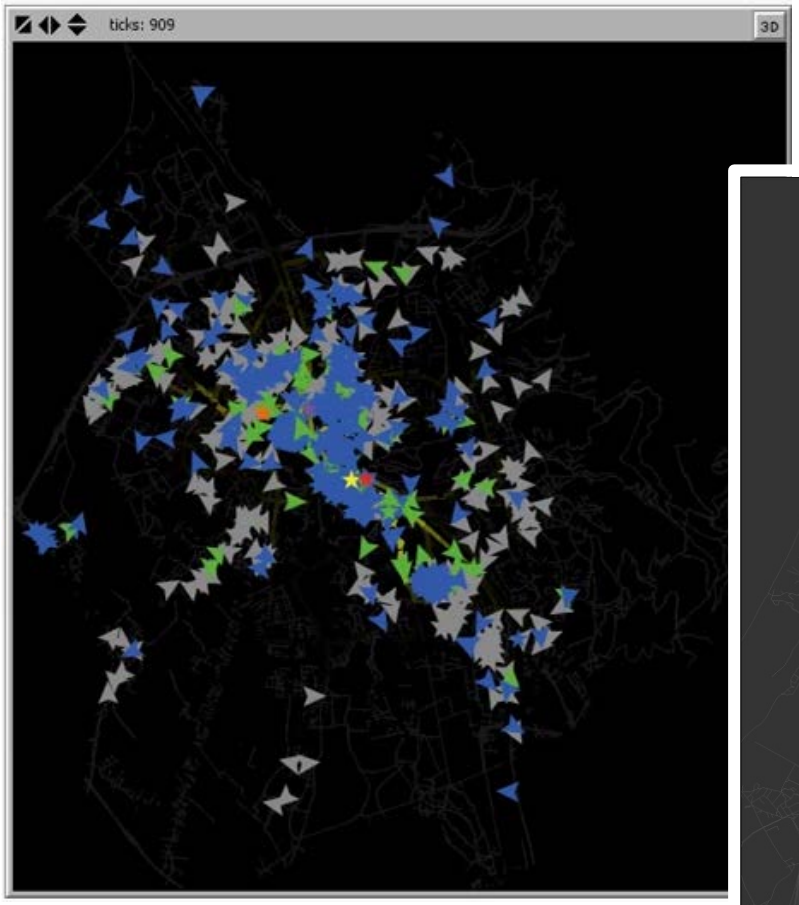
Location Analysis





Quality of accessibility of an location from every raster cell (Loidl 2015)

Spatial Simulation



Agent-based simulation of cyclists (Wallentin 2015)

Conclusion

- Static model → Dynamic process
- Black box → Transparent and comprehensible procedure
- Intuitive GUI → Increased usability also for non-GIS experts
- Responsive changes → Enhance the fields of application

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