ZGIS
DEPARTMENT OF GEOINFORMATICS

UNIVERSITY of SALZBURG

Safest Path for Bicyclists

How to model secure Routes in Urban Areas

Esri UC 2014
July 14–18 | San Diego, CA

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Agenda

- Why bicycle safety?
- How can GIS support the promotion of safe cycling?
- What makes a bicycle route safe?
- Assessment model and safety index
- Application: Find a Safe Route

Context – Why bicycle safety?

"Road safety: Second good year in a row puts Europe firmly on track towards target" (EC - IP/14/341; 31/03/2014)

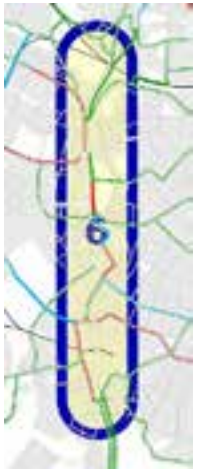
Another worrying feature of the statistics is the situation of vulnerable road users: The number of pedestrians killed is decreasing to a lesser extent than expected and **the number of cyclists killed has recently even been increasing**. This is partly due to the fact that more and more people cycle; the challenge for Member States is to **encourage people to use their bicycles** rather than their cars more often, but to **make sure that the shift from car to bicycle is a safe one**.

How can GIS support the promotion of safe cycling?

Number of bicyclists

Number of accidents

Goal



- Status-quo analysis
  - Weak-point analysis
  - Corridors
  - etc.
- Planning & Infrastructure
  - Priority of measures
  - Budget allocation
  - etc.
- Information
  - Routing
  - etc.

→ Assessment of Network

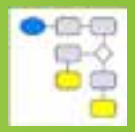
Workflow

Stage 1

Analysis 

- Spatio-temporal analysis of accident data set
- Specification of accident types/categories
- Formulation of recommendations

Stage 2

Model 

- Development of an indicator-based model for road network assessment
- Focus on road safety for bicyclists

Stage 3

Application 

- Development routing system
- Application for planning and simulation tasks

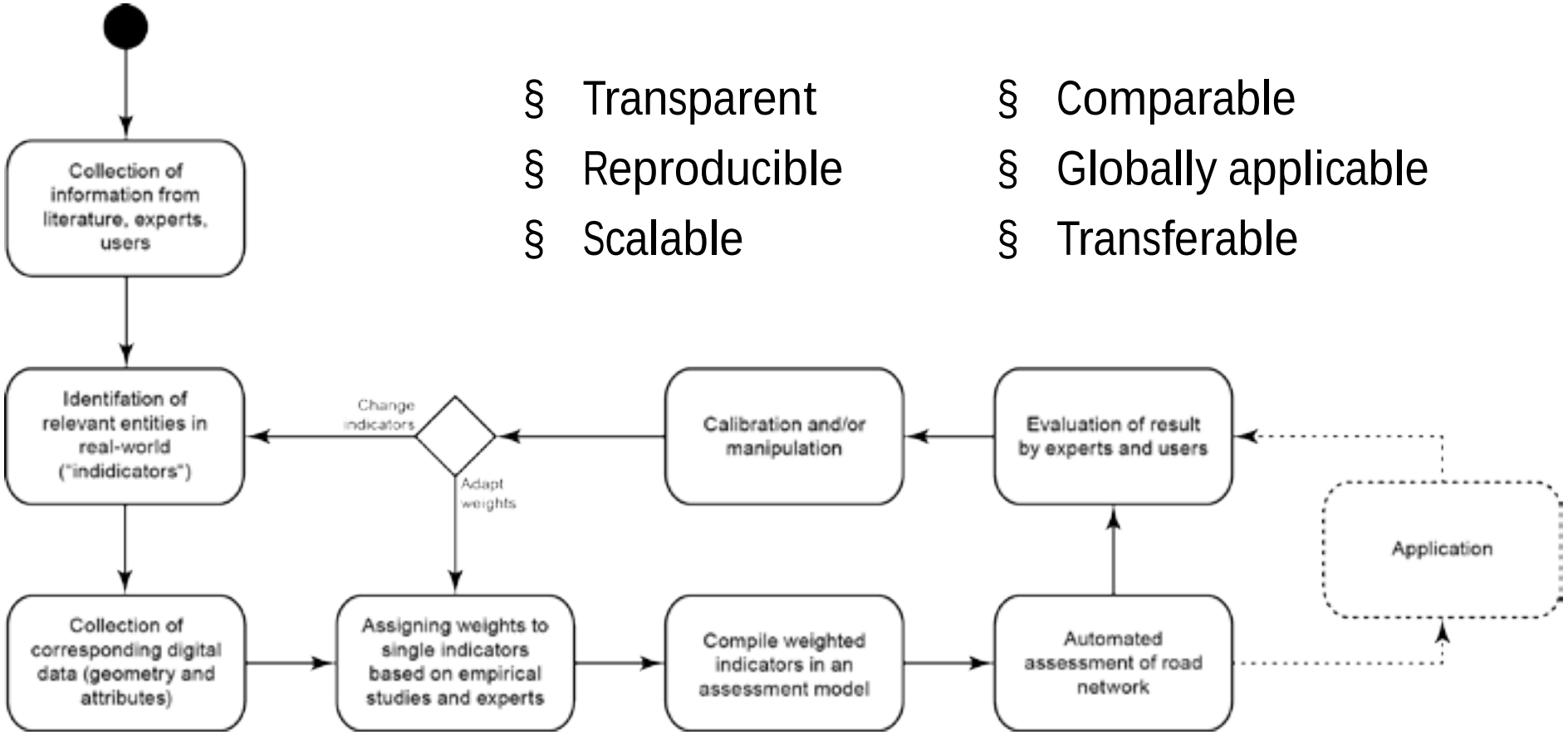
Indicator-based approach

What makes a bicycle route safe?

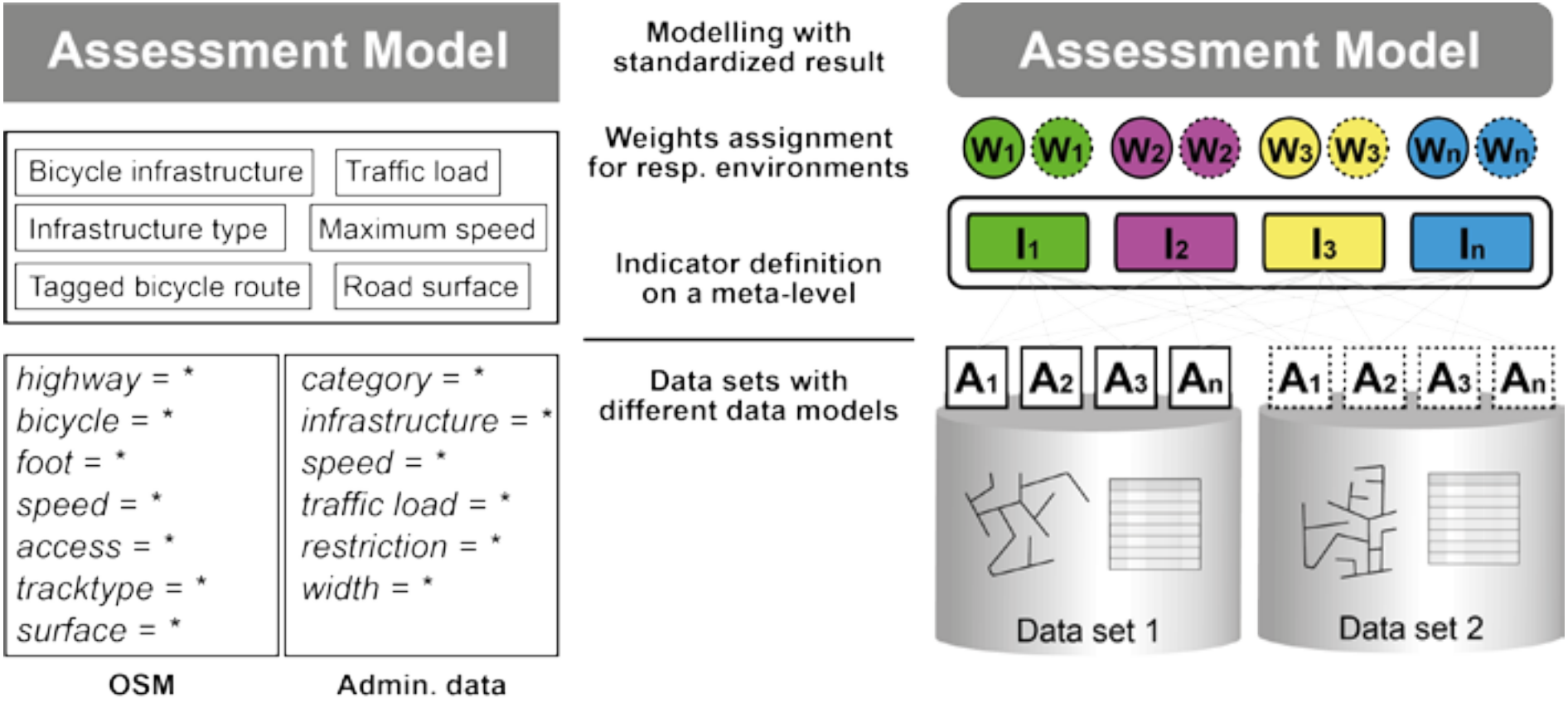
- Road safety for bicyclists
- Indicators (examples):
  - Bicycle infrastructure
  - Road category
  - Traffic volume
  - Max speed
  - Road surface
- Weights:
  - Empirical studies (field tests)
  - Accident analysis
  - Expert knowledge

Indicator-based GIS Model

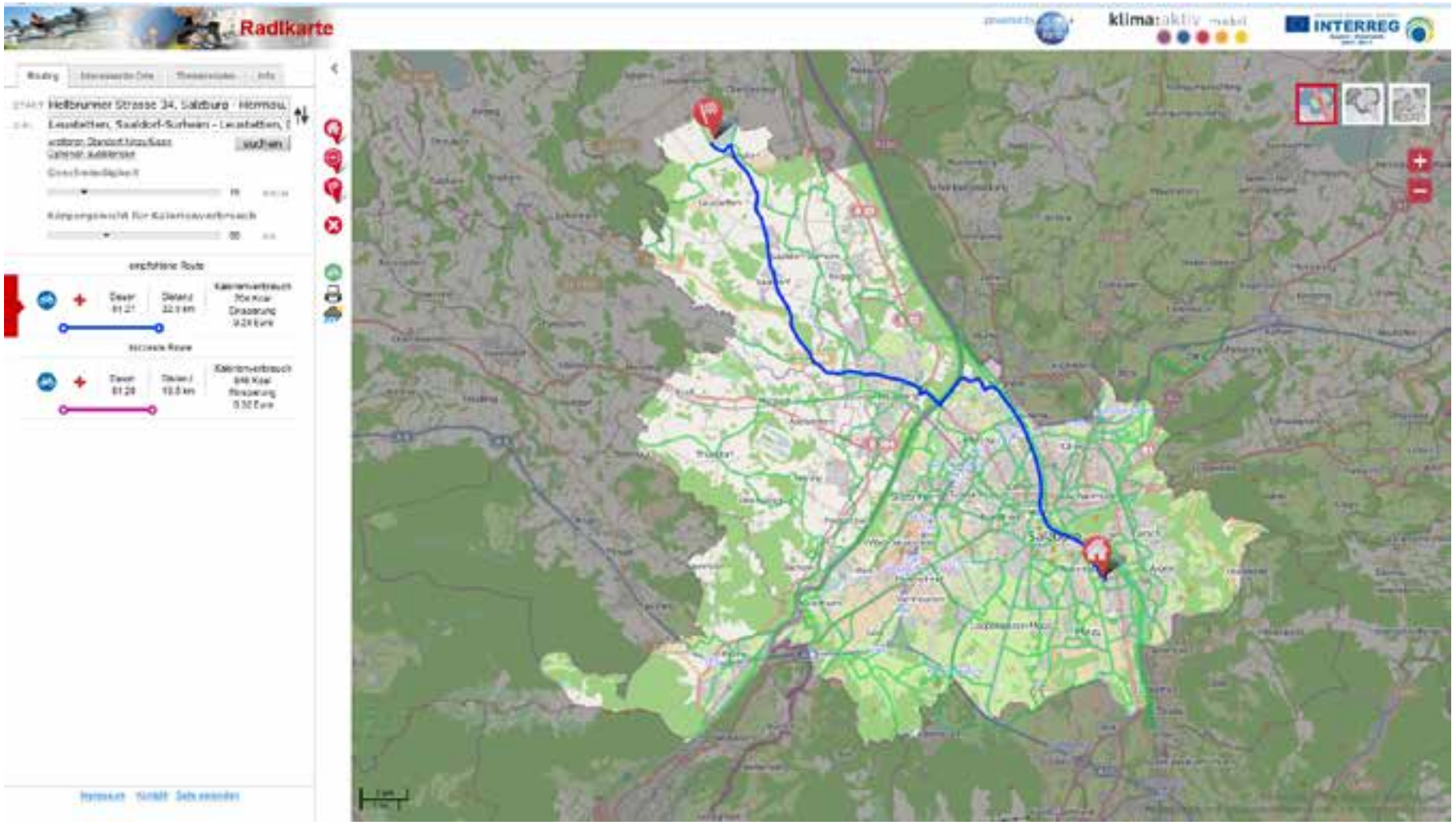
- § Transparent
- § Reproducible
- § Scalable
- § Comparable
- § Globally applicable
- § Transferable



Model Workflow

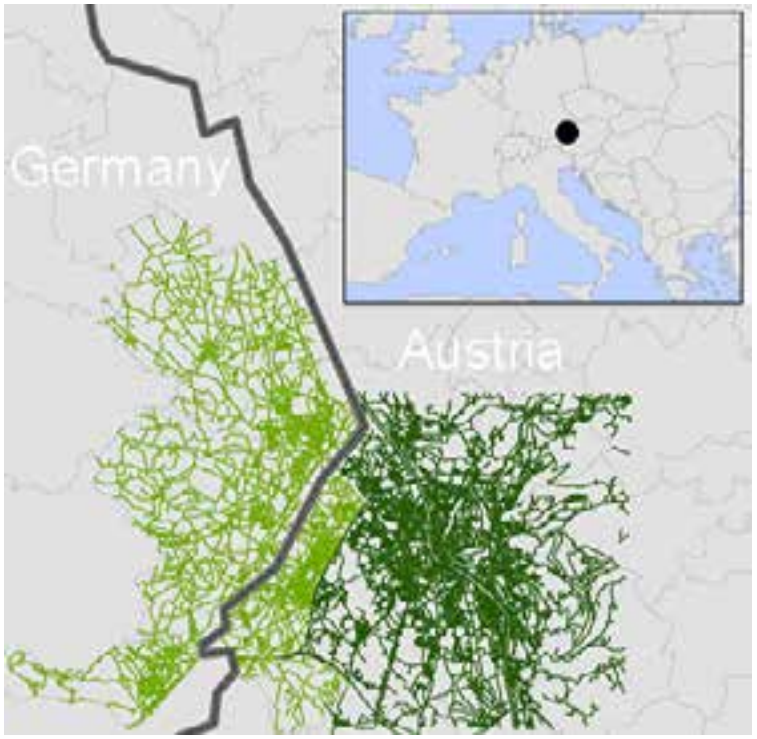


Case Study



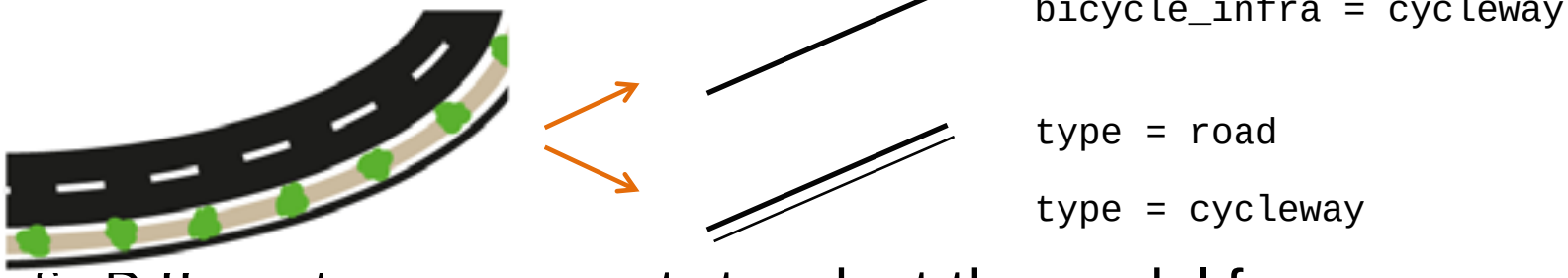
Study Area & Data

- Authoritative data for city of Salzburg
  - 11,458 edges
  - 1,119.7 km net length
- OpenstreetMap extract for adjacent municipalities
  - 9,601 edges
  - 941.3 km net length
- Data sets with different data model and attribute structure



Problem Statement

- Different data sets from different sources
- Different data models
  - Geometry and attributes



- Different environments to adapt the model for
  - Urban vs. rural

Data models

- Authoritative graph
  - Center line
  - Complex attributive formulation of bicycle infrastructure
  - Complete and homogeneous

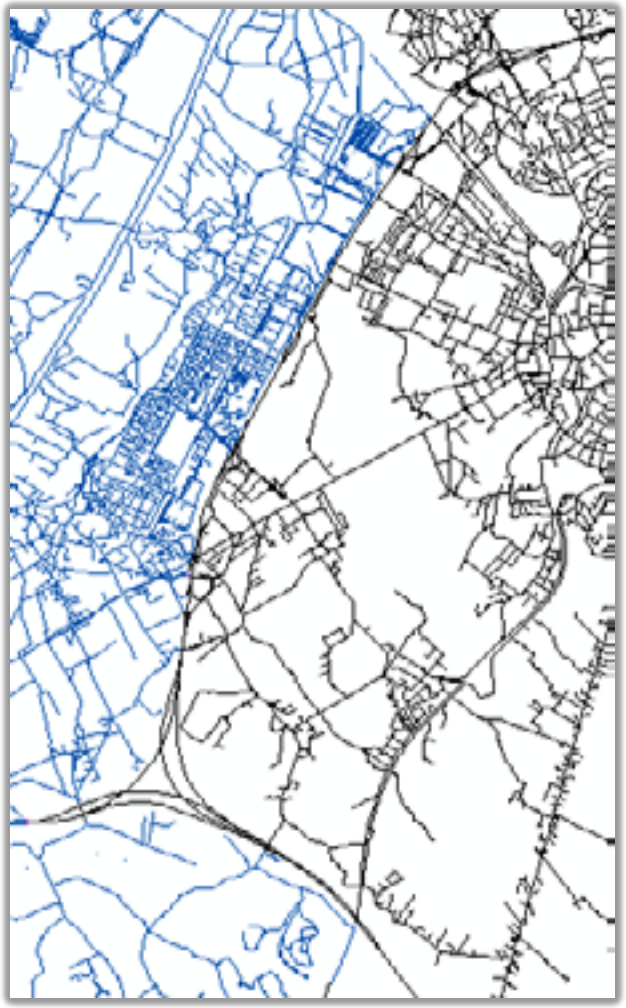
DB-Name	Attribute	Value	Value description
SIC_STRAS4	Road category	400	Municipal road
SIC_STRAS5	Max.speed, km/h	50	
SIC_STRA9	Buslane	1	Yes, FT
SIC_STR13	Oneway	1	Yes, FT
SIC_RAD_RE	Bicycle infrastructure (right side, FT)	10	Yes, undefined
SIC_RAD_R1	Bicycle infrastructure (left side)	5	Cycle-/footway mixed
SIC_RAD_RI	Direction bicycle infrastructure (FT)	0	No
SIC_RAD_R5	Direction bicycle infrastructure (TF)	4	Both directions, independet from oneway
SIC_STR24	Motorized traffic load, V/24h (TF)	0	
SIC_STR25	Motorized traffic load, V/24h (FT)	17698	

Data models

- OSM graph
  - Edge for every physically separated lane
  - Very simple tag (key = value) structure
  - Up-to-date
  - Gaps, inconsistencies, errors, heterogeneous attribute structure

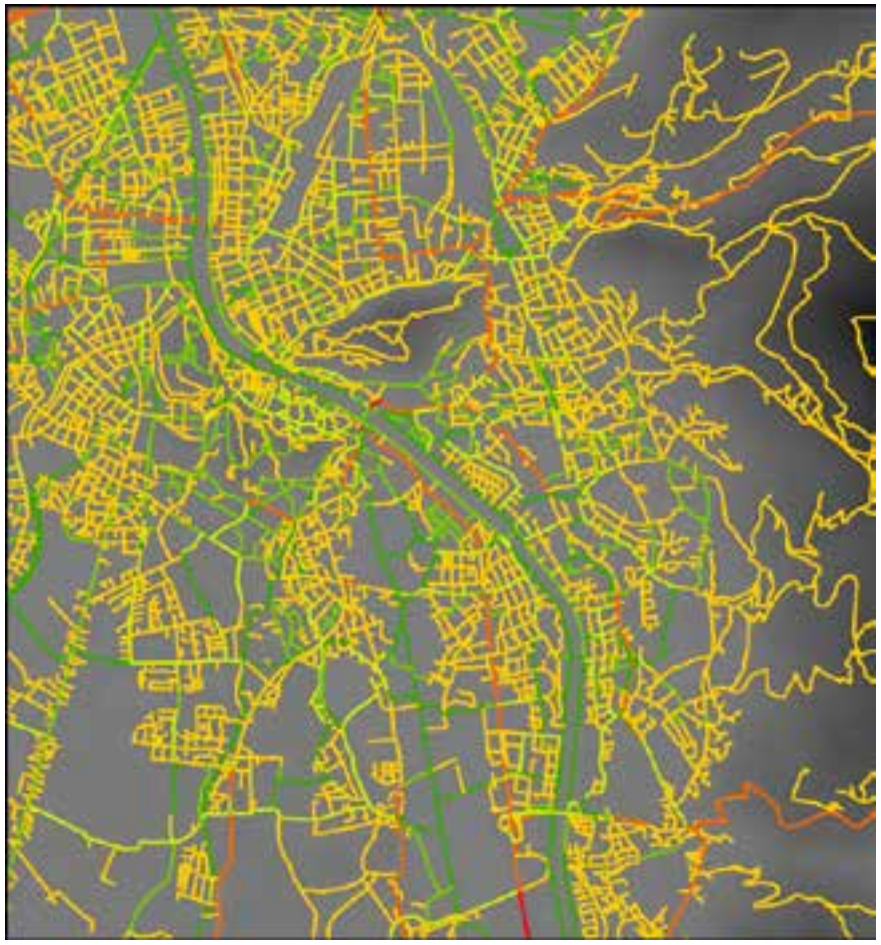
Key	Value
highway	path
bicycle	designated
foot	designated
surface	paved

Geometry & Topology



- Transfer points
  - Bridges, under-/overpasses
- Transition edges
- Line matching

Result: „Safety Index“



Pedestrian- and bicycle lane (separated), no motorized traffic
Index value = 0.68

Bicycle lane, no parking
Index values = 1.12

Residental road, no bicycle infra-strucutre, parking on both sides
Index value = 1.56

Primary road, bicycle lane, parking for delivery purpose
Index value = 1.81

Application „Safety Route“