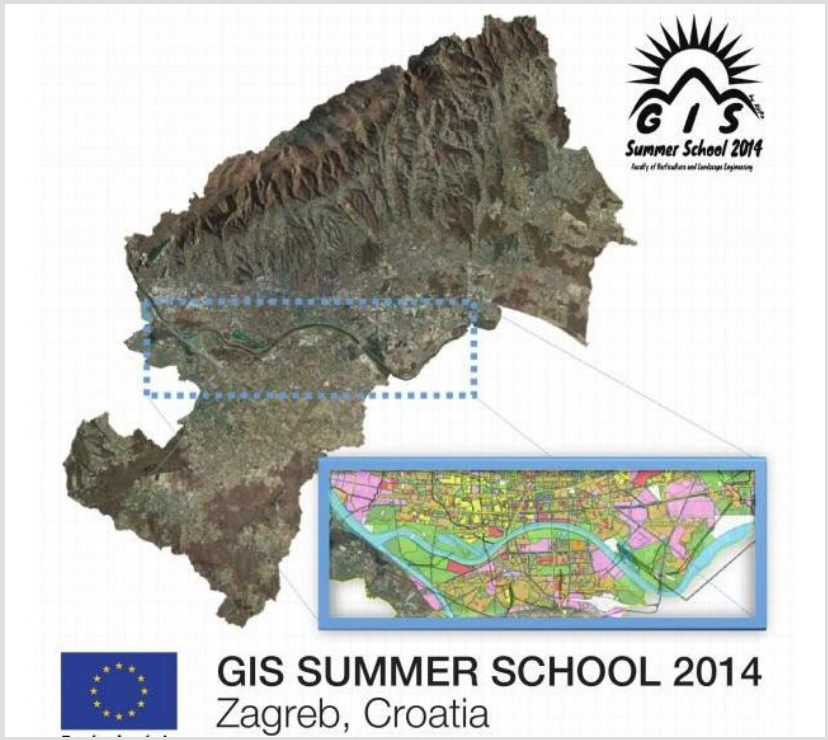

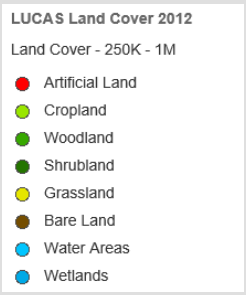

Interoperable Volunteered Geographic Information empowering e-governance processes: Case study for Land Use Dataset in the City of Zagreb

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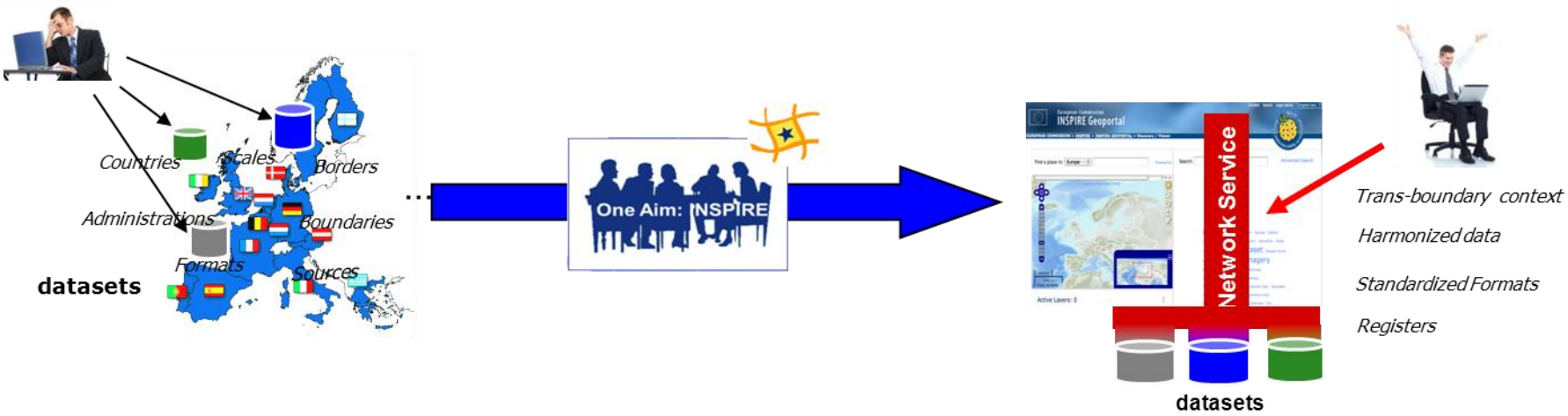
ICA European Symposium on CARTOGRAPHY
VIENNA, 10–12 NOVEMBER 2015

Outline

- INSPIRE
- Land Use/Cover
- Research idea?
- Methodology
- Results and Analysis
- Conclusions and future directions

INSPIRE

- The INSPIRE directive aims to create a European Union (EU) SDI. This will enable the sharing of environmental spatial information among public sector organisations and better facilitate public access to spatial information across Europe
- The INSPIRE directive will be implemented in various stages, with full implementation required by 2020



INSPIRE Data Themes

Annex I

1. Coordinate reference systems
2. Geographical grid systems
3. Geographical names
4. Administrative units
5. Addresses
6. Cadastral parcels
7. Transport networks
8. Hydrography
9. Protected sites

Annex II

1. Elevation
2. Land cover
3. Ortho-imagery
4. Geology

Annex III

1. Statistical units
2. Buildings
3. Soil
4. Land use
5. Human health and safety
6. Utility and governmental services
7. Environmental monitoring facilities
8. Production and industrial facilities
9. Agricultural and aquaculture facilities
10. Population distribution – demography
11. Area management/ restriction/regulation zones & reporting units
12. Natural risk zones
13. Atmospheric conditions
14. Meteorological geographical features
15. Oceanographic geographical features
16. Sea regions
17. Bio-geographical regions
18. Habitats and biotopes
19. Species distribution
20. Energy Resources
21. Mineral resources

Research idea?

- Land is an essential natural resource. It can be divided into two interlinked concepts:
  - Land Cover (LC) refers to the bio-physical coverage of land (e.g. crops, grass, broad-leaved forest, or build-up area)
  - Land Use (LU) indicates the socio-economic use of land (e.g. agriculture, forestry, recreation or residential use)
- Standardisation
  - Eurostat LUCAS (Land Use and Cover Area frame Survey)
  - INSPIRE HILUCS (Hierarchical INSPIRE Land Use Classification System)
  - National models (CROTIS, LBCS, etc.)
  - Local models
  - …

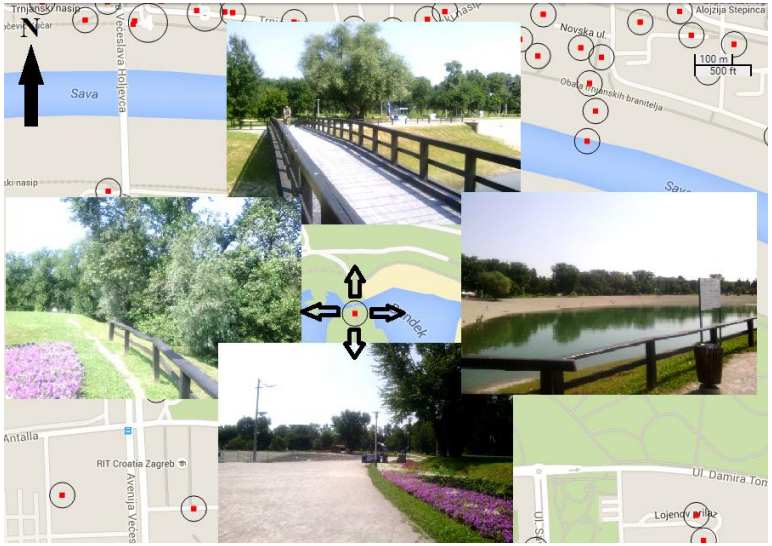
Research idea?

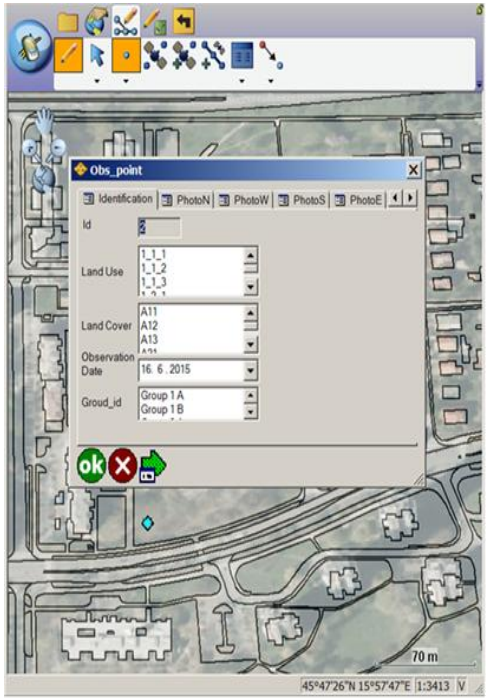
- To explore possibility of „VGI” observations for land use areas definition based on the LUCAS fieldwork methodology, HILUCS (Hierarchical INSPIRE Land Use Classification System), and reference topographic layer
- Practical research work was performed during the GIS summer School 2014 in the city of Zagreb

Methodology – Field works

- Input data
  - Topographic dataset (> 11000 features) with 23 LU categories defined by CROTIS
  - Orthophoto of the study area
  - Observations dataset (HILUCS, LUCAS LC, Photo)

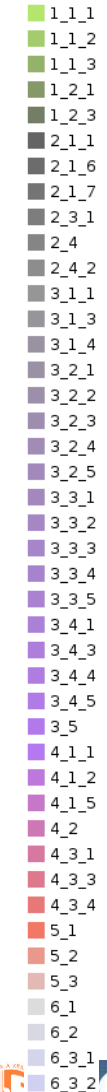
Original nomenclature	Area (ha)	Part from whole area (%)	Feature count	Average area of feature (ha)
Residential and combined objects	74,76	4,10	3751	0,02
Public objects	13,48	0,74	213	0,06
Economical objects	45,87	2,51	844	0,05
Cultural objects	0,01	0,00	1	0,01
Religious objects	0,43	0,02	12	0,04
Other objects	15,7	0,86	2543	0,01
Road transportation	121,02	6,63	449	0,27
Railway transportation	3,2	0,18	6	0,53
Public transportation	6,07	0,33	29	0,21
Arable land	119,44	6,54	74	1,61
Grassland	416,09	22,79	1349	0,31
Fruit plants and vineyard	17,75	0,97	44	0,40
Park	229,13	12,55	654	0,35
Forests	98,97	5,42	20	4,95
Shrubland	40,72	2,23	43	0,95
Abandoned area	3,69	0,20	6	0,62
Public build up area	246,15	13,48	689	0,36
Economical build up area	47,13	2,58	30	1,57
Transportation build up area	0,17	0,01	1	0,17
Courtyard	117,46	6,43	306	0,38
Areas under construction	6,27	0,34	11	0,57
Water streams	84,05	4,60	13	6,47
Backwater	117,84	6,46	23	5,12
Total	**1825,4**	**100,00**	**11111**	**0,16**





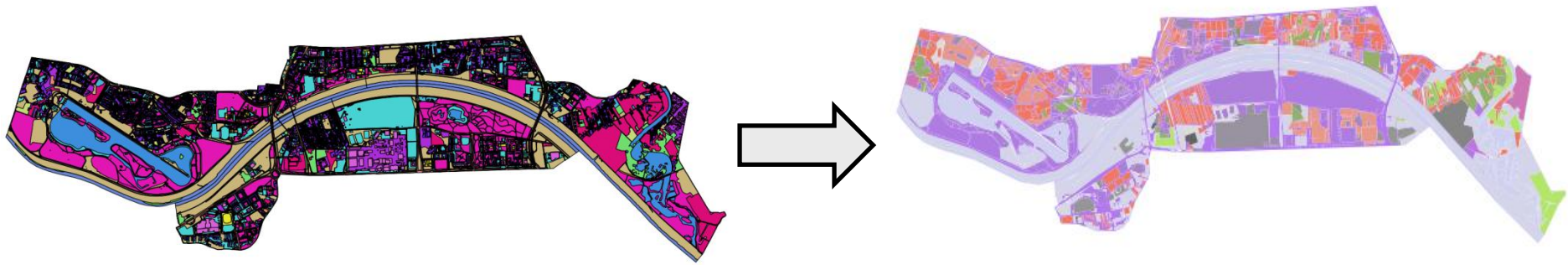
Methodology – data processing and publication

- QGIS open source Desktop GIS
  - Cleaning observed data
  - Matching observed data with polygon features from input data
  - Topological cleaning
- GeoServer open source Web GIS server
  - Publishing the INSPIRE Land Use dataset (WMS, WFS)
  - Style defined by INSPIRE LU Data Specification SLD
- Mapshup open source Web GIS client library
  - Providing a light Web based client for the end user



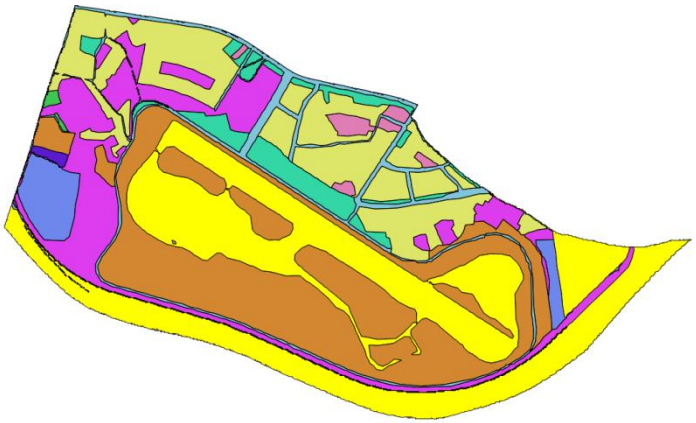
Results and analysis

- 1755 (-132) observations with > 7000 photographs collected in 4 days by 6 surveying groups
- 44 HILUCS categories identified in the field
- 68,98% of original areas were assigned the HILUCS code automatically
- 31,02% were determined manually
- More homogeneous representation (6,5 times smaller feature count)

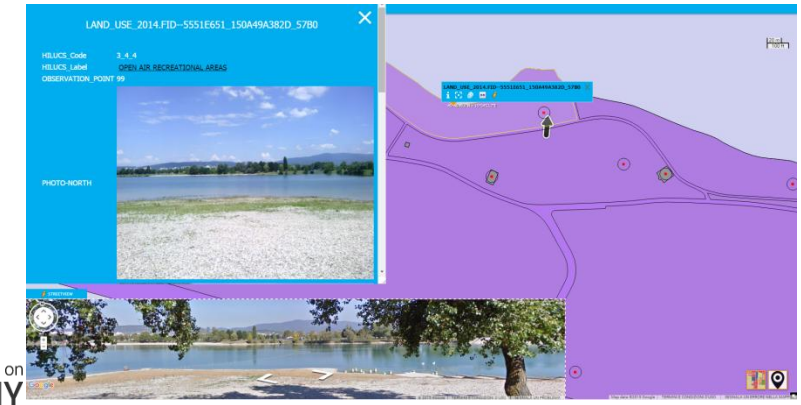


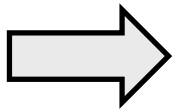
Results and analysis

- Land Use Zagreb (2011) compared to Land Use HILUCS (2014)



- Web GIS client linked to INSPIRE Registry



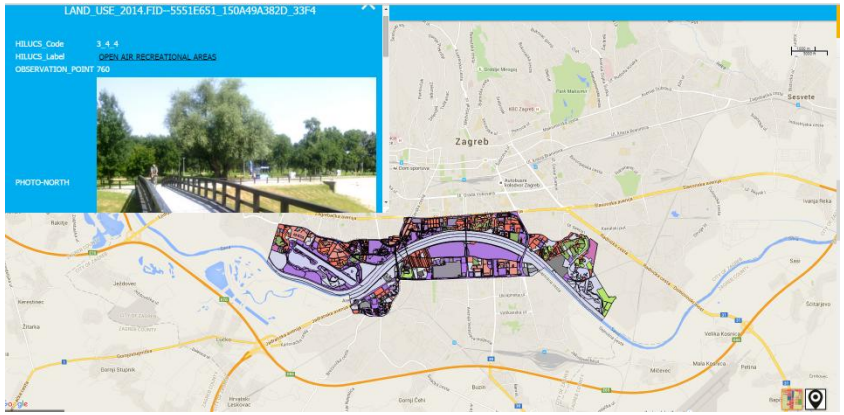


Conclusions and future directions

- Education activities as possible VGI data sources for various use cases to empower e-governance processes
- Knowledge transfer to future generation (Mobile, Web GIS, SDI, INSPIRE)
- Harmonisation can be achieved by VGI (HILUCS)

- Testing the developed dataset on real use cases defined by the office for strategic planning and city development
- Develop “open” and standardised (WFS) tool to collect data in the field by smartphones

Summer GIS school 2014 in pictures …



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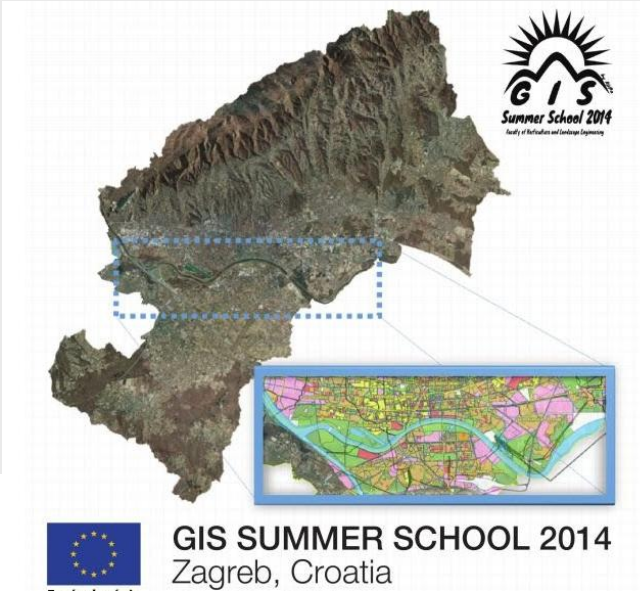
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