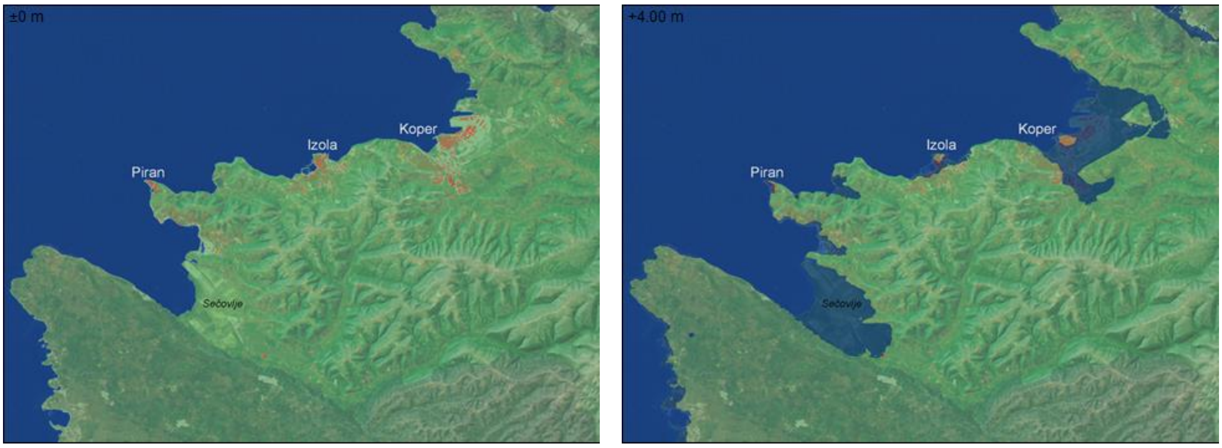
Tomaž Podobnikar – Portfolio

The geospatial examples (with natural & social environment GIS analysis projects – results/maps)

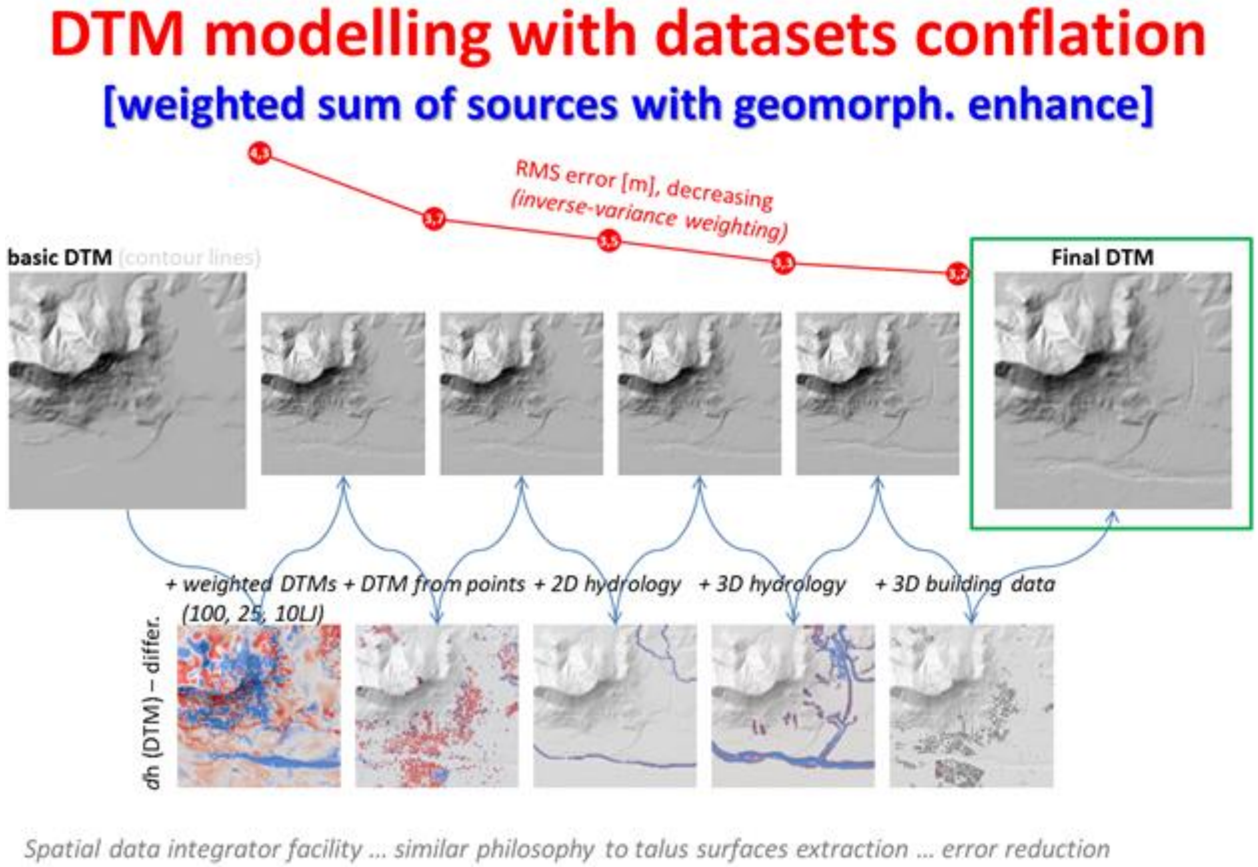
See also https://youtu.be/8V6Hx7IoZLI and CV

(a)

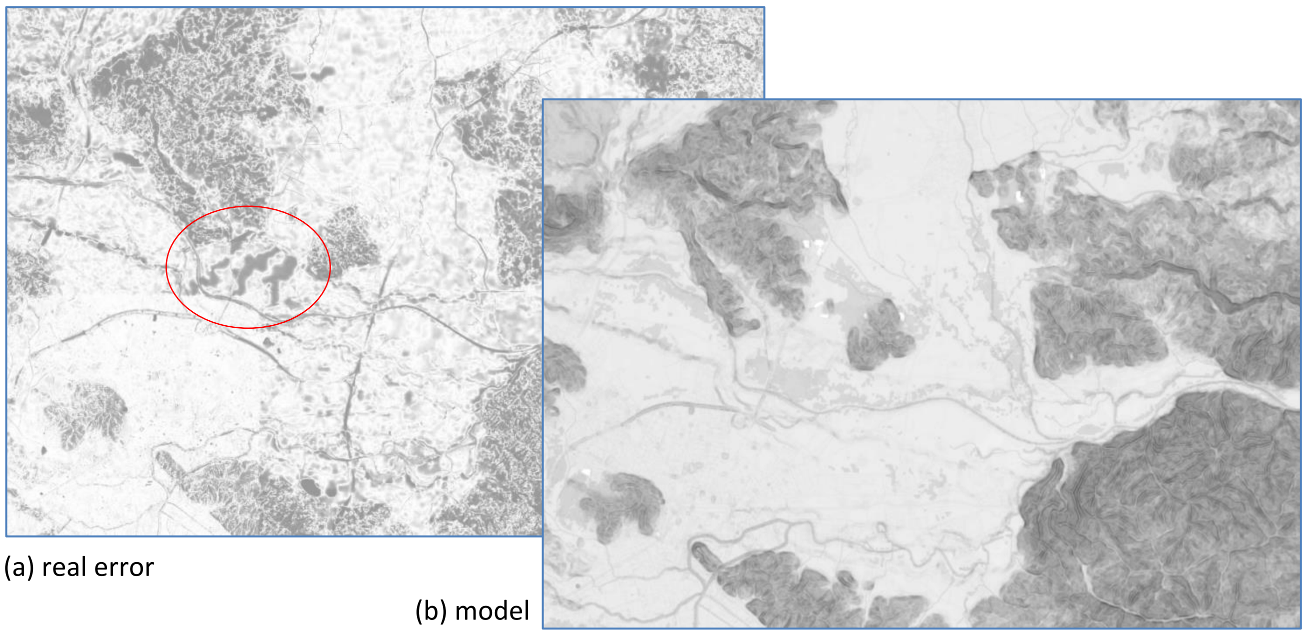


(b)

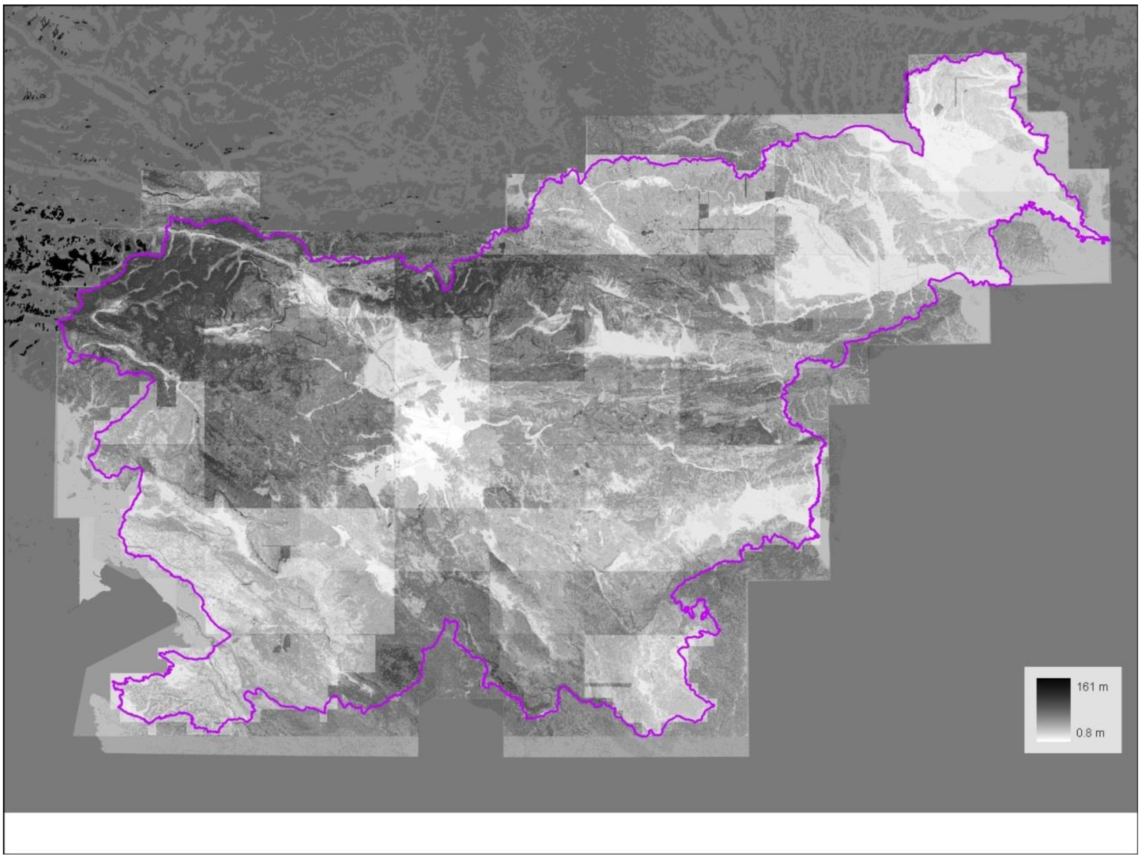
1) Simulation of the sea level rise by 6 m presented for the Slovenian Coast, using own digital elevation model (DEM). (a) The effects of the sea rise are visualized in different shades of blue (bathymetric tinting of dark blue for the highest sea level rise and light blue for the lowest; in addition, an advanced analytical shading of my MVI method had been applied), and the build-up areas are in red. (b) The time-series effect was presented in Ljubljana at the event organized for Al Gore's visit, see two fragments of the sea rise by 0 and 4 m of the movie (2008).



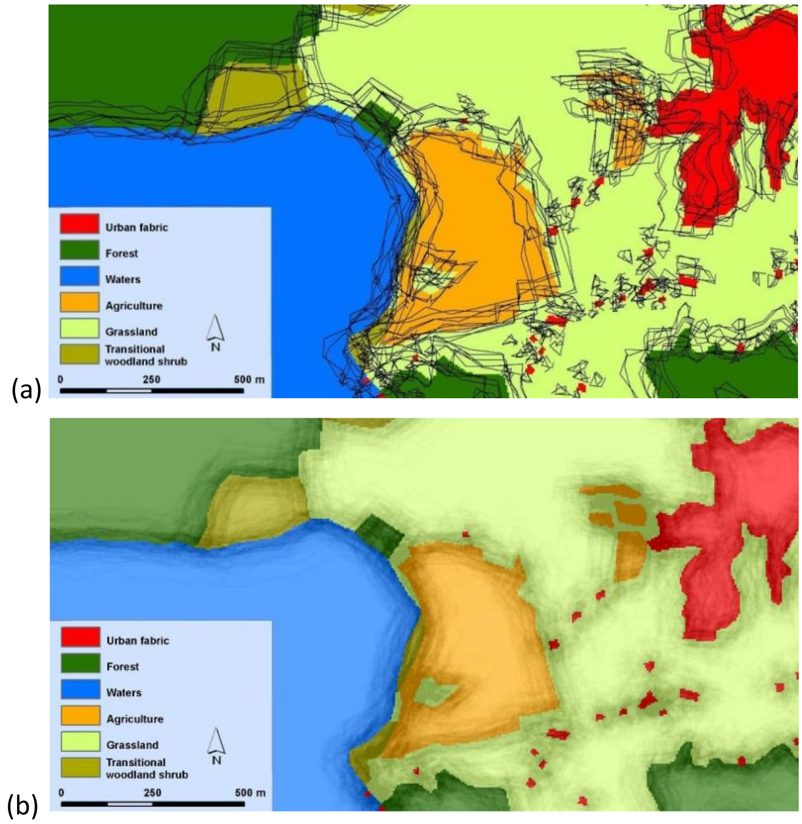
2) A unique digital elevation model (DEM) of Slovenia processing with the data conflation (fusion, integration) procedure to improve the dataset quality (for Surveying and Mapping Authority of the RS) (1997-2005).



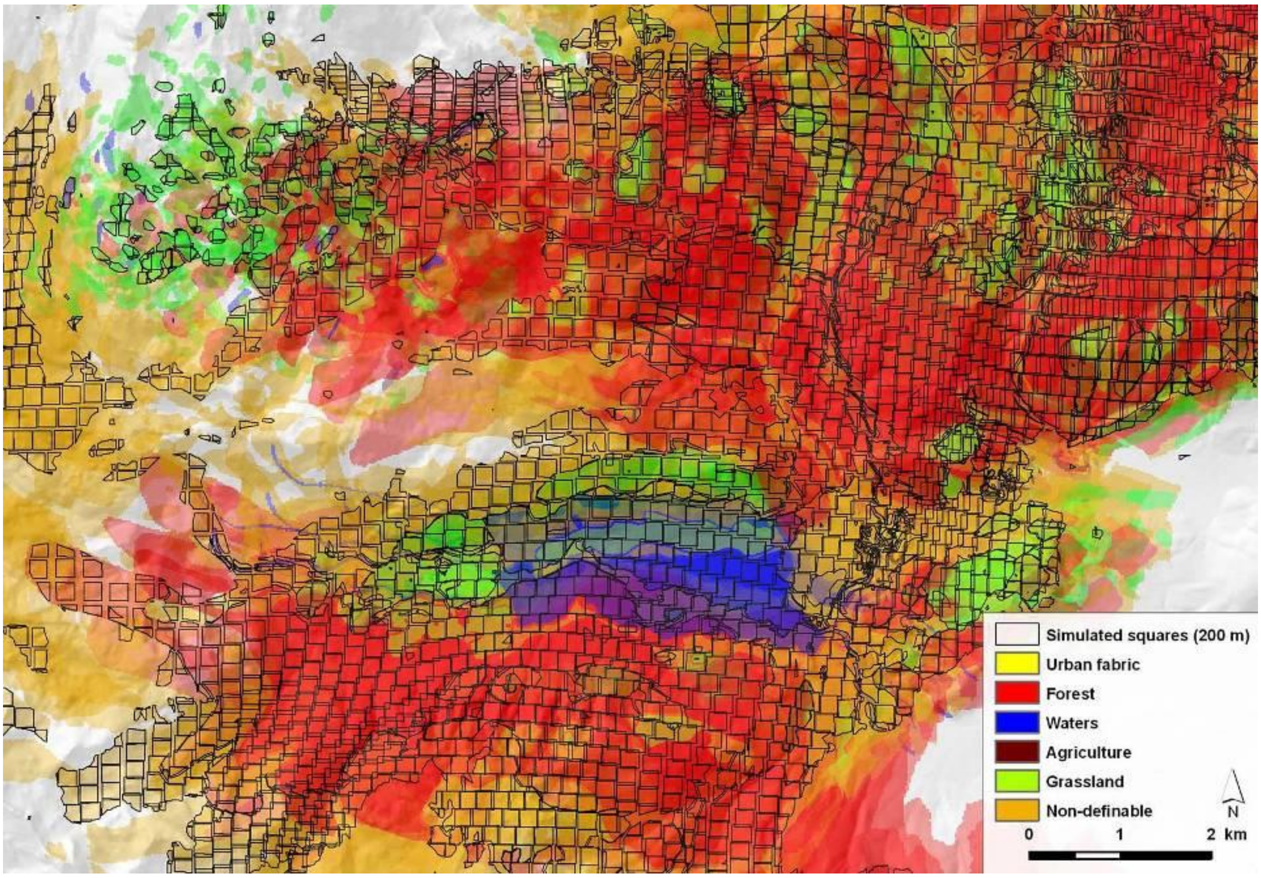
3) A unique DEM error field modelling (darker is an area, larger is the error – up to ~8 m): (a) Absolute error, calculated as the difference between independent reference and target DEMs 12.5 m; (b) spatial error model – prediction. The prediction model considers the right terrain parameters, variables and weights. The most obvious differences are due to interpolation discrepancies (encircled) (surroundings of Ljubljana, central Slovenia, 20 x 15 km) (2016).



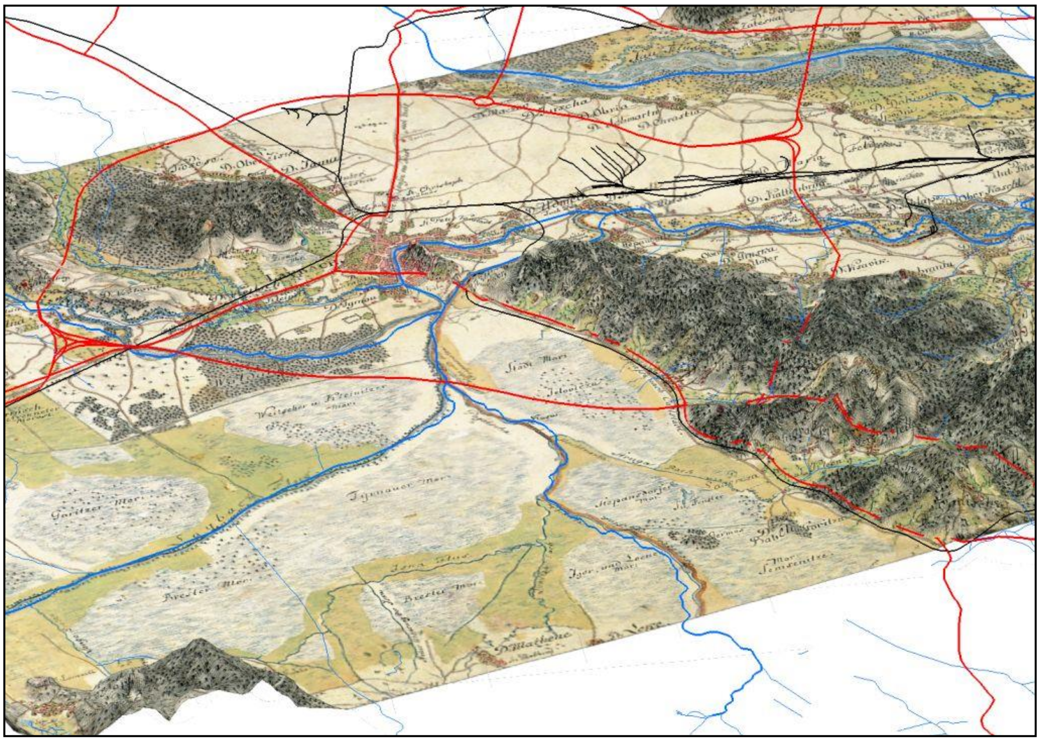
4) A digital elevation model (DEM) error field prediction for absolute error of the National DEM 12.5, calculated for the entire Slovenia (darker area = larger error) as a spatial error model (for Surveying and Mapping Authority of the RS) (2005).



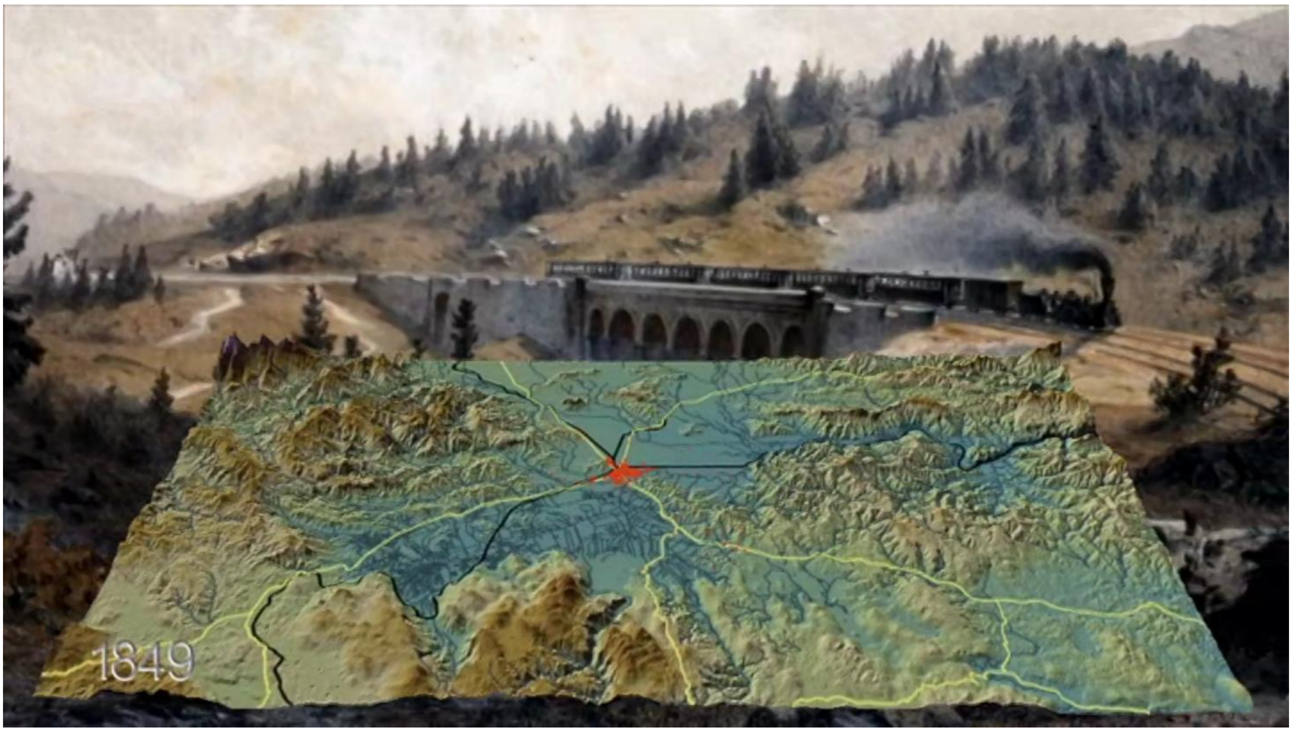
5) A Monte Carlo simulation of potential positional vectorization error. (a) 5 simulations, (b) 1000 simulations (part of Lake Bohinj, Slovenia) (2008).



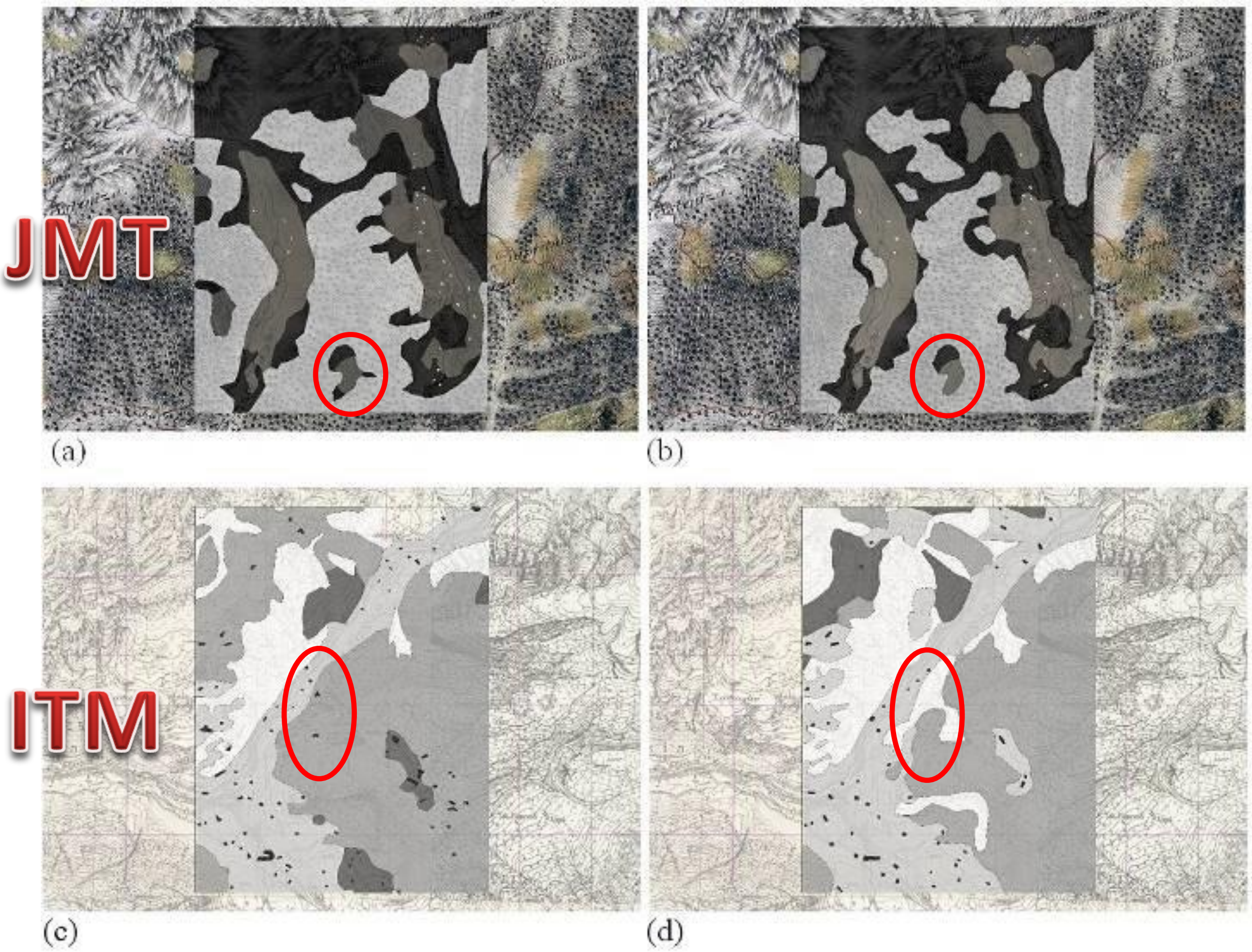
6) A complex Monte Carlo simulation of the error field for positional systematic and locally systematic errors of land use digitized from Josephine survey old map from the end of the 18th century (Lake Bohinj, Slovenia) (2009).



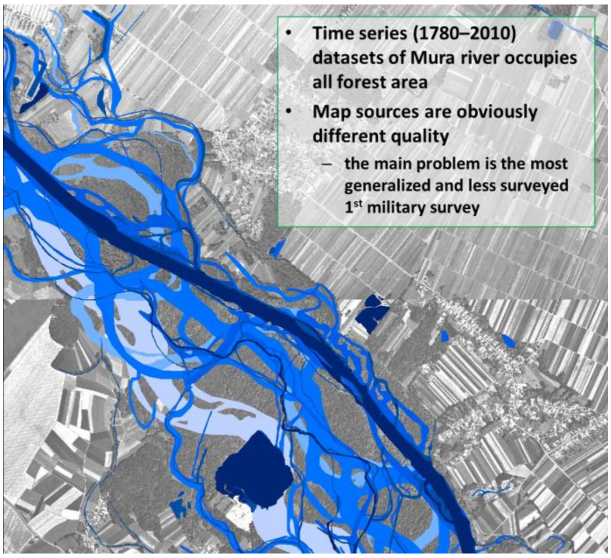
7) Historical maps application: advanced georeferencing, mosaicking, harmonization and land use changes analysis (urban development). The Combination of georeferenced Josephine survey old map from the end of the 18th century with the contemporary road and hydrological network (Ljubljana, central Slovenia, for the film "Nature and the City" for the City Museum of Ljubljana) (2010).



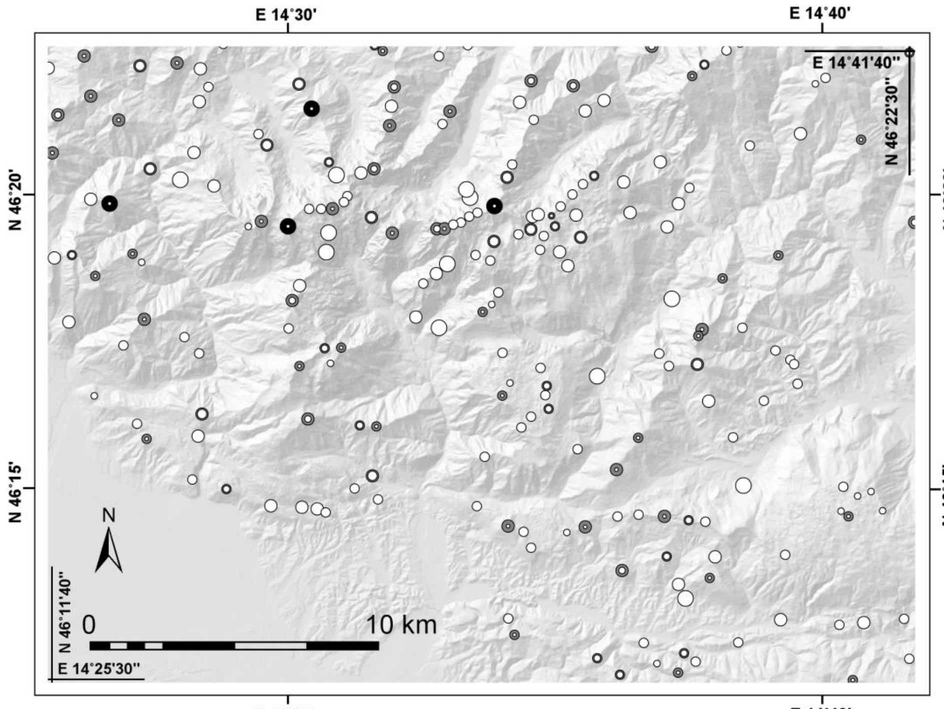
8) Paleo relief & historical environment modelling time series (Ljubljana Marshes); City Museum of Ljubljana, “Nature and the City” exhibition (two excerpts from the film) (2006).



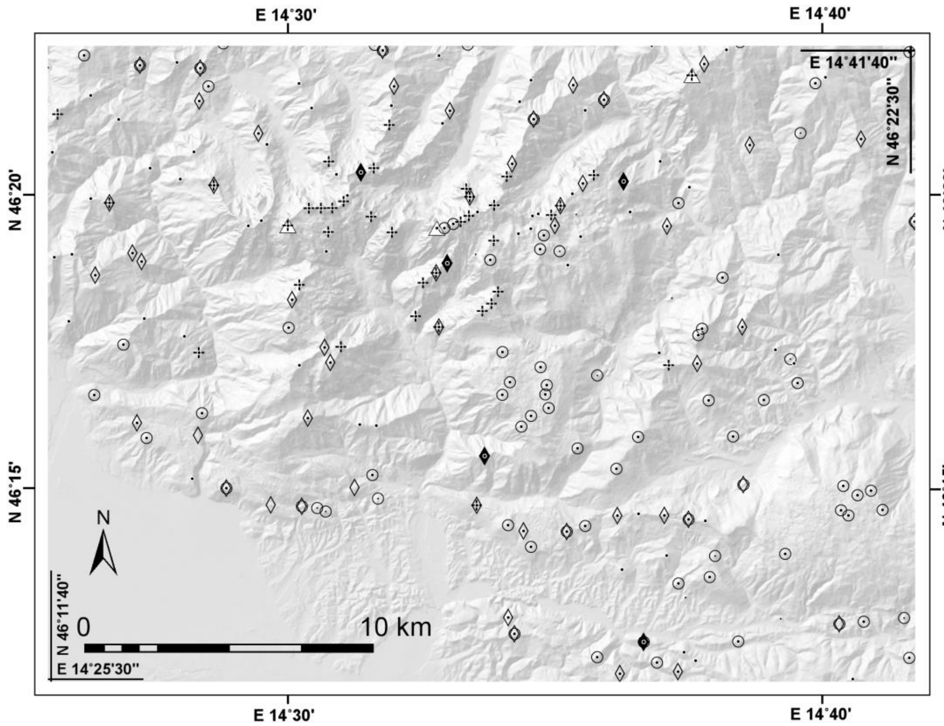
9) QA/QC through interpretation and repeatability – land use data digitalization of two series of old maps* (a: JMT, c: ITK) and repeated digitalization several days later (b, d) with the same experienced operator. The human factor in thematic accuracy is unexpectedly high and obvious. The result – together with participatory cartography can be used to enrich the final database and knowledge (for SISTEMaPARC – Spatial Information Systems for Translational Environmental Management of Protected Areas and Regions in CADSES) (Uskovnica and Voje, W Slovenia). *JMT: Josephine Military Topography in scale 1:28,800 from the end of 18th century ITM: Italian Topographic Maps in scale 1:25,000, from the beginning to the end of 20th century (2008).



10) Land use stability analysis – historical hydrology (Mura River, NE Slovenia) (for TransEcoNet – Transnational Ecological Networks, Central Europe, EU) (2011).

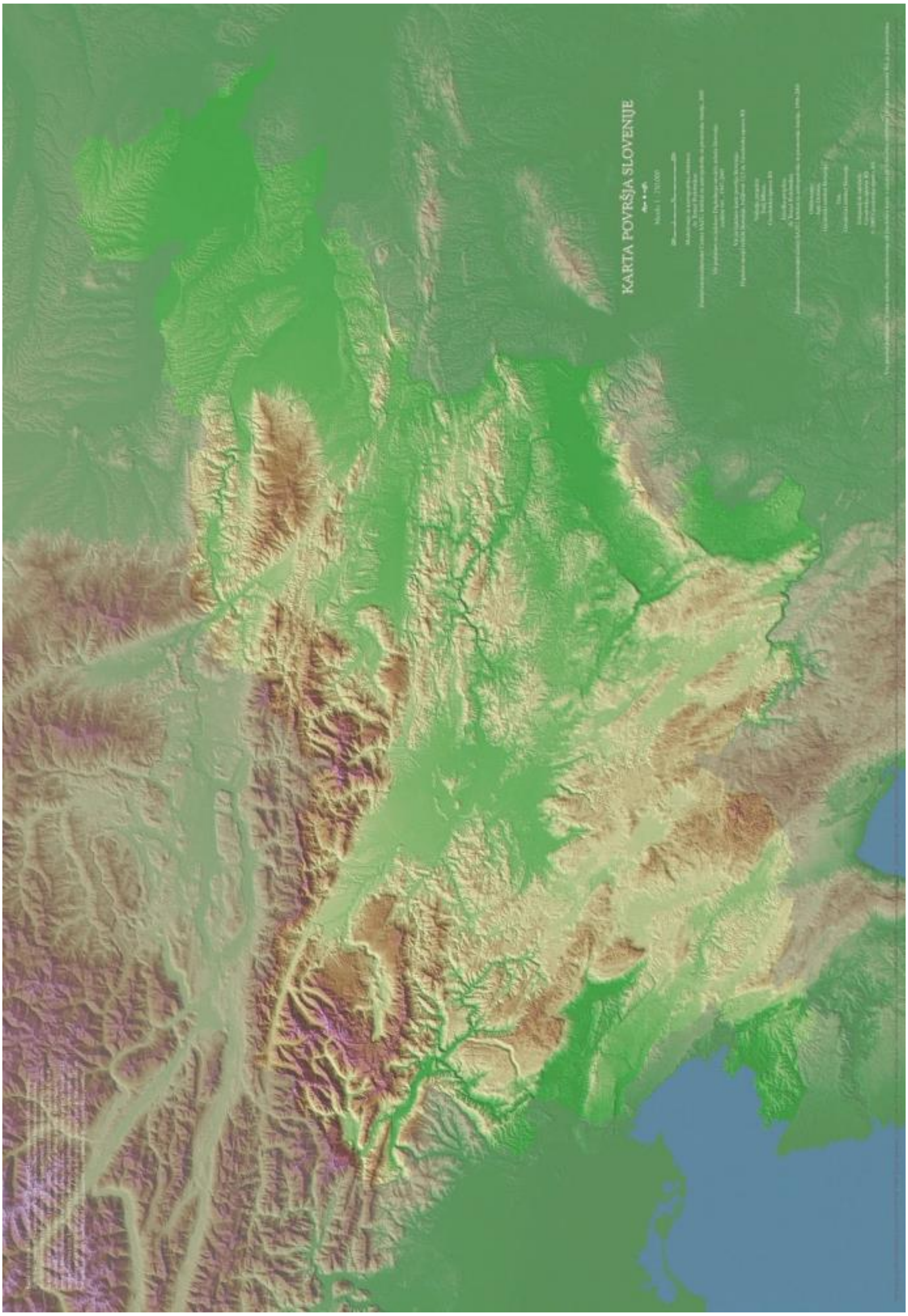


(a)

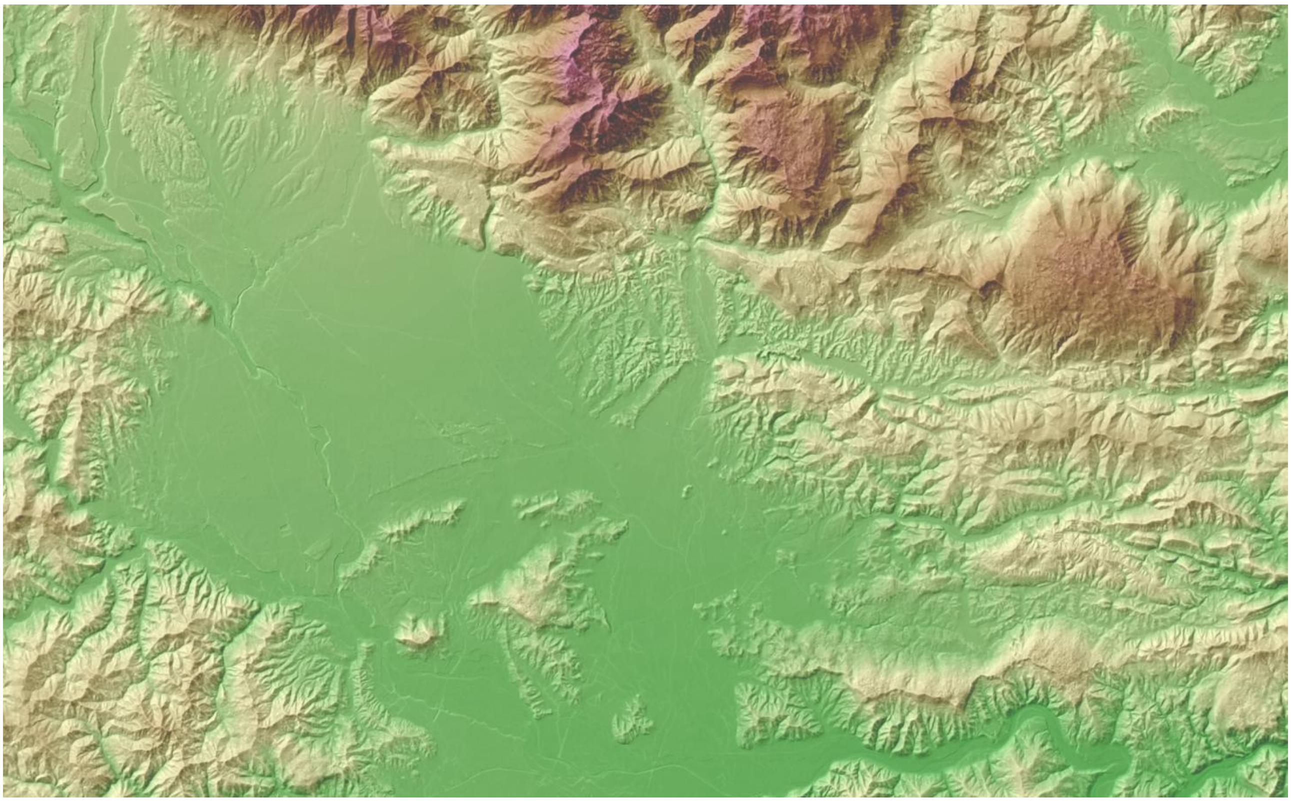


(b)

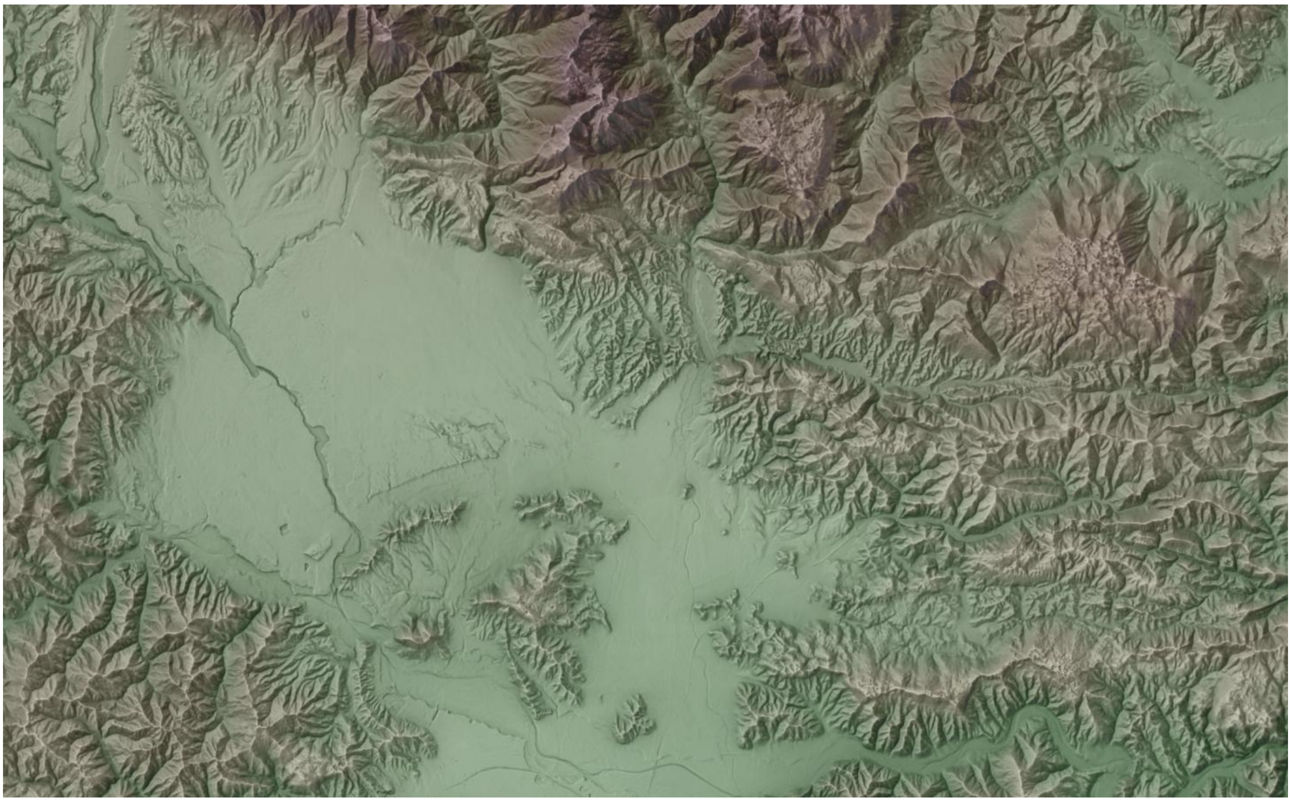
11) Detecting Mountain Peaks and Delineating Their Shapes Using Digital Elevation Models, Remote Sensing and Geographic Information Systems Using Autometric Methodological Procedures: (a) The extent of conical formation in regional peaks. Large black circles with small white dots denote evident "conicalness", whilst smaller grey circles denote some degree of conical form, and the white circles of different sizes denote the peaks that are not conical.
(b) Regional with global peaks (triangular). Additional labels denote the shape of the peaks: crosslet: sharp peak; empty circle: blunt peak; rhombus: oblong peak (a full rhombus denotes a greater degree of oblongness). It can be seen that the sharp and blunt shapes of the peaks cancel each other out, while the oblong shapes can add to each other (B&W cartography, Kamnik Alps, North Slovenia, 2012).



12) Landform map of Slovenia on a scale of 1:250,000 that has been used in all high schools in Slovenia with inventively enhanced topographic edges and multi-scale appearance using different methods. The map was also produced for a comprehensive presentation of the high quality national digital elevation model of Slovenia (DEM 12.5 m) produced based on my unique methodology. This model was integrated into both the European model and the improved Google Earth model (for the Surveying and Mapping Authority of the RS) (2005).



(a)



(b)

13) Advanced analytical shading techniques development: (a) Enhanced topographic edges, multi-scale appearance using different methods. (b) Global shading, enhanced topographic (morphologic) edges, lighter flat areas, multi-scale and isotropic appearance, using multidirectional visibility index (MVI) (north part of Slovenia) (2005-2012).

(a) 

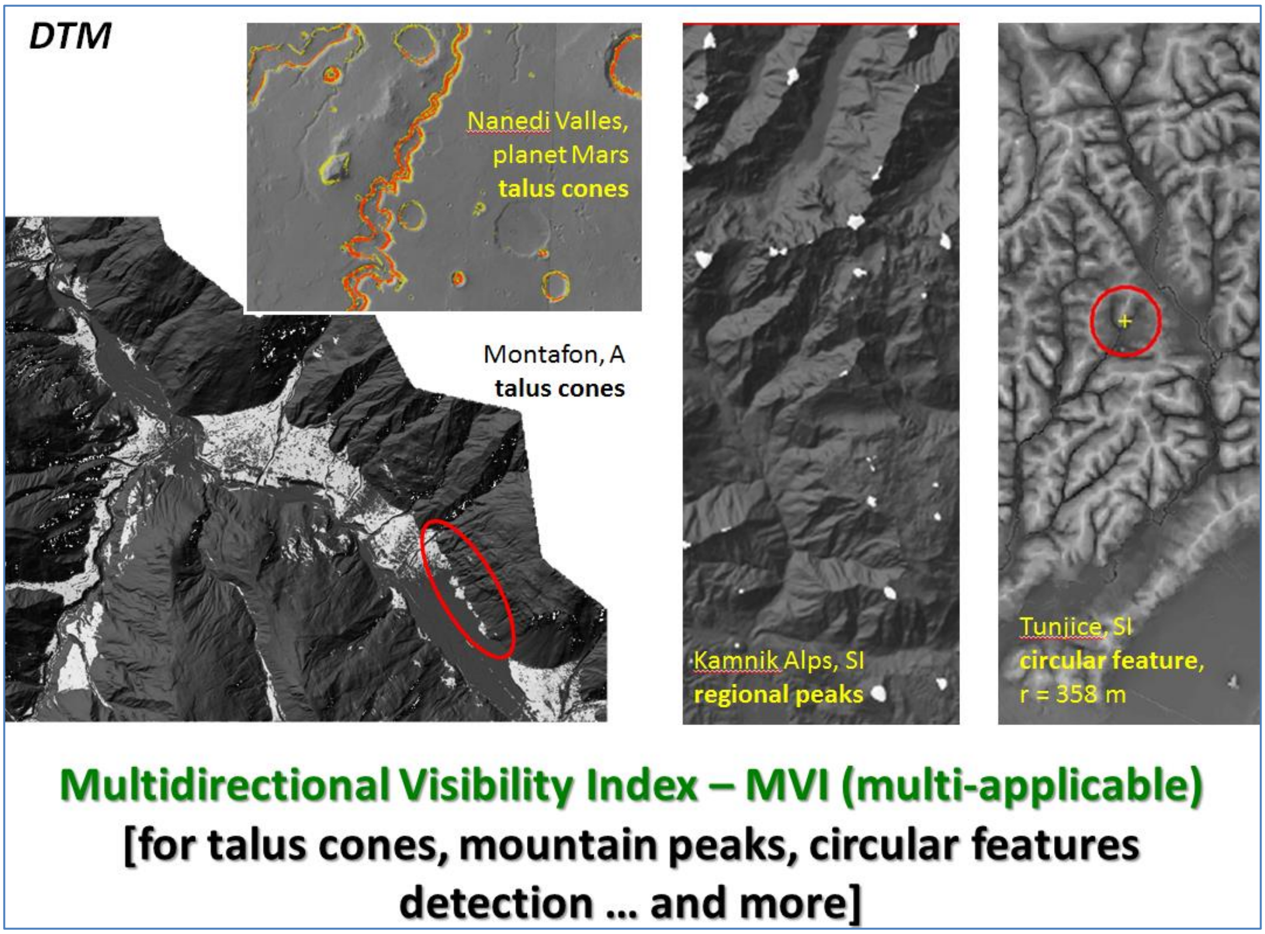
(b) 

14) Advanced analytical shading: A comparison of classical (a) analytical shading and (b) one of the options applying the multidirectional visibility index (MVI) (below, Podobnikar 2012). The data source is a lidar digital surface model (DSM) with a resolution of 1 m. (small town Kobarid, NW Slovenia) (2012).

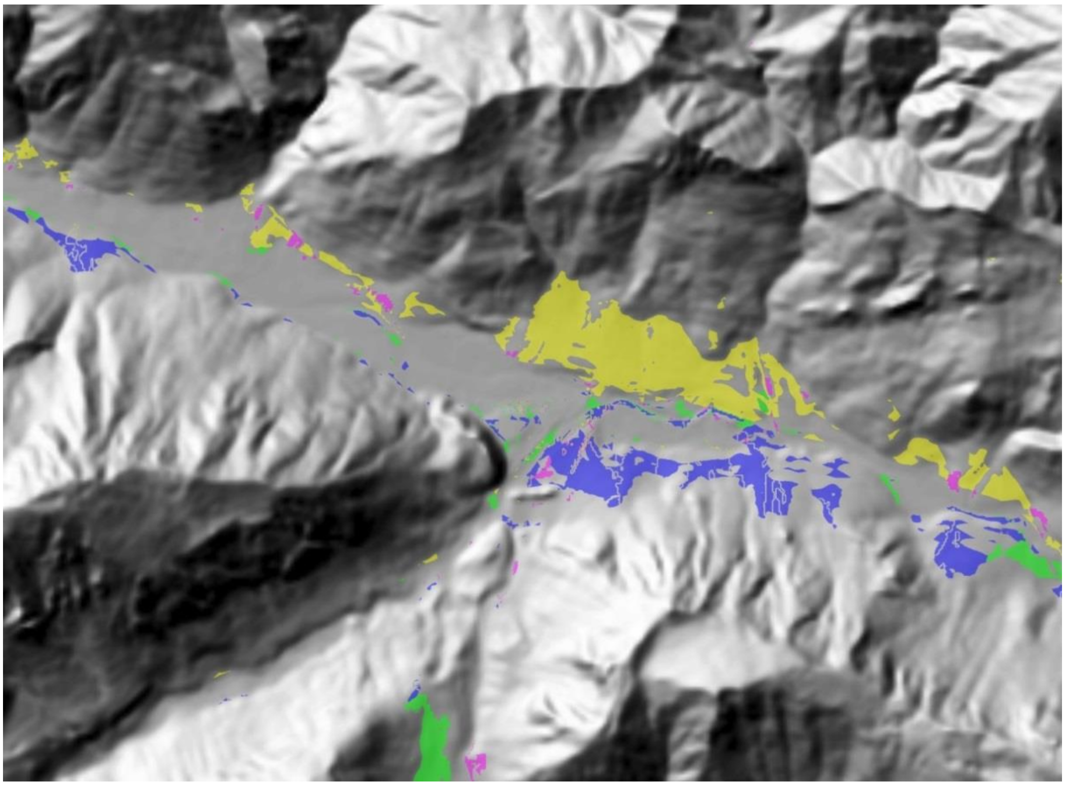

(a)


(b)

15) Application of my multidirectional visibility index (MVI) for image processing: (a) An original photograph, and (b) the analytically shaded scene as the multidirectional visibility index (MVI) composed from visibility masks of the photographs. Many very small features (details) and prominent structures are more recognizable in the photograph b) (2012).



16) A multi-applicability of my multidirectional visibility index (MVI) – generic methods 2006-2013).

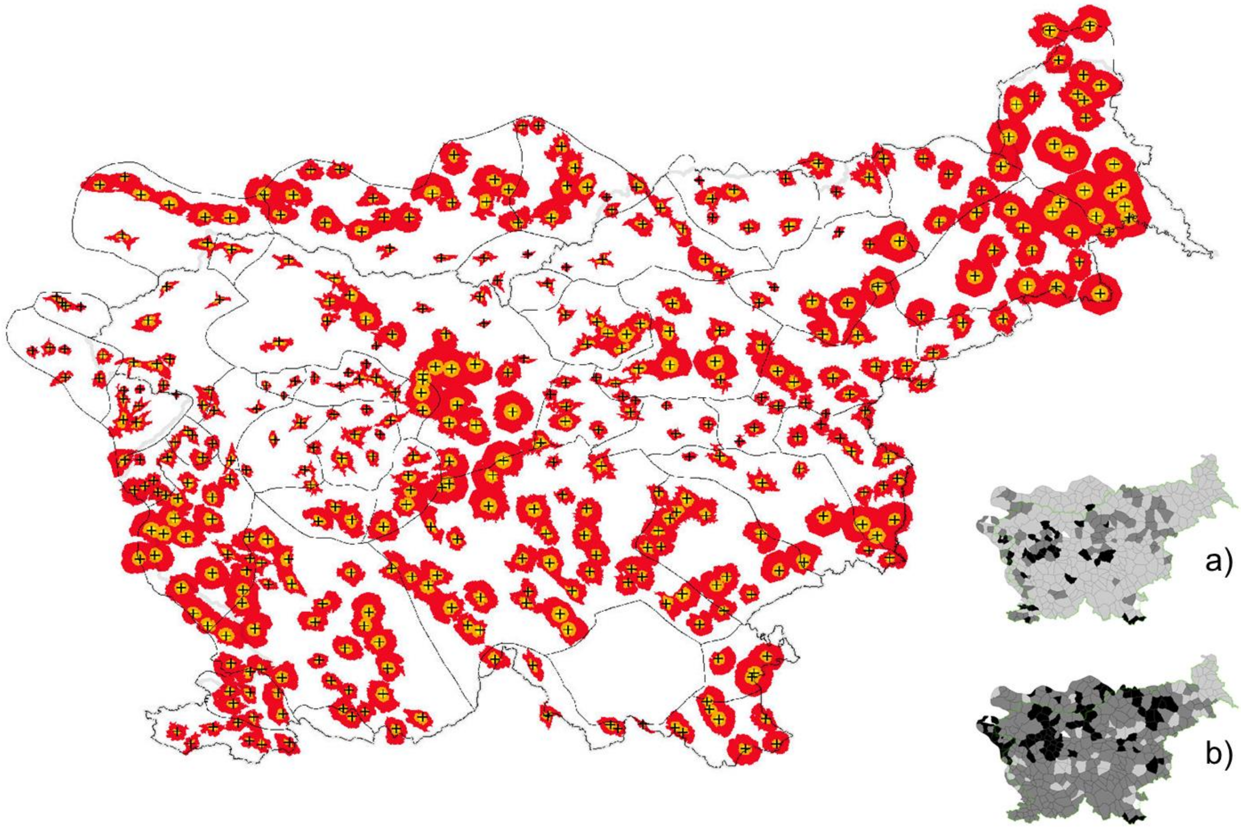


17) Geomorphometry development: A talus cones model, small inclinations (Upper Sava Valley, NW Slovenia, 12.5, 7.9 x 5.8 km, using DEM) (2007).

(a)

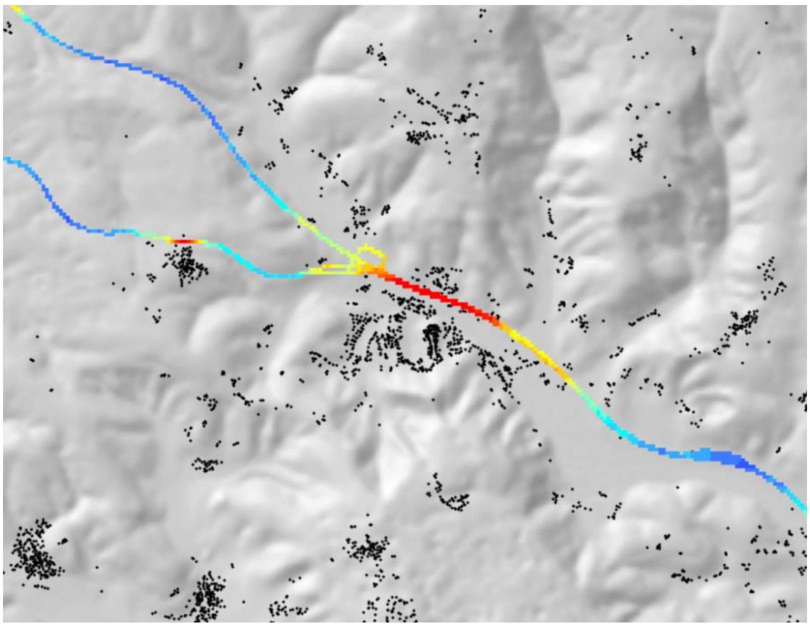
(b)

18) Geomorphometry development: (a) Talus cones model, small inclinations (slopes), and (b) large inclinations, using lidar (Upper Sava Valley, NW Slovenia, 7.9 x 5.8 km) (for PARAmount, Alpine Space Programme) (2007).

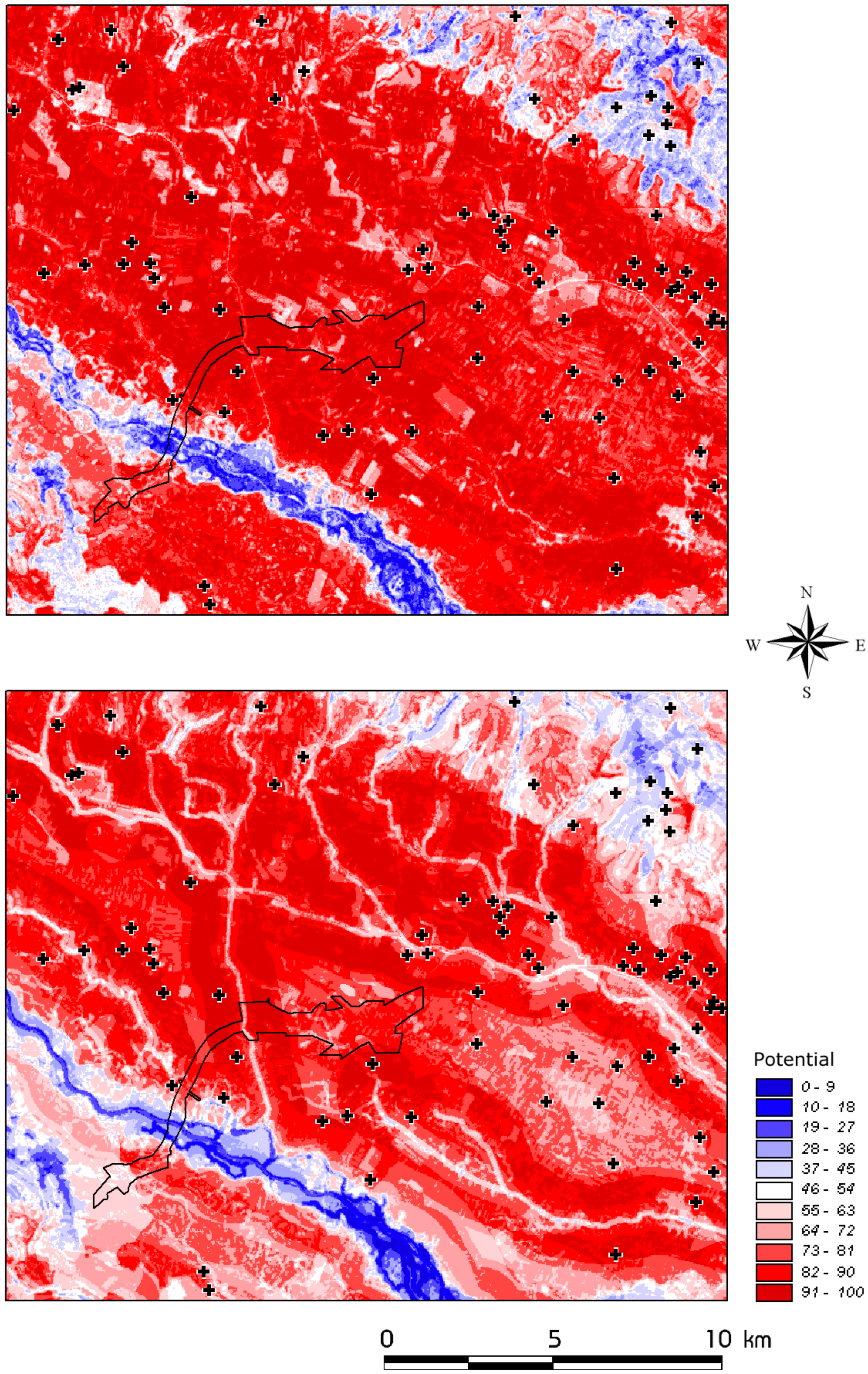


Cost distances: Areas of the same energy consumption considering the slope of relief in environs of 406 data points from SLA. For visual interpretation and classification – right: a) more oblong and b) smaller regions are darker

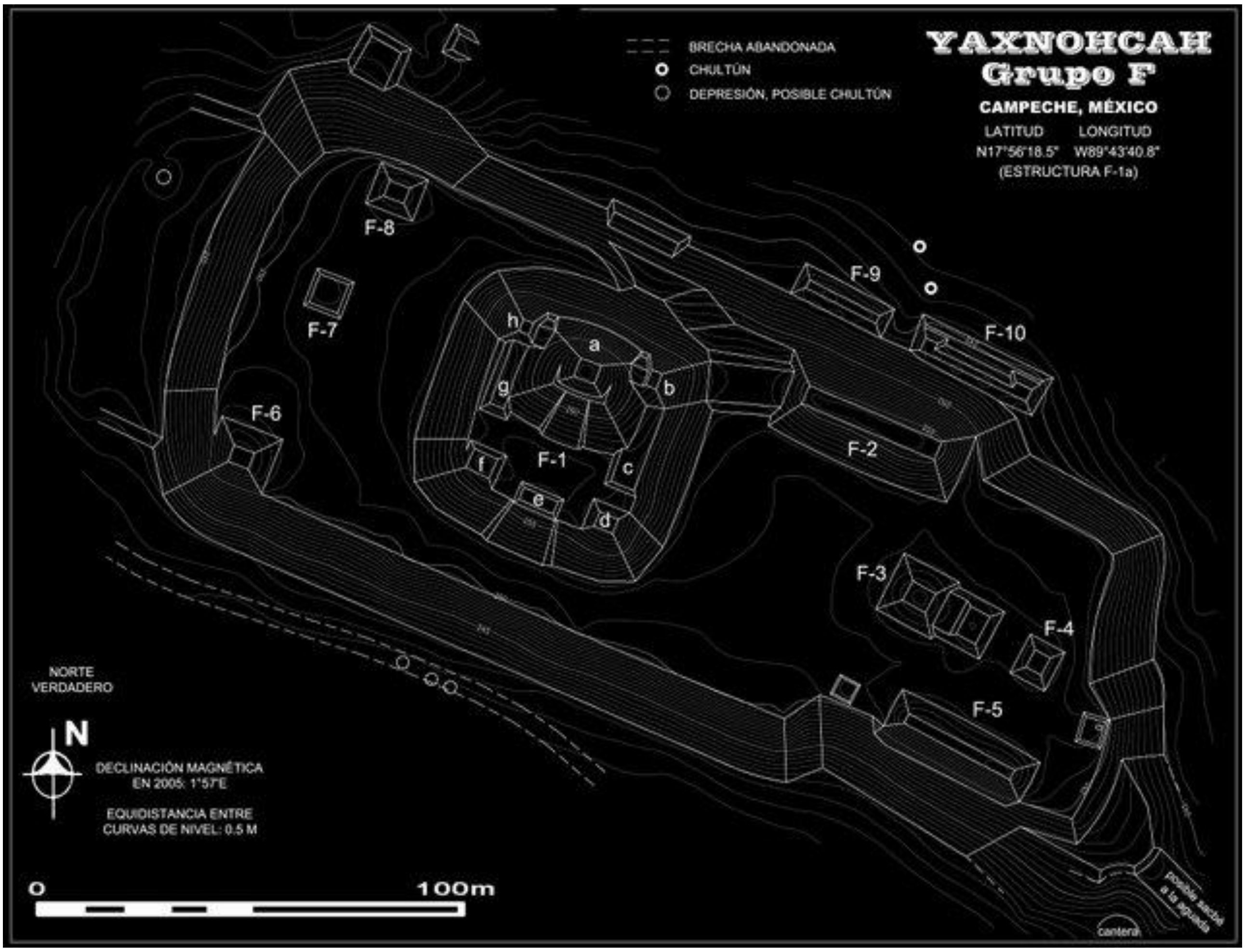
19) Dialectometry: measuring of similarities, a classification for more precise determination of local speech areas in environments of Slovenian Linguistic Atlas data, and a more precise determination of dialect areas and dialect groups' areas in Slovenia (2009).

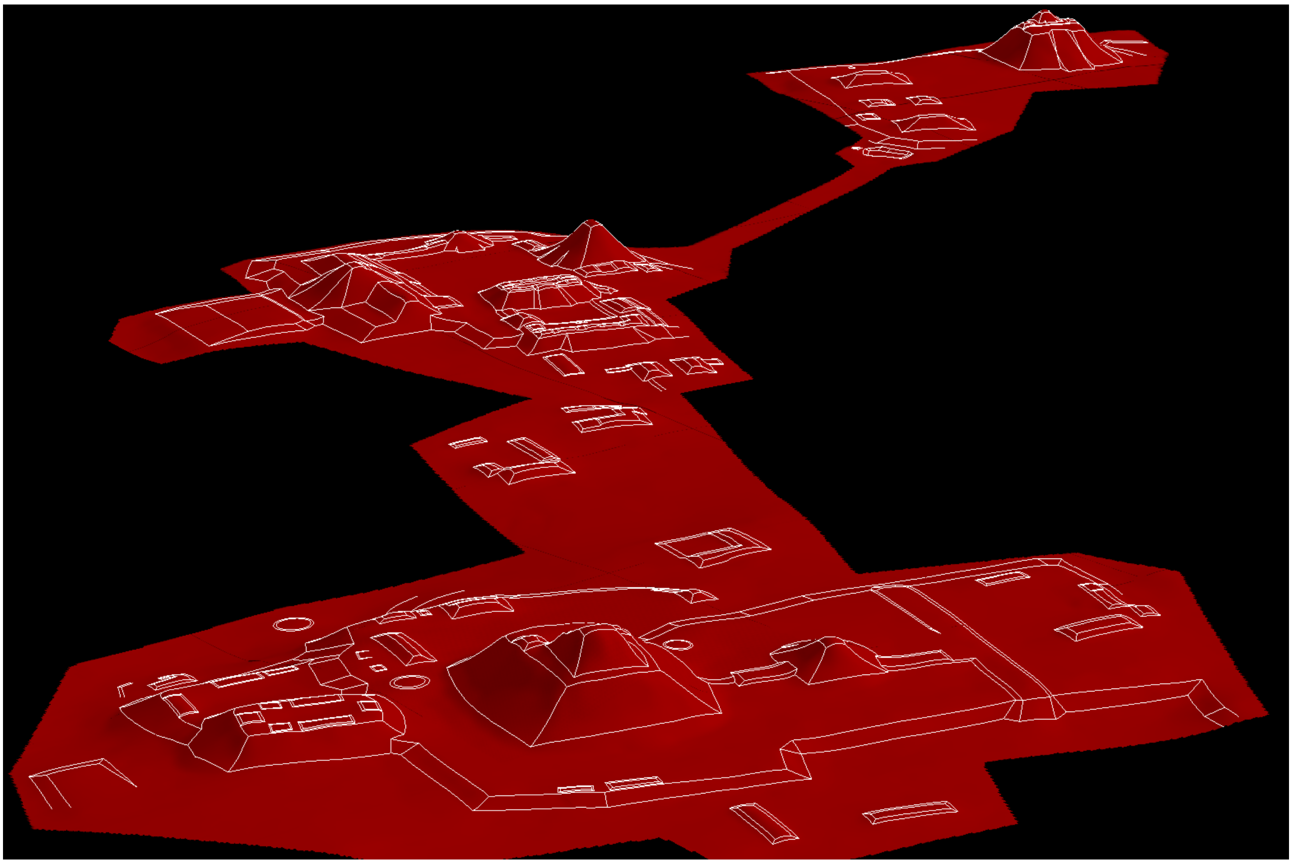


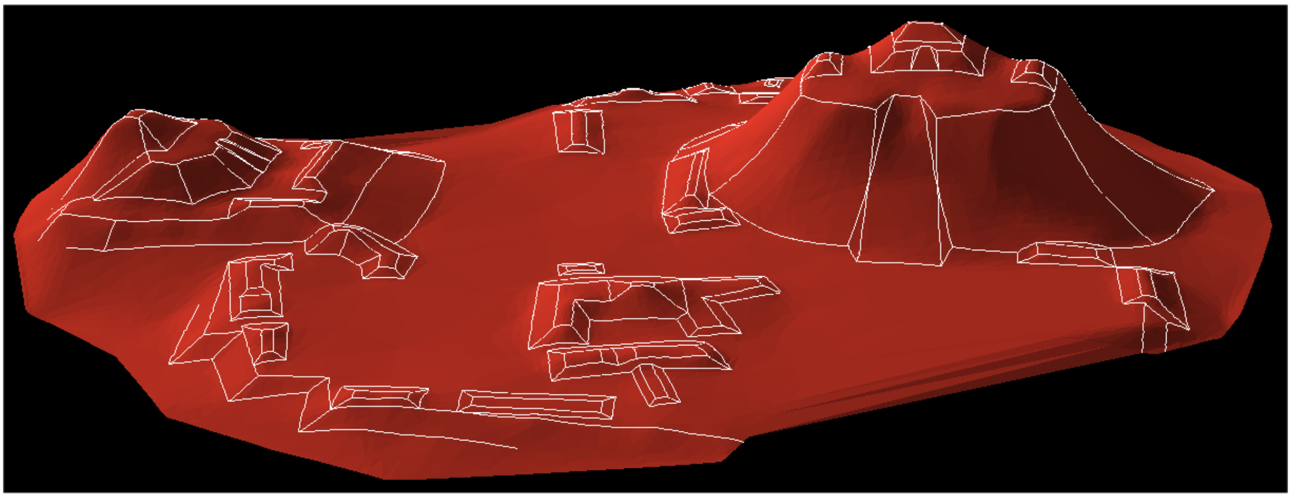
20) Modelling the spatial parameters for dynamic road pricing (Slovenia): Detailed presentation of the model with a distribution of population, where the red patches are distinctive negative influences of highways to a residence and blue distinctive positive (Preparing of the starting points for the methodology of dynamical toll collection considering sustainable development (Lower Carniola = Dolenjska, Slovenia) (for Ministry of Traffic RS) (2006).



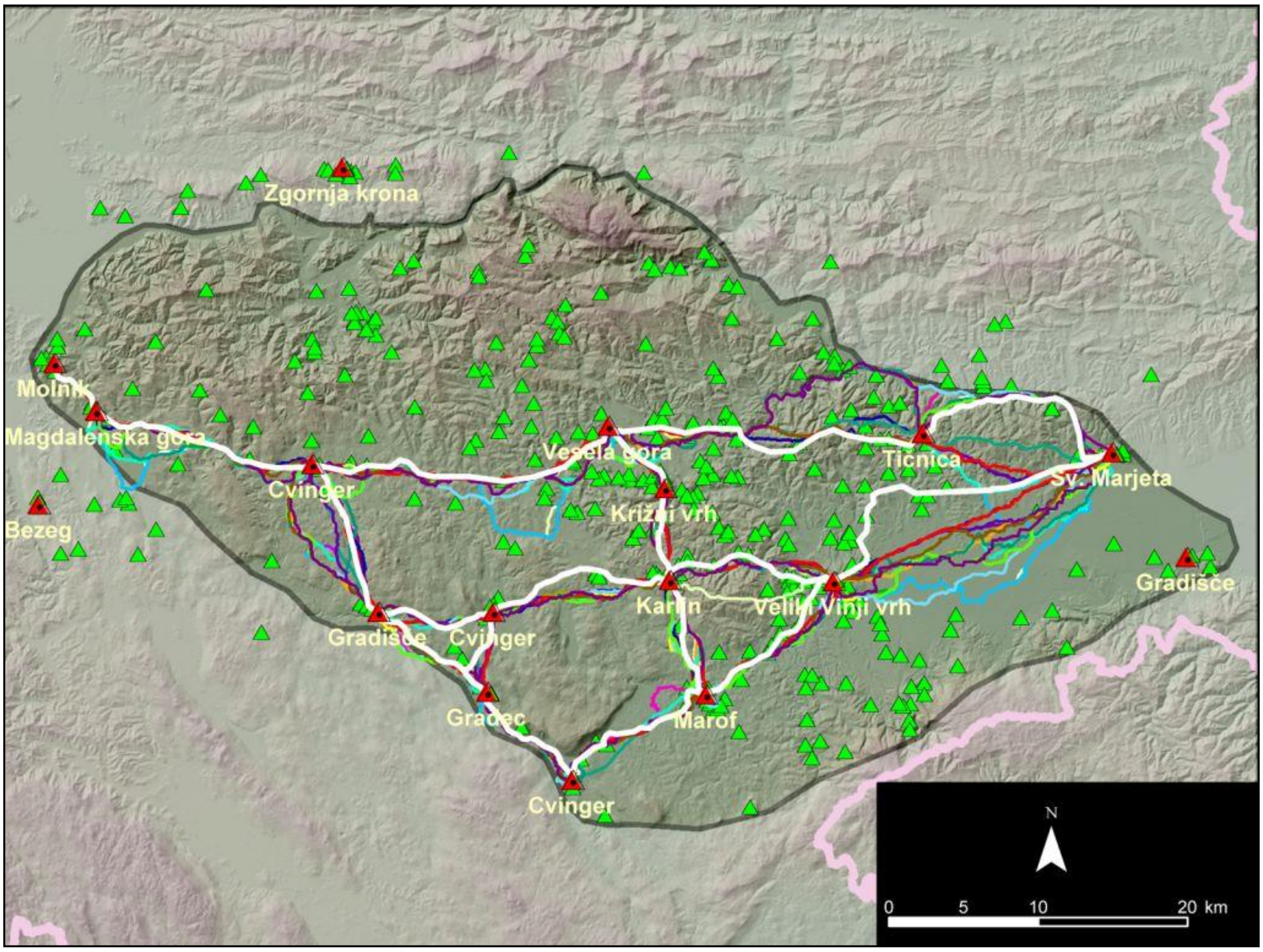
21) The archaeological predictive model based on archaeological data for Slovenian highway network planning (Landscape archaeology, Pomurje region, NE Slovenia) (for Methodology of archaeological predictive models in the planning of road construction, DARS d.d.) (2001).


YAXNOHCAH
Grupo F
CAMPECHE, MÉXICO
LATITUD LONGITUD
N17°56'18.5" W89°43'40.8"
(ESTRUCTURA F-1a)
BRECHA ABANDONADA
CHULTÚN
DEPRESIÓN, POSIBLE CHULTÚN
F-1
F-2
F-3
F-4
F-5
F-6
F-7
F-8
F-9
F-10
a
b
c
d
e
f
g
h
NORTE VERDADERO
N
DECLINACIÓN MAGNÉTICA EN 2005: 1°57'E
EQUIDISTANCIA ENTRE CURVAS DE NIVEL: 0.5 M
0
100m
posible sacbé a la aguada
cantera

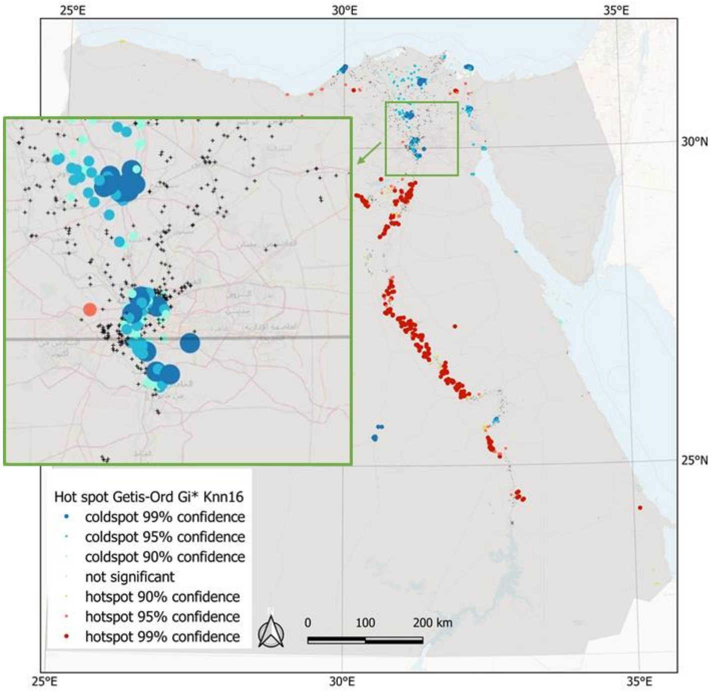




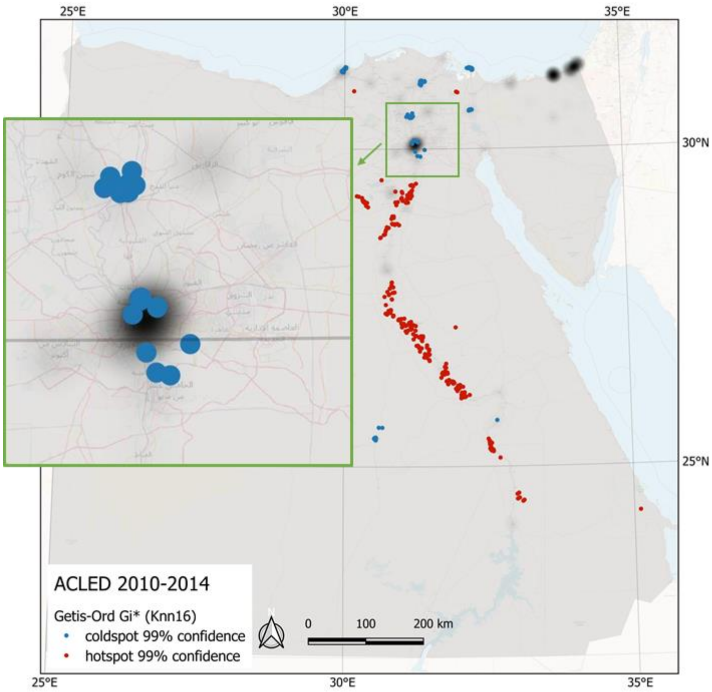
22) Maya heritage surveying, traditional and 3D (perspective) sophisticated mapping (examples for Yaxnohcah and Las Delicias, Yucatan, Mexico, CRE grant) (2004-2005).



23) A multi-simulation of historical paths between prehistoric settlements, including a participatory mapping approach (Lower Carniola = Dolenjska, Slovenia) (2004). Based on this model, archaeologist found segments of prehistoric paths.

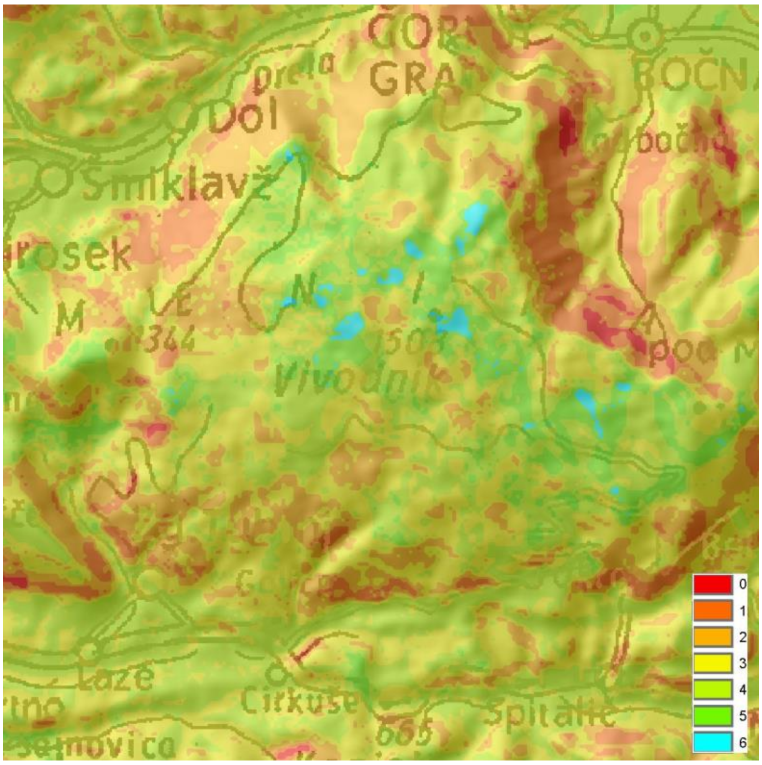


Egypt:
MPI (multidimensional poverty) hot-cold spots, based on the DHS data for the year 2014 where a feature with a high value surrounded by other high-value features appears as a hot spot. On the map, poor and rich areas are mapped, where the black dots are insignificant locations regarding MPI.

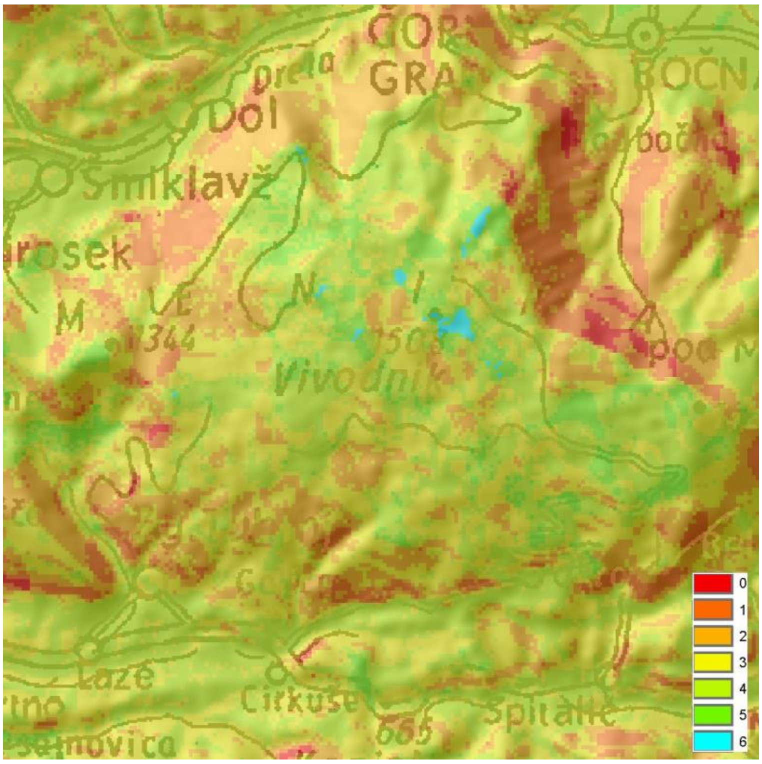


Egypt:
Overlaying hot-cold spots with density of events based on ACLED (2010-2014) provides a visual relation between them.

24) Human development, poverty and multiple shocks in the Arab region, as ESCWA (Cluster 2 and 6) project builds on ongoing and past work on multidimensional poverty, estimated for all member states, as well as on methodologies developed to estimate the costs of child marriage, and the expertise in spatial analyses from Statistics. The unique contribution is to link knowledge on governance, human development and spatial analyses and provide for a comprehensive view. Descriptive and exploratory spatial analysis with main goal to understanding patterns of households (PSU), multidimensional poverty [MPI] and events (multiple shocks) with their intensity, relations, through time, via maps. I provided and automated and optimized solution (FOSS4G) coded in Python (GDAL, QGIS), PostGIS and CMD Shell as proof of concept. A series of automatically processed 62 maps were produced (2022).

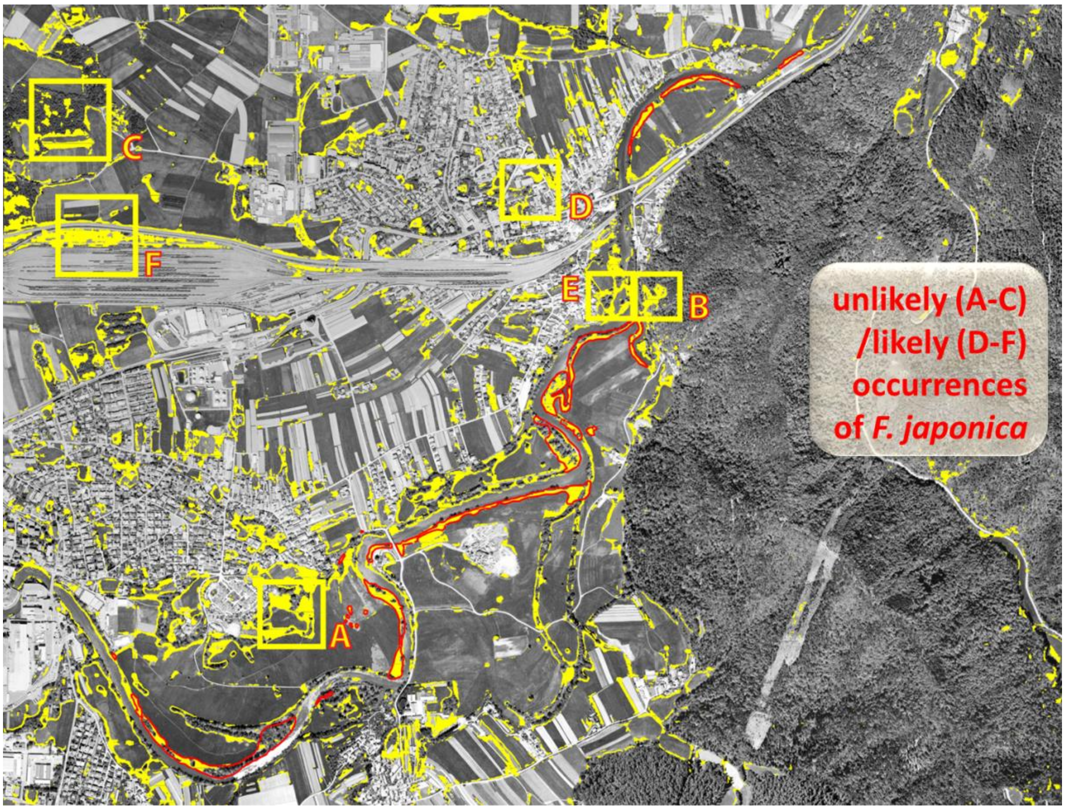


(a)

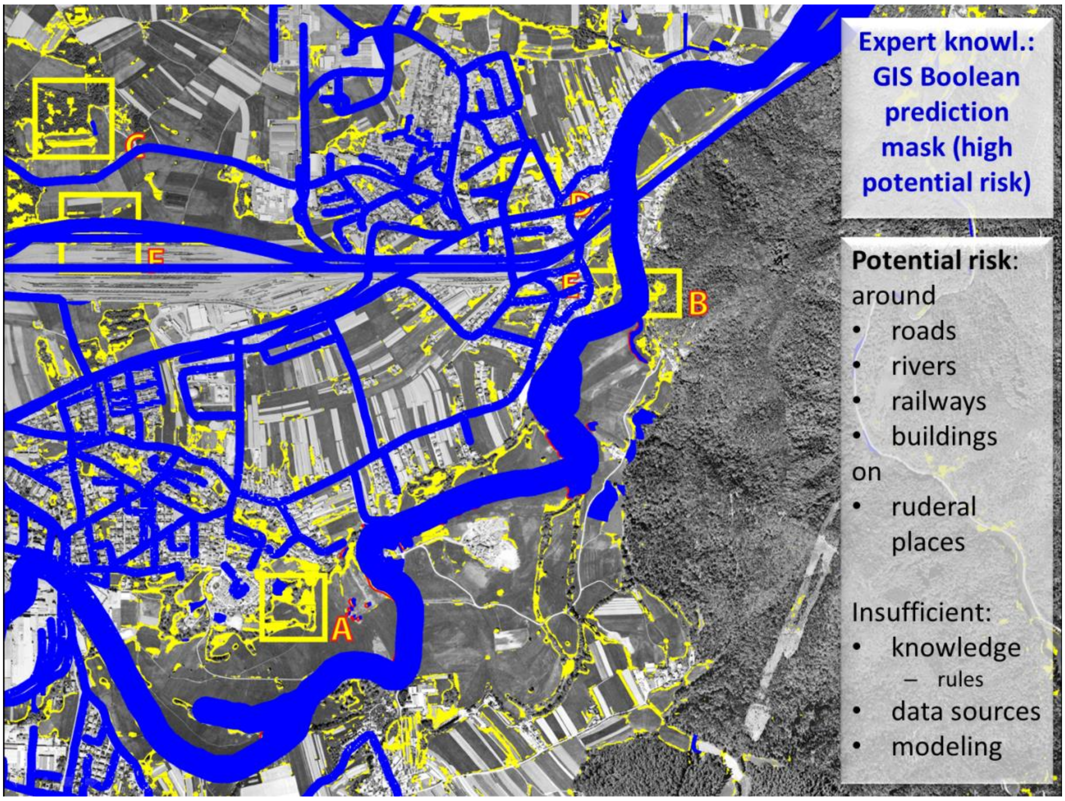


(b)

25) A GIS-based predictive model that can identify suitable sites for wind energy installations: (a) Results for Menina planina classified in six classes (values present how many of all the 6 criteria are suitable for installing wind power plants – land use, settlement areas, roads, slopes, mean wind velocity data and protected areas); 10 x 10 km, where an average wind velocity at least 4.5 m/s, and (b) at least 5.0 m/s (Menina planina, central Slovenia) (for Alpine Windharvest; Alpine Space Programme) (2005).

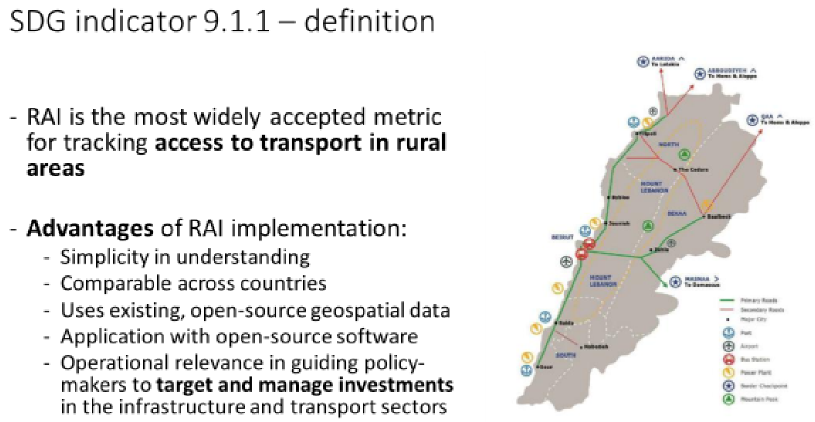


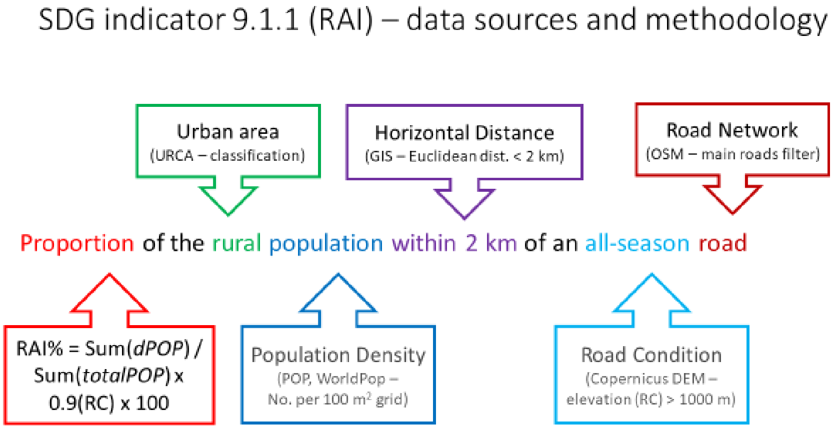
(a)

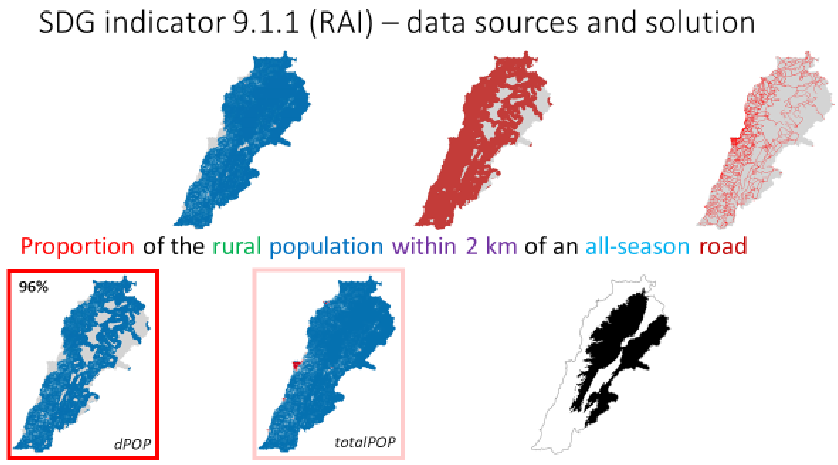


(b)

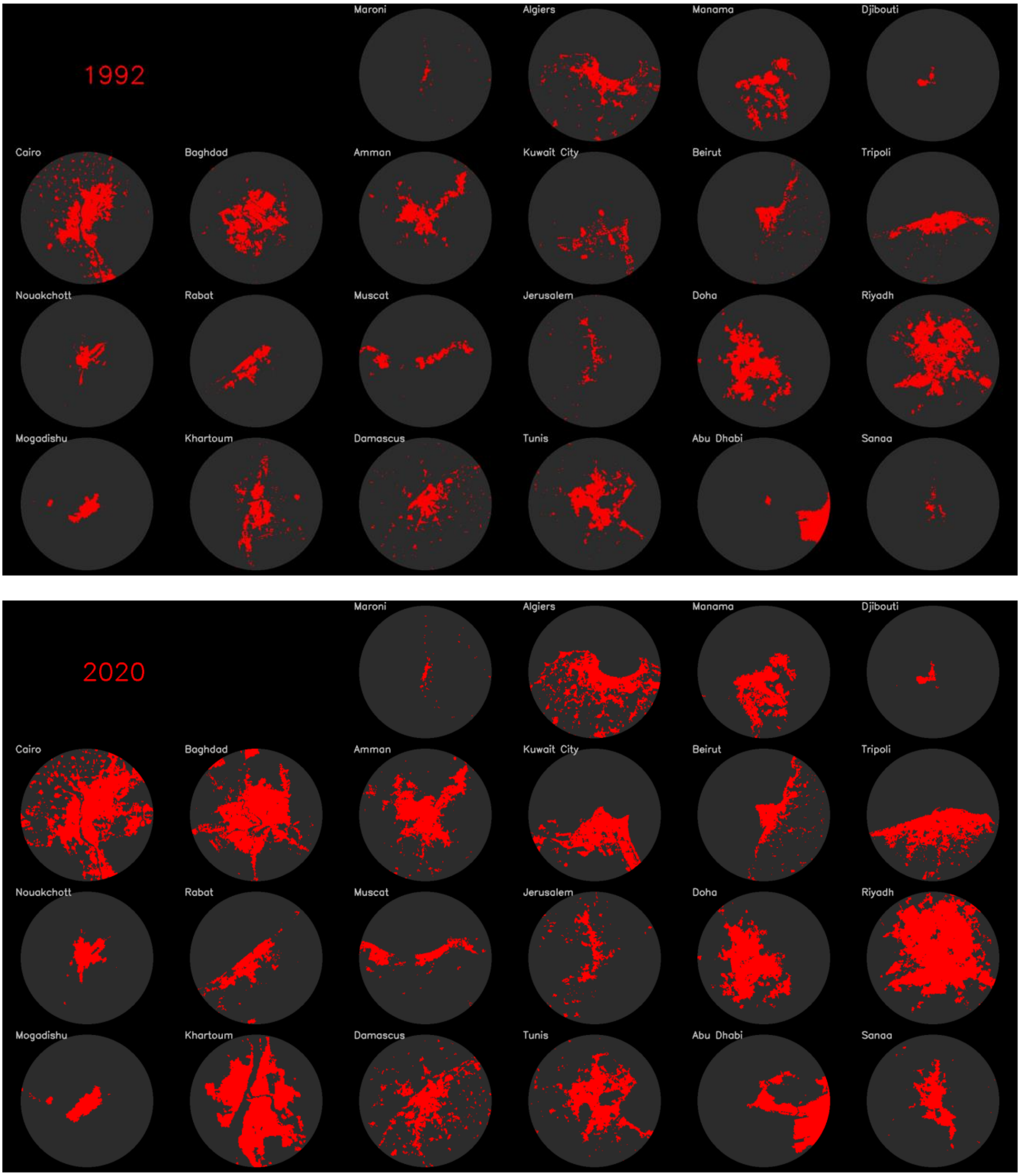
26) Japanese knotweed (*Fallopia japonica*) is listed among 100 of the World's worst invasive alien species and poses an increasing threat to ecosystems and agriculture. (a) *F. japonica* prediction: A RS method based on a random forest model to detect local occurrences of *F. japonica* (yellow) from low-cost digital orthophotos by concurrently exploring its temporal, spectral, and spatial characteristics, in relation to ground truth field mapping (red). (b) A GIS-based predictive model (blue) of *F. japonica* over detected *F. japonica* (yellow) (a built-up and semi-natural area in the east part of Ljubljana, Slovenia) (2012).



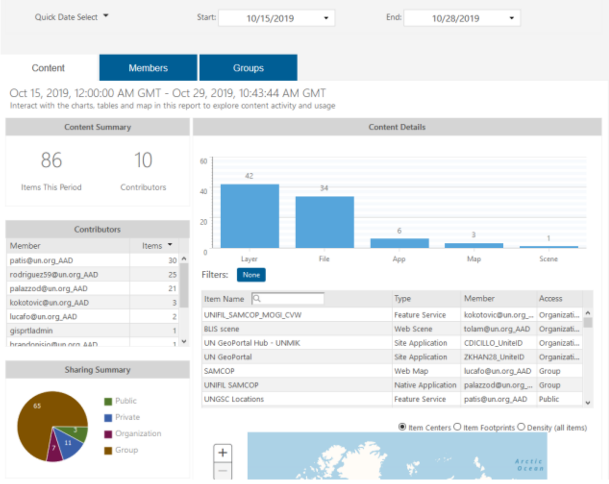


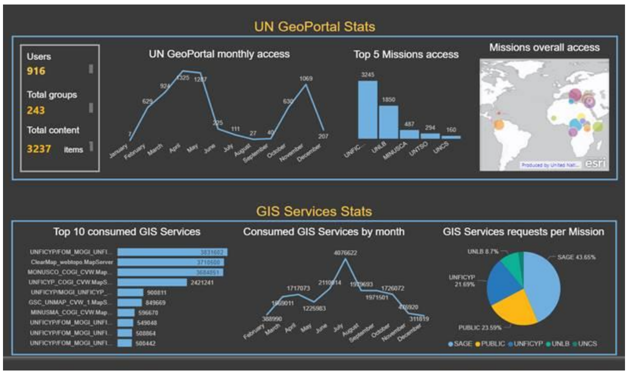


27) SDG indicator 9.1.1 (Rural Access Index, RAI) application with my simplification, but effective and quality solution, presented for the Use Case Lebanon, using optimized ESCWA SDI standard procedure with fundamental data themes, which I developed, too. Applying the SDI and optimized algorithm for this SDG was realized through automated (on click) and speedy solutions for all 22 Arab States (2023).

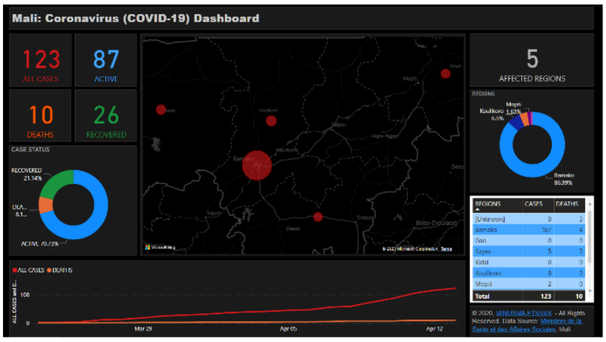


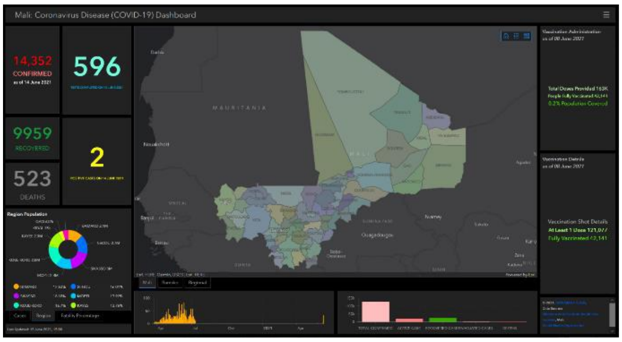
28) Built-up areas for 22 Arab capitals: Time series 1992-2020 (yearly). Based on ESCWA SDI standard procedure + fundamental themes and automatic FOSSAG solution. Different versions were produced to simulate and visualize urban population growth. Data source: Copernicus land cover data with resolution 300 m. Radius around each capital is r = 25 km, projection is Lambert. More comprehensive visualizations of simulations were also automatically generated in GIF and MP4 formats (2022).





29) Design of the UNGSC internal dashboard for the Unite Geoportal and GIS service statistics in Power BI. The geoportal fulfilled the following goals that I proposed: (a) monitoring and creating alerts, (b) automated production of queries and for easier writing reports, (c) internal monitoring of key performance indicators (KPI), (d) continuous registration from different kinds of devices, (e) all data are collected and stored to a common server, (f) maximizing efficiency of the resources and minimizing environmental impact, (g) savings: strategic, operational, environmental and financial. The geoportal design was aligned with SOP-FSSU-1002 (Podobnikar, T. 2019: UN GeoPortal Governance: managing access, groups and roles) (2003-2019).





30) I initiated an idea of a COVID-19 spatial platform in the UN. I proposed the following applications: (a) visualization – qualitative presentations (infogrames, maps) for individuals, populations, immunity status, for predictions, (b) tracking (+ alert) infected people, to allow a social distance, (c) dispatch system (based on various data, tracking), (d) propose an optimal treatment system, (e) analytics to check and react to different scenarios, (f) prediction next stages of epidemics, (g) analytic tools to check if the public/government data are correct. I could realize a live survey data spatial dashboard for MINUSMA in 2020. I had consultation with Mali WHO Country Office on further implementation of this COVID-19 spatial platform. Visualization solutions: Power BI dashboard (left), ArcGIS Dashboards (right). The latter allowed better cartography, which outreach is in publication “Geospatial for Humanity: Prevention, Response and Recovery of the World from the Pandemic COVID-19”, UN-GGIM, 2021 (2019-2023).