



Summary of the main activities of the Institute of Geography of the Slovak Academy of Sciences



GEOGRAFICKÝ ÚSTAV SAV
INSTITUTE OF GEOGRAPHY SAS



Structure of the Institute

- Director: prof. RNDr. Vladimír Ira, CSc. (2012-2015)
Mgr. Daniel Michniak, PhD. (since May 2016)
- Department of Physical Geography, Geomorphology and Natural Hazards
- Department of Human and Regional Geography
- Department of Geoinformatics
- Economic-Administrative Department (till 31 March 2015 it served also for the Institute of Mathematics)
- The Institute of Geography is the smallest institute in the Section 1 of the SAS (Section 1 - Physical, Space, Earth, and Engineering Sciences)
- In average (2012-2015) 28 employees with university degrees were engaged in research and development (20.4 FTE)



Mission of the Institute

The Institute of Geography

- is focused on **the basic research into the spatial structure of natural and socioeconomic systems in their interactions, with special regard to the territory of Slovakia.**
- carries out research in Physical, Human and Regional Geography and in Geoinformatics.
- has a specific position because it carries out **research at the interface** of Earth sciences, environmental sciences, social sciences and humanities.
- Each area of scientific research should be evaluated in a different way using other parameters of assessment.



Structure of the scientific activities

2012–2015 four research clusters:

- Structure and Dynamics of Natural Landscape, Hazards and Risks
- Landscape Changes Explored by Application of Remote Sensing Data and the Geographic Information Systems
- Sustainability and Quality of Life in Changing Environment
- Society in Flux, Spatial Disparities, and Local and Regional Development

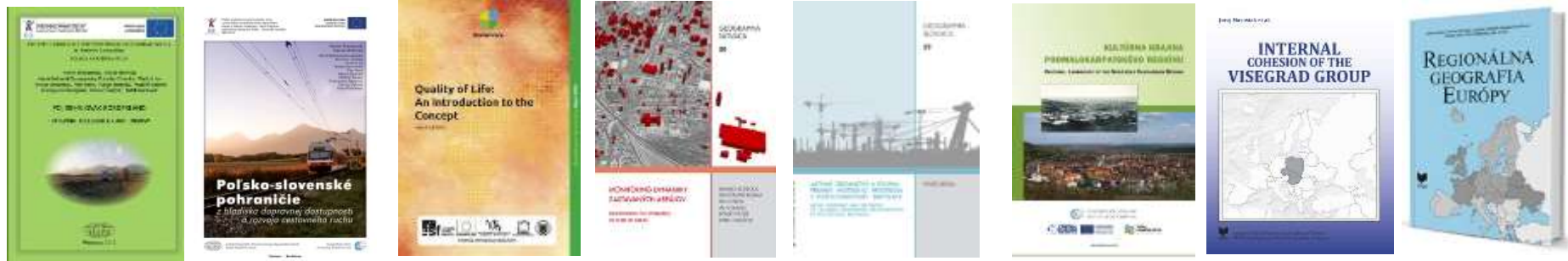
2016-2020 three research clusters:

- Structures, processes and hazards of river systems – their response to and impact on the natural and socio-economic systems
- Land use/land cover change (LUCC) research based on remote sensing
- Development trajectories of localities and regions in the context of socio-economic changes



Publications

- Monographs/books published abroad: 2
- Monographs/books published in Slovakia: 6 + 1 (monographic study)

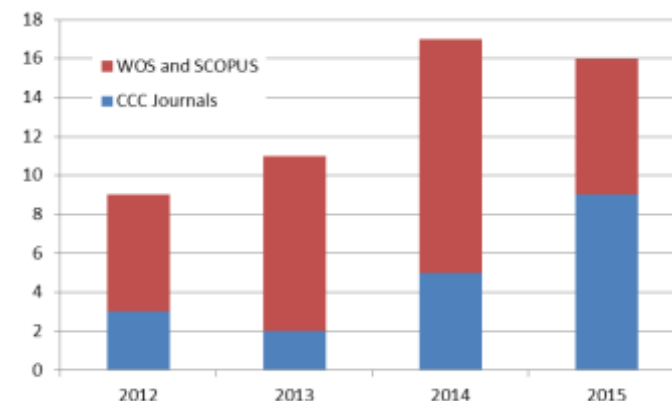


- Chapters in scientific monographs published abroad: **13**
- Chapters in scientific monographs published in Slovakia: **9**



Publications

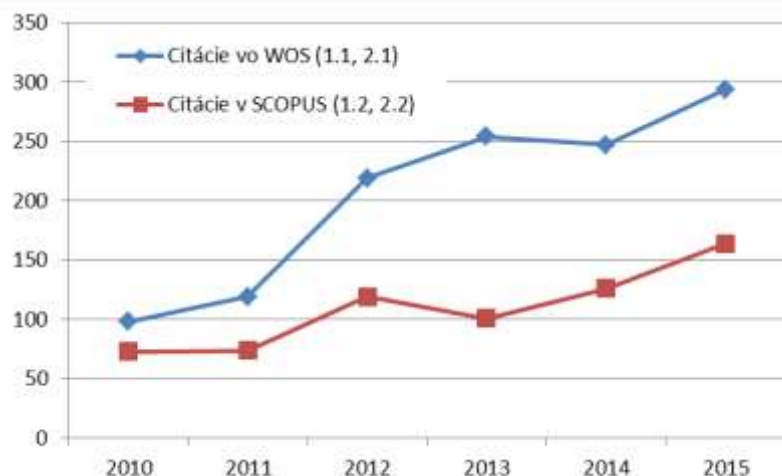
- Scientific papers published in journals registered in Current Contents Connect: **19**
Progress in Physical Geography (3.885 - IF2013)
Applied Geography (2.650 - IF2013)
Computers and Geosciences (2.054 - IF2014)
Social Indicators Research (1.395 - IF2014)
- Scientific papers published in journals registered in Web of Science Core Collection and SCOPUS: **34**
- Scientific papers published in other foreign journals: **16**
- Scientific papers published in other domestic journals: **40**
- Scientific papers published in foreign peer-reviewed proceedings: **26**
- Scientific papers published in domestic peer-reviewed proceedings: **13**



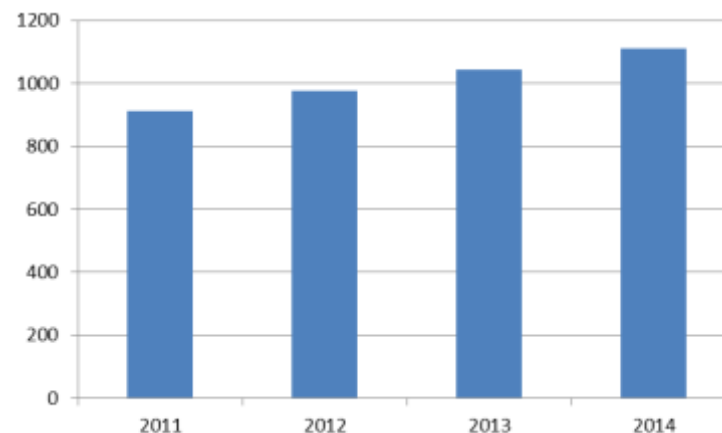
Responses to the research outputs

- Citations in Web of Science Core Collection: **262 per year**
- Citations in SCOPUS if not listed above: **134 per year**
- Citations in other citation indexes and databases: **24.5 per year**
- Other citations: **590.8 per year**
- **39.7 citations per year/ FTE**

Citations in WOS and SCOPUS

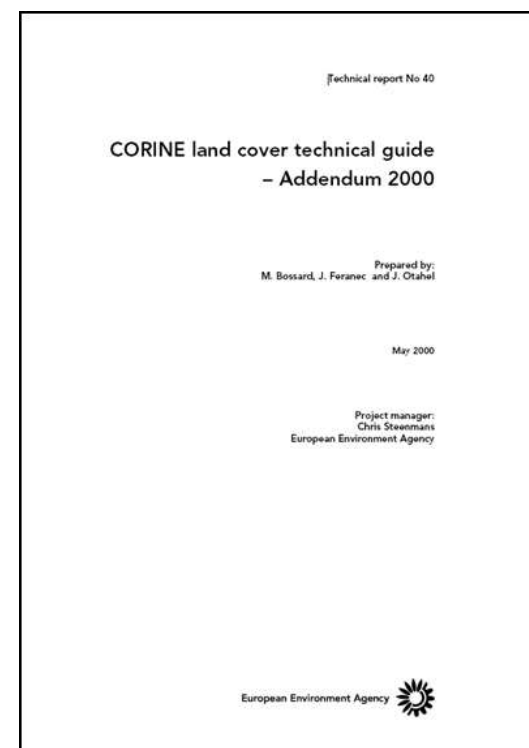


All citations (2011-2014)



Responses to the research outputs

- **Literary Fund Premium** (Prémia Literárneho fondu) for outstanding scientific response to one work in the category of Technical Sciences and Geosciences in **2015**.
- Award for a distinguished scientific response to a work: Bossard M., Feranec J., Otahel J. CORINE land cover technical guide, Addendum 2000: technical report No 40, Copenhagen
- 512 citations (389 in WOS a 61 in SCOPUS)



International/European position of the Institute

- Activities in the **International Geographical Union (IGU)**, the **International Cartographic Association (ICA)** and the **International Association of Geomorphologists (IAG)**
- **8 international conferences** (co)organised by the Institute
- **Projects:**
VITAL LANDSCAPES (OP Central Europe 2007-2013),
INFRAREGTUR (Cross-border cooperation Programme Poland-Slovakia 2007-2013),
COST Action ES1306 Connecting European connectivity research
Urban Atlas - the contract with the Institut géographique national France
International bilateral cooperation projects with academic institutes in Czechia, Poland, Hungary, Bulgaria, and Ukraine
- **9 invited/keynote presentations** at international conferences in France, Czechia and Poland
- memberships in editorial boards of 14 scientific journals published abroad
- memberships of the Institute in international organisations: Global Water Partnership and European Rural Development Network



National position of the Institute

- **14** projects of the Scientific Grant Agency of the Slovak Academy of Sciences and the Ministry of Education (VEGA)
- **1** project of SAS Centres of Excellence
- **8** invited/keynote presentations at national conferences
- **14** conferences of national importance organised or co-organised by the Institute
- **20** memberships in advisory boards of the National Council, Government, ministries, etc.



Activities in submitting of the project proposals

National projects:

- APVV Grant Agency – 3 project proposals in 2013, 4 in 2014 and 6 in 2015
- **Only 2 of 13 were successful**

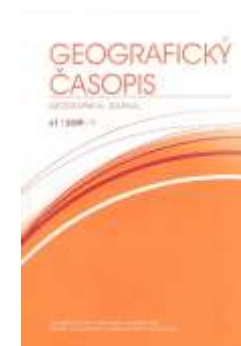
International projects:

- APVV call bilateral cooperation Slovakia – China 2012
- Cross-border Cooperation Programme Slovak Republic – Czech Republic 2007-2013 (2013)
- European Innovation Partnership on Water (2013)
- International Council for Science (ICSU) Grant Programme (2014)
- Interreg Danube Transnational Programme (2015)
- International Visegrad Fund (2015) – 2 projects
- Plan for European Cooperating State (PECS) – (2015) – 2 projects
- START - Danube Region Project Fund (2015) – **successful**



Publishing activities

- **Geografický časopis / Geographical Journal**
*Scientific journal published quarterly since 1949,
67. volume, Registered in **SCOPUS***



- **Geographia Slovaca**
*Nonperiodical serie of publications
published since 1992*



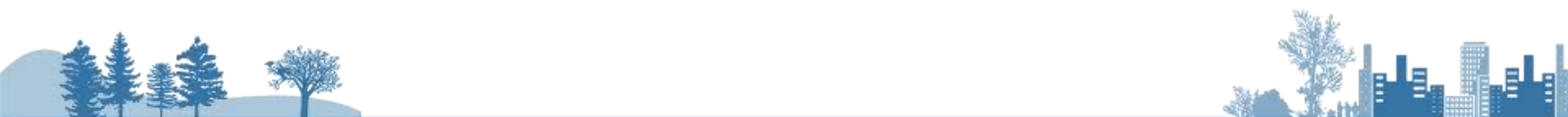
- **Cooperation in publications of journals:**

Kartografické listy / Cartographic Letters

Annual publication published by the Cartographic Society of the Slovak Republic in cooperation with the IG SAS and the FNS of the Comenius University since 1993

Geomorphologia Slovaca et Bohemica

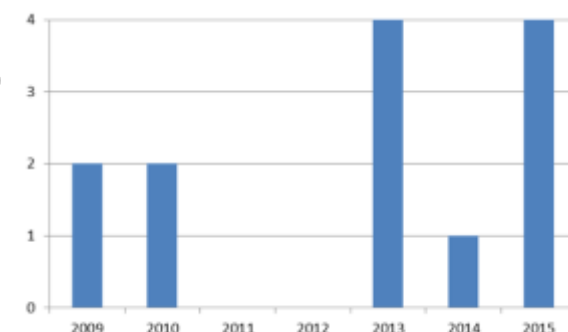
Published by the Asociation of Slovak Geomorphologists in cooperation with the IG SAS (2 times a year since 2001)



PhD studies and educational activities

Two accredited programmes of doctoral studies:

- 4.1.36 Physical geography and geoecology (2007 -)
- 4.1.38 Regional geography (2007 -)
- 2 new internal PhD students a year
- **9 successfully defended PhD thesis in 2012-2015**



Numerous educational activities at universities in the Slovak Republic (Bratislava, Nitra, Prešov) and in the Czech Republic (Brno, Olomouc)

- Lectures (258 hours per year)
- Practicum courses (87 hours per year)
- Supervised diploma theses (17 per year)
- Supervised PhD theses (15.5 per year)



Applied research and social impact

■ Project **VITAL LANDSCAPES**

- Alternatives for the Development of the Sub-Little Carpathian (SLCR) Cultural landscape
- Four meetings and small conferences for local stakeholders were performed.

■ Project **INFRAREGTUR**

- Possibilities of transport accessibility improvement as a factor of tourism development
- One of the main aims of this project was a transfer of scientific knowledge and experience to the administrative sector.
- More than 700 publications in Slovak and Polish languages were distributed among experts in the fields of transport and tourism in respective ministries, NGOs, regional and local governments and to the private sector (entrepreneurs in the tourism sectors).



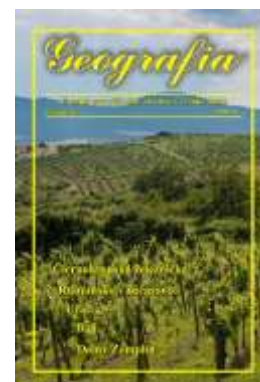
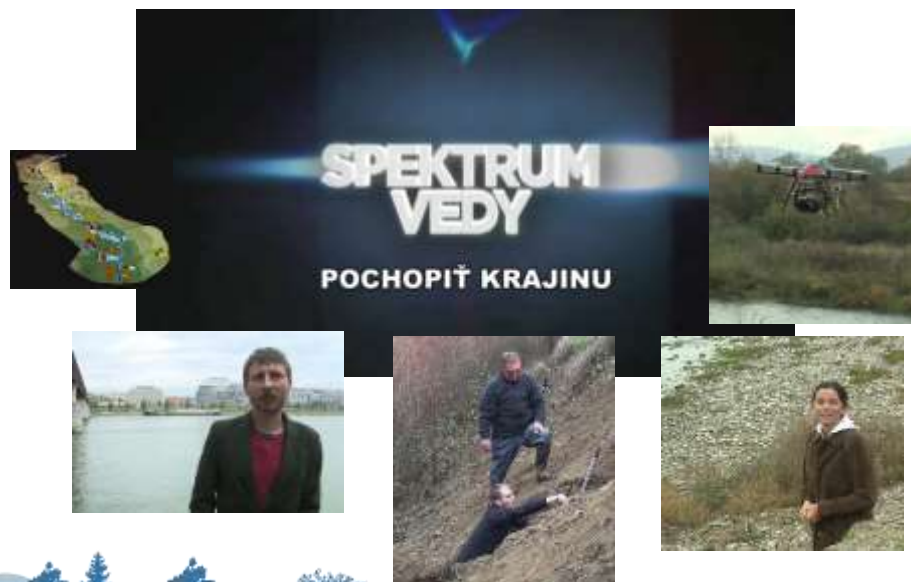
Applied research and social impact

- **Urban Atlas**, Partner: Institute Geographique National France International, Paris, 2013-2016, funding: 15,000 €
- **Analysis of challenges, needs and potentials of the CENTRAL EUROPE area and strategic orientations in view of the transnational cooperation for the period 2014-2020**, Partner: ÖIR GmbH, Vienna, 2012-2013, funding: 3,700 €
- **Quality Assessment of the CORINE Land Cover 2012 and CORINE Land Cover Change 2006-2012**, Partner: Institute Geographique National France International, Paris, 2015, funding: 1,000 €
- **Urban planning and landscape study for protection against flash floods in the Small Carpathian region**, Partners: Faculty of Natural Sciences of the Comenius University, Bratislava self-governing region, 2014-2015, funding: 1,900 €
- Prof. Mikuláš Huba was a member of the National Council of the Slovak Republic (2012-2016)



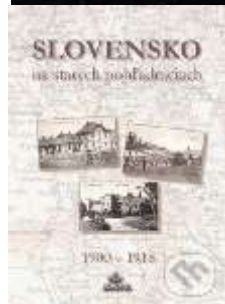
Popularisation of Science

- Pochopit' krajinu
(How to understand the landscape)
Documentary of the Centre of Scientific and Technical Information from the cycle Spectrum of Science, RTVS, 5.12.2013
- Geografia (Geography) – Journal for primary and secondary schools and universities



Popularisation of Science

Meniace sa Slovensko očami satelitov (Changing Slovakia in the eyes of satellites), 2013, VEDA, Bratislava.



26.1. BANSKOBYSTRICKÝ KRAJ
Pitná voda a sieť kanalizácie v kraji



Popularisation of Science

Barbara Petchenik Children's World Map Competition 2013 and 2015

- organised by the International Cartographic Association (ICA)
- in Slovakia by the Cartographic Society of the Slovak Republic and the Institute of Geography, SAS



Research cluster I

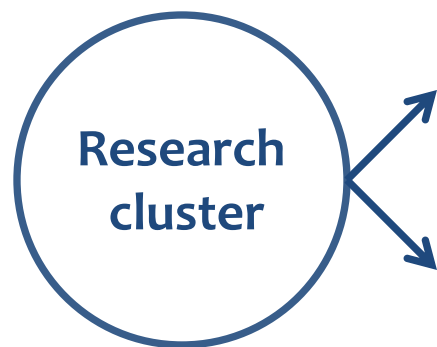
Structure and Dynamics of Natural Landscape, Hazards and Risks



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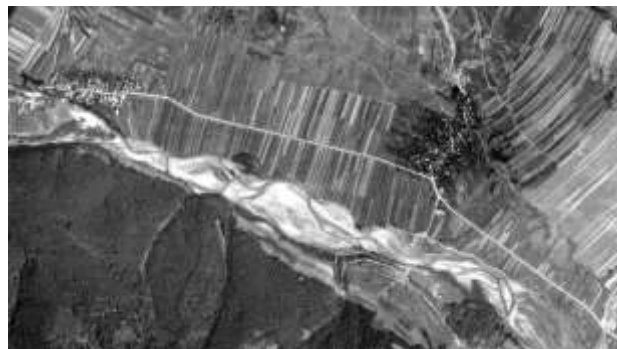


Two research themes



1) *integrated assessment a management of flood risk*

2) *river morphology changes and long-term development of fluvial systems*

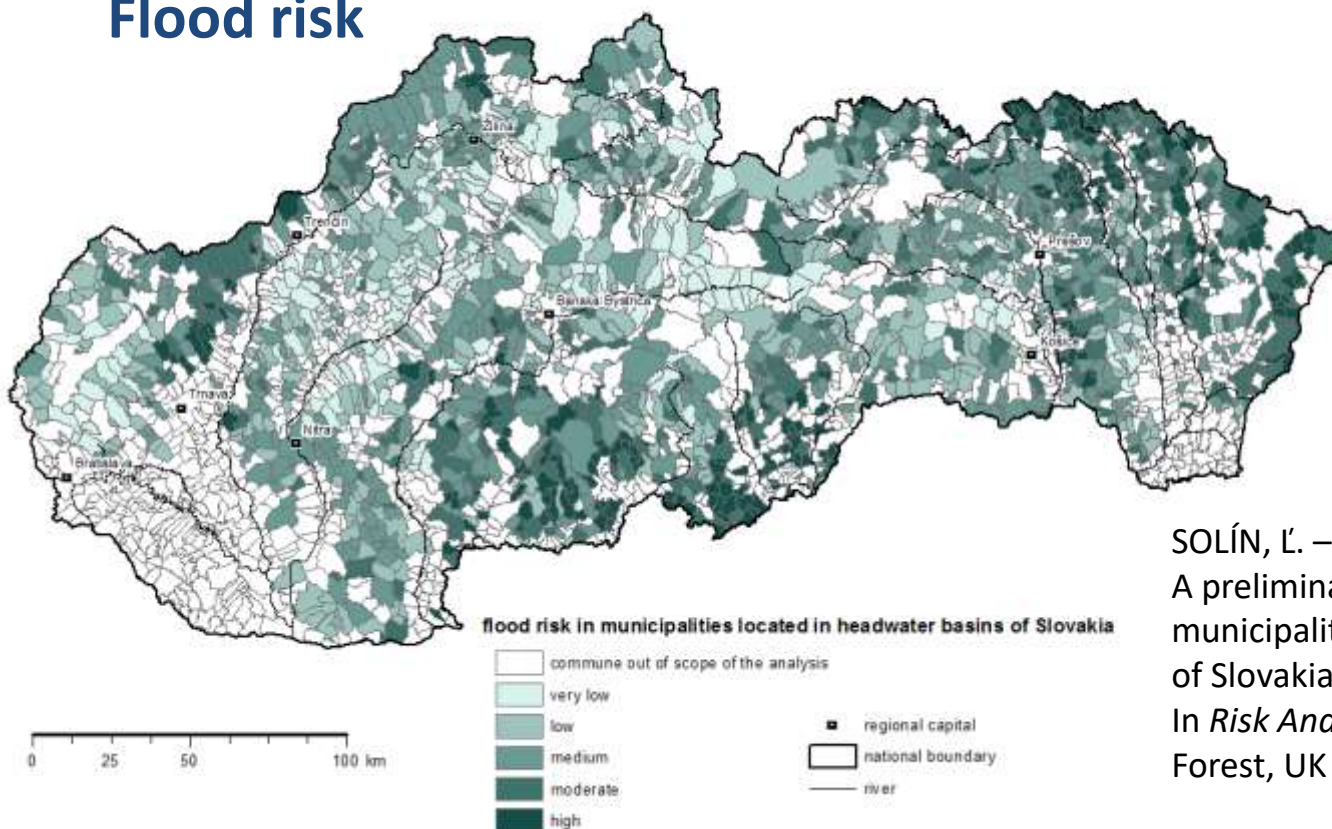


- ❖ Research of the cluster has been financially supported by the **3 VEGA** Grant Agency projects and the joint Polish-Slovak research project *The influence of hydrotechnical constructions on the development of fluvial systems of the Lower Vistula and the Danubian Lowland* (2010-2012)



Integrated assessment of flood risk for the municipalities in upstream basins – national level

Flood risk



SOLÍN, Ľ. – SKUBINČAN, P. – MADAJOVÁ, M.
A preliminary flood-risk assessment of municipalities located in headwater basins of Slovakia based on the integrated approach. In *Risk Analysis IX*. Editor C.A. Brebbia. – New Forest, UK : WIT Press, 2014, s. 61-72.



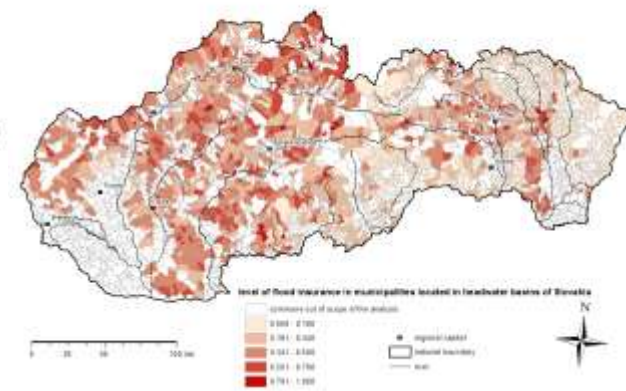
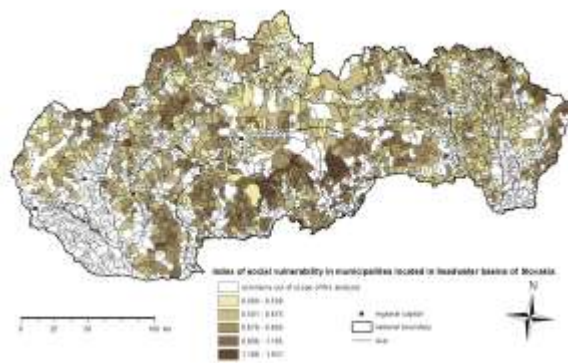
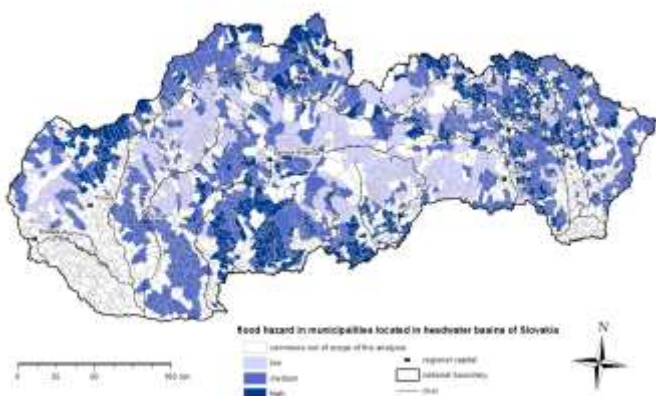
Flood risk

=

Component: flood hazard

social vulnerability

resilience



by application of GIS



SOLÍN, Ľ. Recent Slovak flood protection relative to integrated flood risk management.

In *International Journal of River Basin Management*, 2015, vol. 13, no. 4, p. 463-473.

SOLÍN, Ľ. Spatial variability in the flood vulnerability of urban areas in the headwater basins of Slovakia. In *Journal of Flood Risk Management*, 2012, vol. 5, no. 4, p. 303-320.

(1.000 – IF2011).

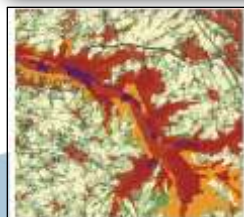
SOLÍN, Ľ. MADAJOVÁ, M., SKUBIBČAN, P. Mitigating flood consequences: analysis of private flood insurance in Slovakia In *Journal of Flood Risk Management* 2015, DOI: 10.1111/jfr3.12191 (In press).

MADAJOVÁ, M. – SOLÍN, Ľ. – MICHÁLEK, A. Vývoj a priestorová variabilita poistenia obyvateľstva proti riziku povodne na Slovensku v období 2002 – 2011 = The Development and Spatial Variability of Flood Risk Insurance in Slovakia in the period 2002-2011. In *Ekonomický časopis*, 2015, roč. 63, č. 2, s. 167-187

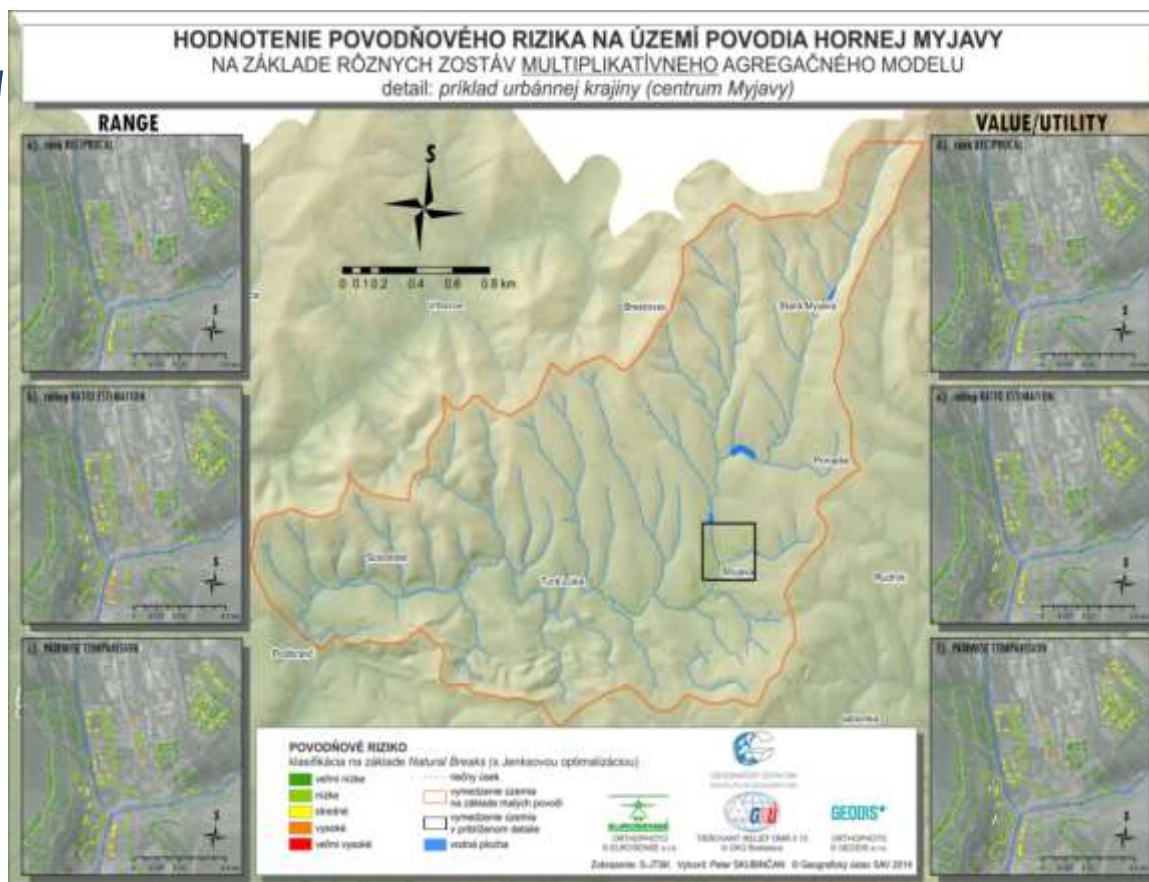
Integrated assessment of flood risk in headwater basins of the Myjava river – regional level

Multiplicative aggregation model

combining different methods of
standardization of data and
weighting variables

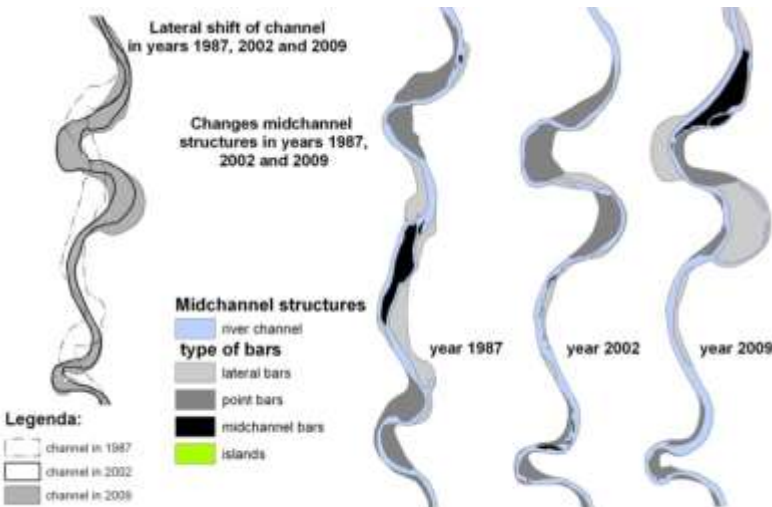
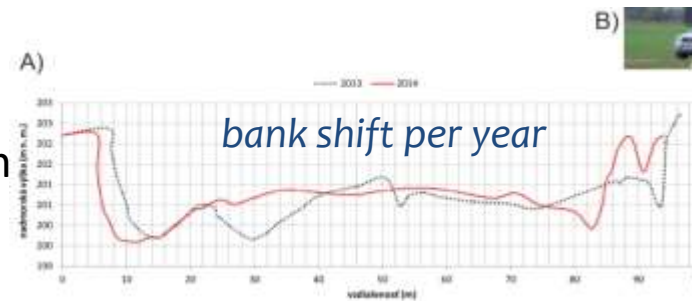
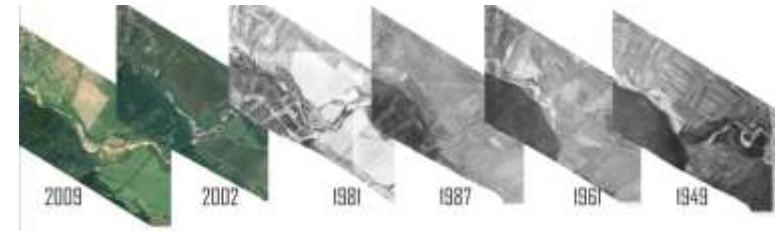


Extreme Risk
High Risk
Medium Risk
Low Risk



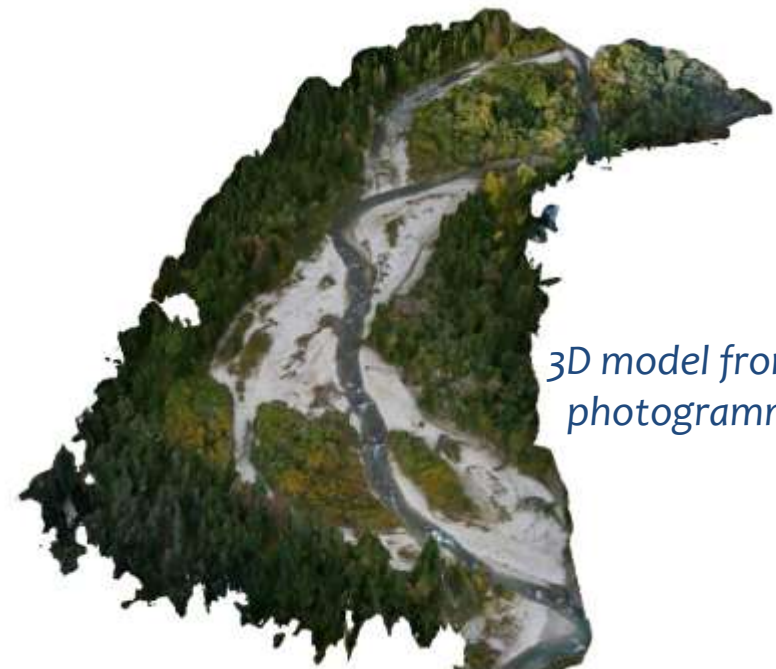
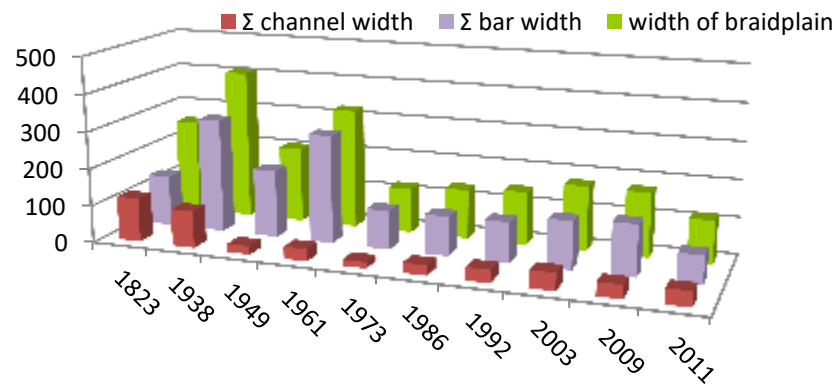
The effect of flood events on the lateral channel shift and inchannel landforms pattern

- using GIS and aerial photographs
- arable land destruction
- average lateral channel shift per year was 1.1 m
- **maximum shift 217 m**
- climate changes - morphological changes – geodiversity – ecosystem services



Evolutionary trend of the erosion corridor of a braided-wandering river

- using GIS and aerial photographs
- decreasing trend of the erosion corridor shows the **long term degradation (incision)**
- channel straightening or the increase in the area of islands
- climate changes - morphological changes – geodiversity – ecosystem services



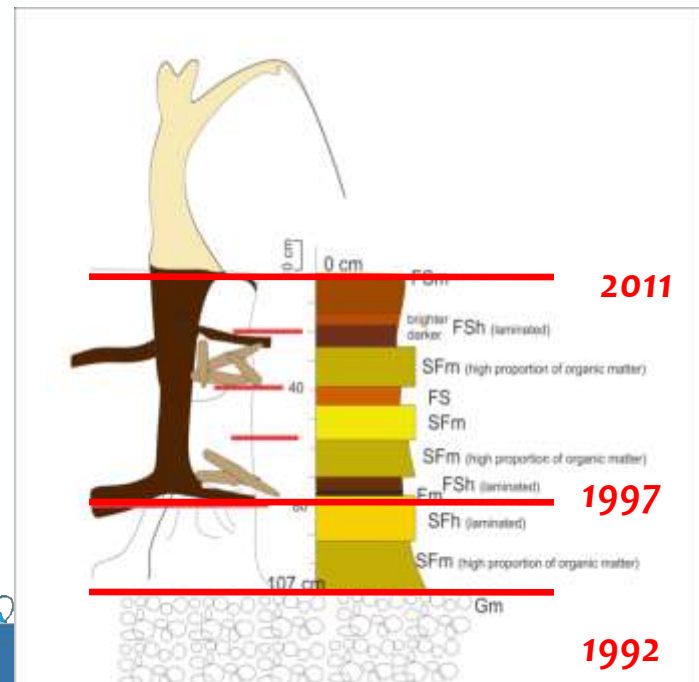
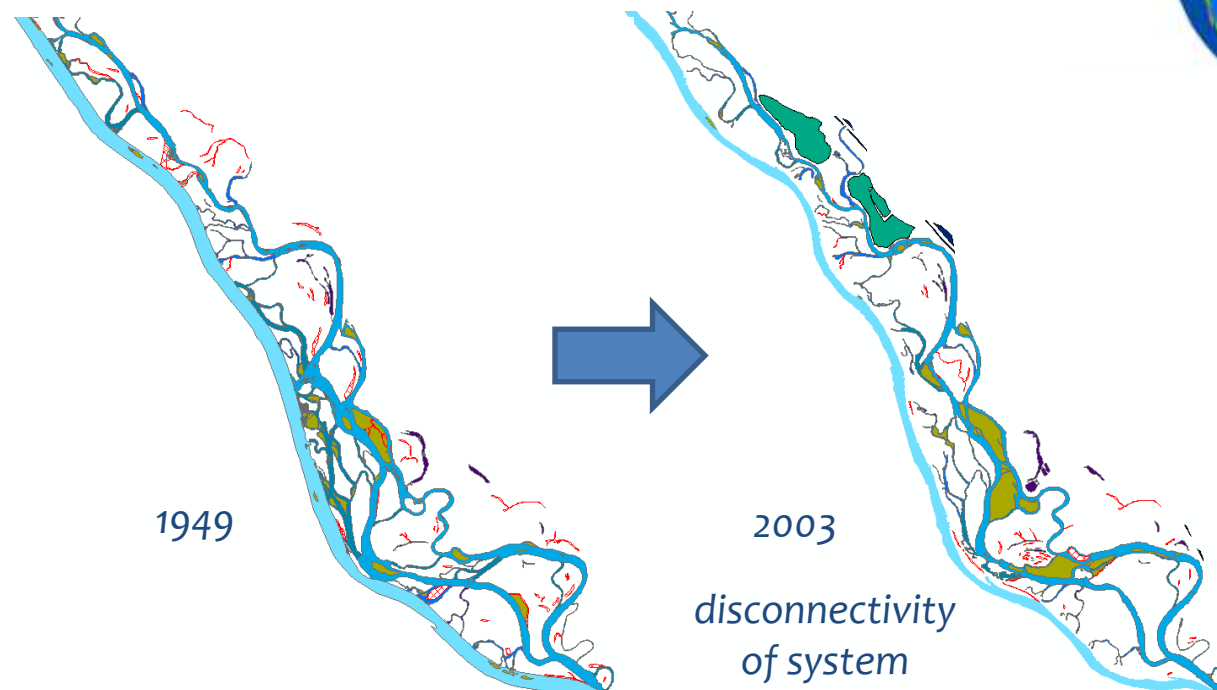
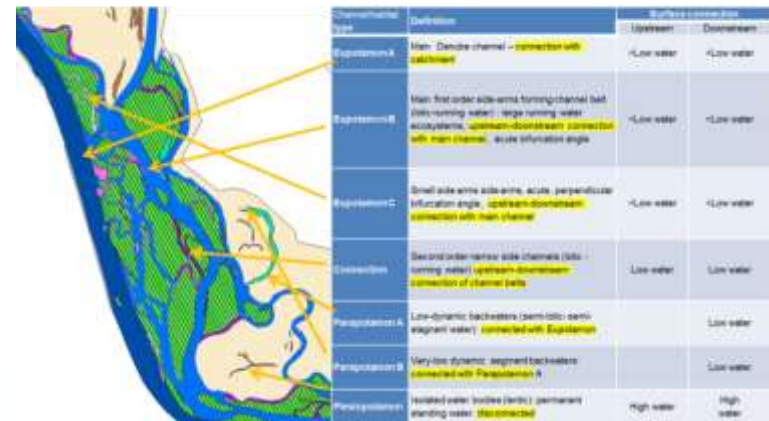
3D model from UAV
photogrammetry



Response of the changing discharge to the connectivity in sediment fluxes

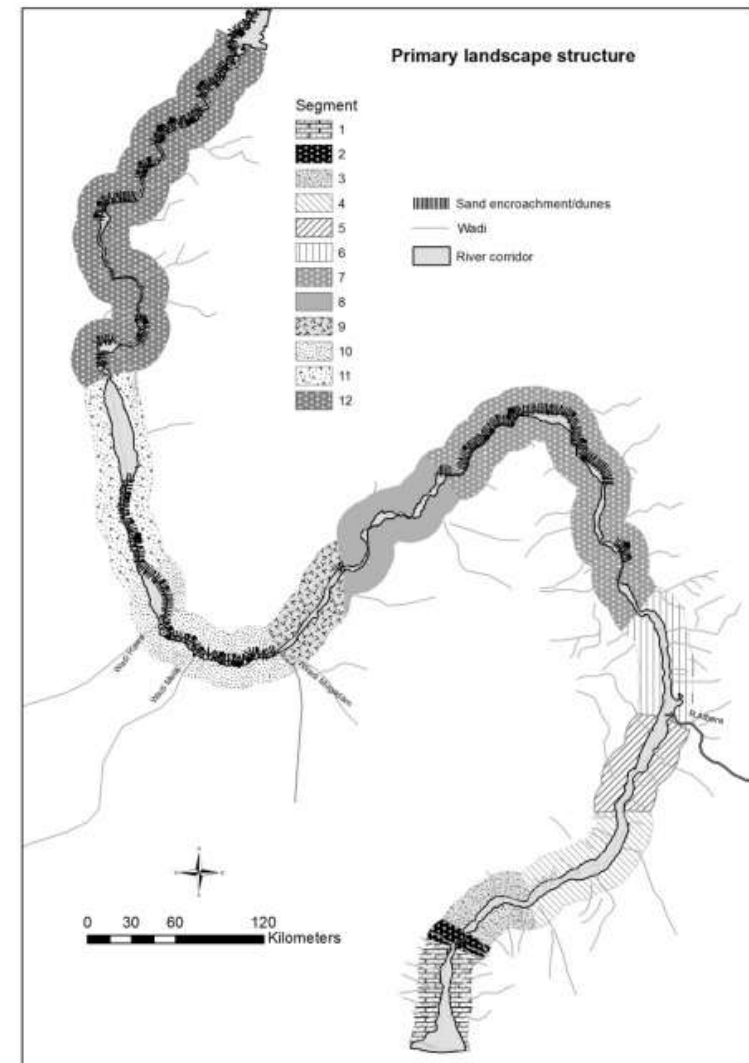
- the **bypassed Danube channel**
- functional classification of channels
- the identification of discontinuity surfaces and particle-size changes in the vertical accretion
- accretion more than 1 m since 1992

Functional classification of channels – based on intensity of hydrological surface connectivity (Amoros et al., 1982, 1987, Hohensinner et al. 2010).



Large river – classification and environmental issues

- **The Nile River** in northern Sudan (1,492 km length)
- classified into twelve segments based on the analyses of aerial photos (1985) and Landsat images (2000, 2005) in the GIS
- segments have been assessed and environmental issues have been detected



Structures, processes and hazards of river systems – their response to and impact on the natural and socio-economic systems

Research cluster (2016-2020) – two research themes

1) Evaluation of flood hazard *negative consequences in relation to:*

- *the vulnerability of environmental and socio-economic systems,*
- *the ability of environmental and socio-economic systems to cope with the negative consequences*

2) Diversity, drivers of development and responses of the geomorphic-sedimentary and land cover layers of riverine landscapes to the direct and indirect climatic and human induced impacts

- *the interpretation of the current behaviour of water courses as well as designing the scenarios of their future development,*
- *the ecosystem services (economic, environmental and social) research*





Research cluster II

Landscape Changes Explored by Application of Remote Sensing Data and Geographic Information Systems



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Theoretical and methodological bases of land cover and its change research

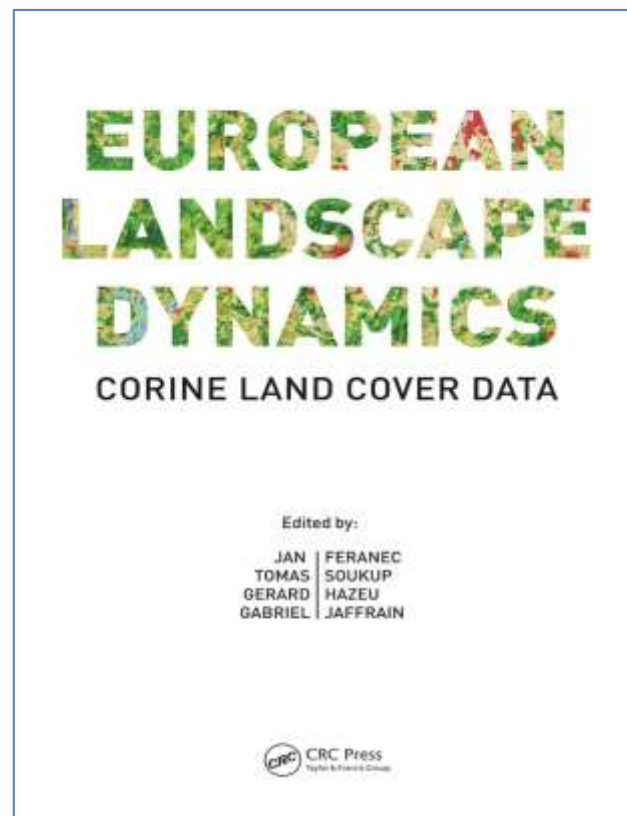
- Expert assessment of semantic similarity between different land cover nomenclatures (on the example of CLC and NLCD)
- *Progress in Physical Geography* (2014)

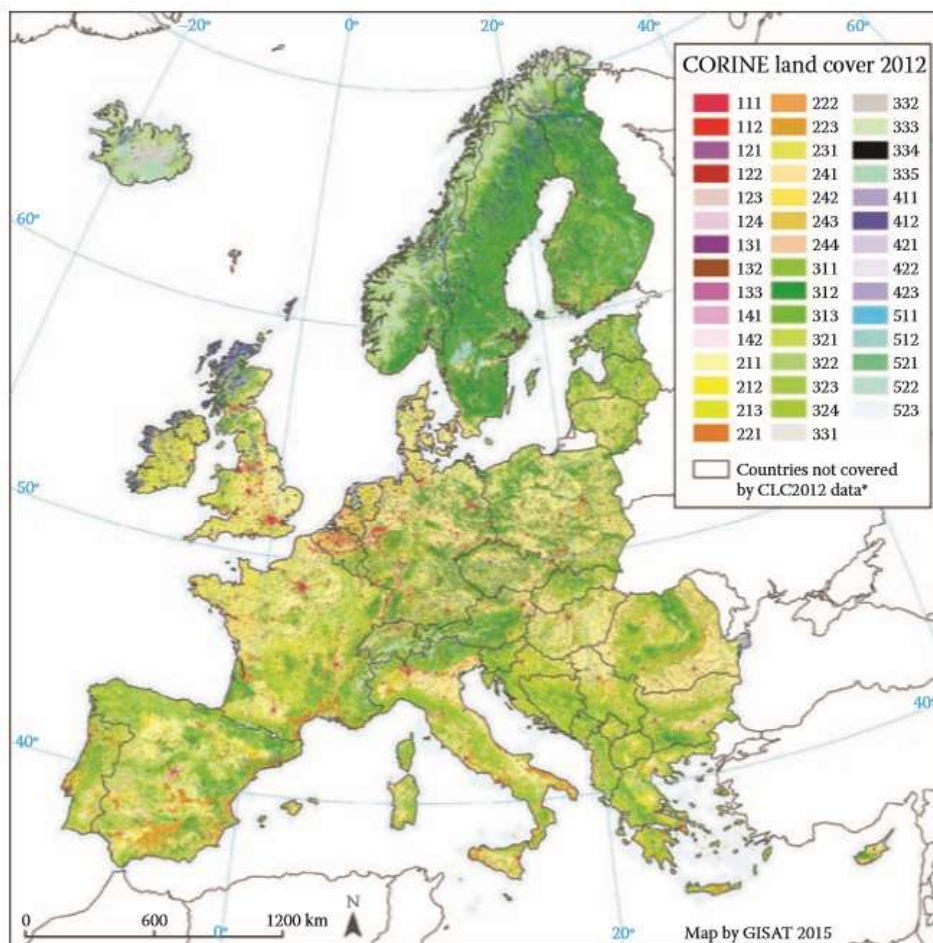


Multitemporal analysis based on CORINE Land Cover data

Summarizing international research and application activities in the field of the identification, analysis and assessment of land cover and its change based on satellite data in Europe

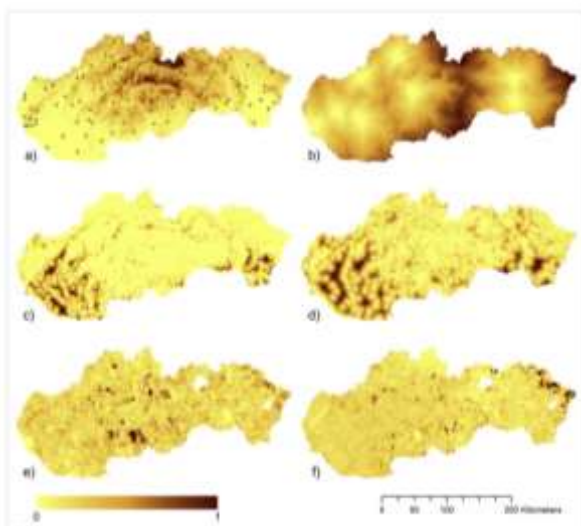
- Monograph:
*European Landscape Dynamics:
CORINE Land Cover Data* (CRC Press,
Taylor & Francis, 2016).





Monitoring of significant processes in the landscape

- Dynamics of built-up areas
- Abandonment of agricultural land



Example of determinants used to model the occurrence of the abandonment of arable land and grasslands



Case studies – spatial aspects of land cover changes

- Cartographic presentations of the land cover changes are regularly published in the atlases, issued by the IGU/LUCC Commission





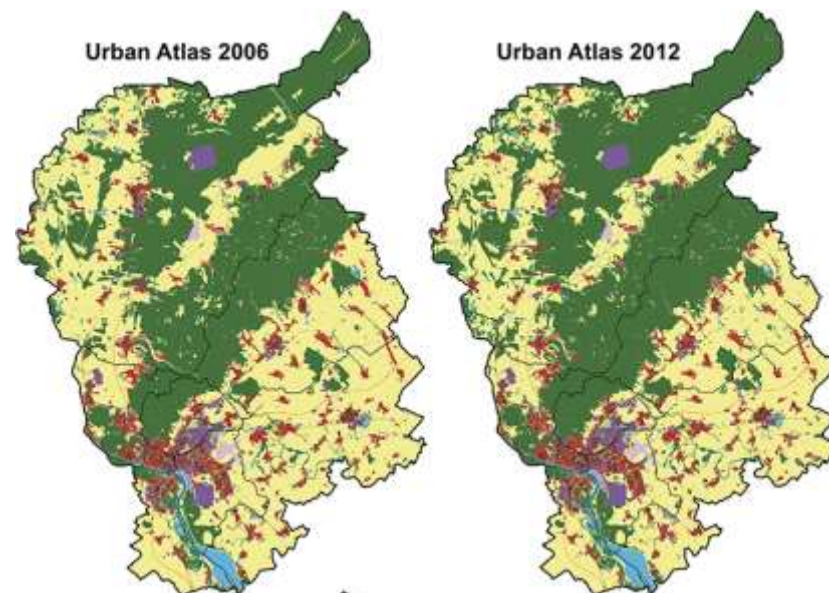
Fig. 7 – Urban dynamics in Bratislava in 2002-2011

Table 8 – Comparison of average annual intensity of urbanization in towns and Burgen (in hectares per year)

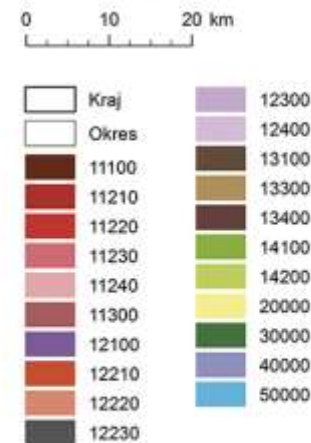
Intensity of changes	Towns (Stavice)	Burgen (Bodajov)
Urban extension	12.81	4.27
Urban infill	5.96	27.14
Other urban changes	4.05	3.53



Fig. 8 – Urban dynamics in Burgen in 2006-2010



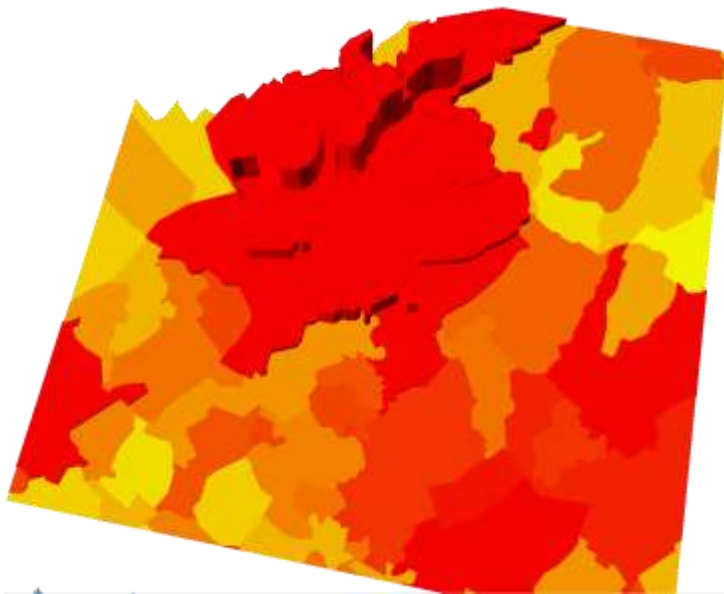
Zmeny 2006-2012



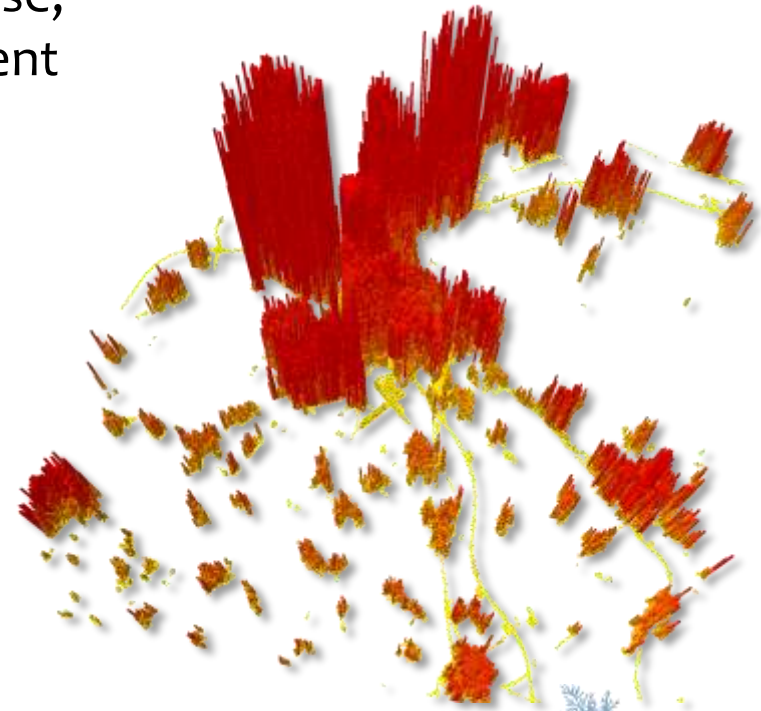
Okresy: 1) Bratislava I, 2) Bratislava II, 3) Bratislava III, 4) Bratislava IV, 5) Bratislava V, 6) Malacký, 7) Pezinok, 8) Senec

Spatial disaggregation of population density

- Variables derived from remote sensing (land cover, imperviousness) are used as proxies that help sharpen the information about spatial distribution of human population
- Application e.g. in emergency response, spatial planning and impact assessment



Municipalities



100 meter grid

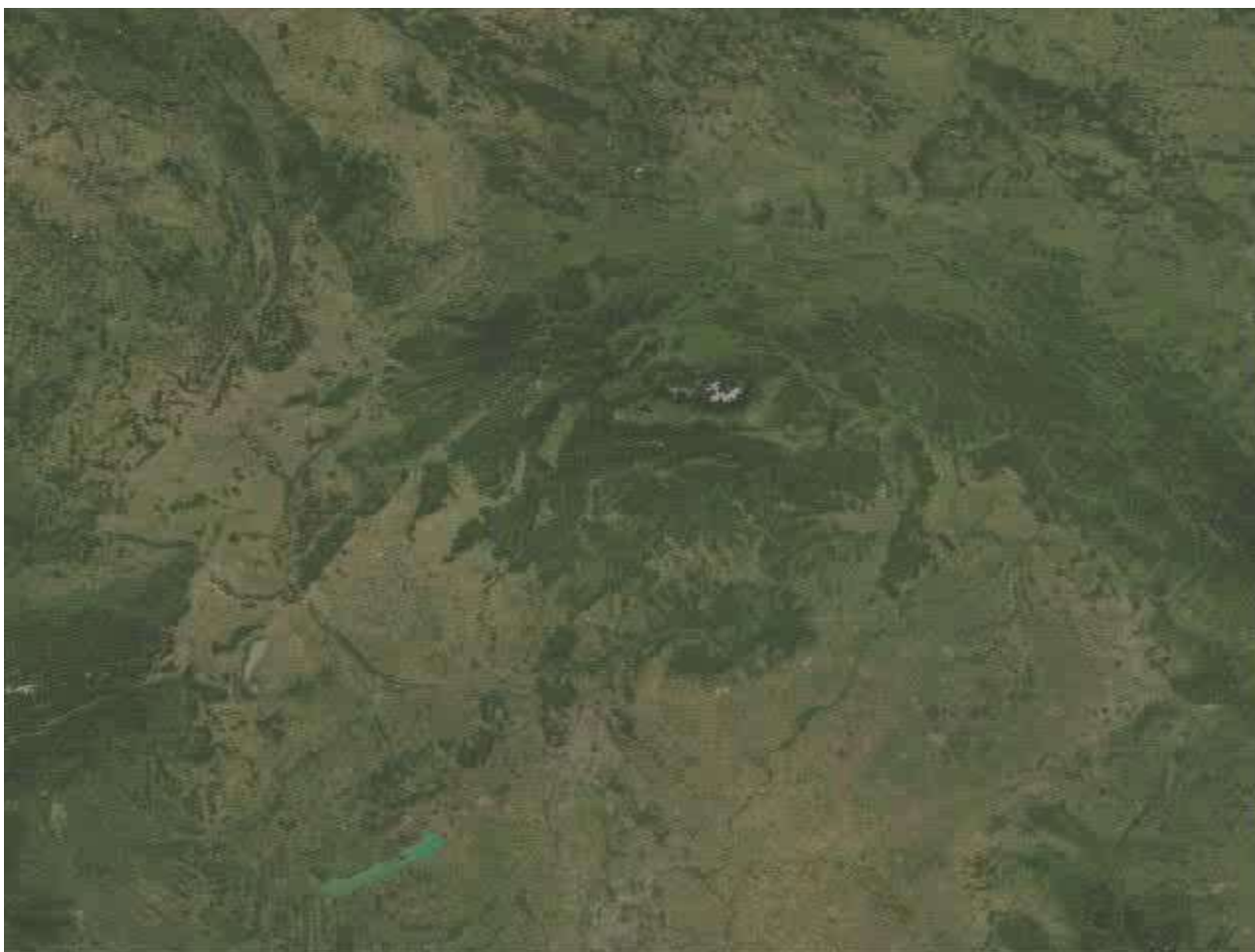


Popularisation of remote sensing

Examples of application of remote sensing data – animation of different processes in the landscape for the wide public

- Changing satellite eye's view of Slovakia
- (DVD publication, Veda 2012)





Priorities for future research

- Assessment of urban landscape in the context of urban heat islands research (project: Slovak Research and Development Agency)
- Identification and assessment of agriculture land abandonment (project: PECS)
- Participation in space research activities related to cooperation with ESA (project: Slovak Ministry of Education, Science, Research and Sport)





Research cluster III

Research cluster: Society in Flux, Spatial Disparities, and Local and Regional Development

(Summary of R&D activity pursued by the institute during
the assessment period in both national and international contexts)



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Research of regional structures and spatial disparities

- Regional structures
- Endogenous potential and exogenous factors of development
- Level of inter- and intraregional disparities
- Relevant dimensions of demographic, social, economic and infrastructural nature on several hierarchic levels.



Regional and spatial disparities in Slovakia

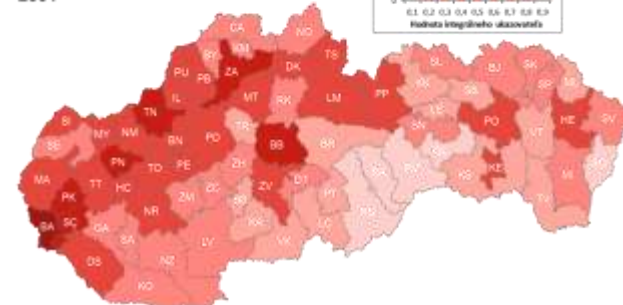


MICHÁLEK, A., PODOLÁK, P. eds. (2014). Regionálne a priestorové disparity na Slovensku, ich vývoj v ostatnom desaťročí, súčasný stav a konzekvencie (REGIONAL AND SPATIAL DISPARITIES IN SLOVAKIA: DEVELOPMENT IN THE LAST DECADE, THE PRESENT STATUS AND CONSEQUENCES). Bratislava : Geografický ústav SAV.

2011



2001

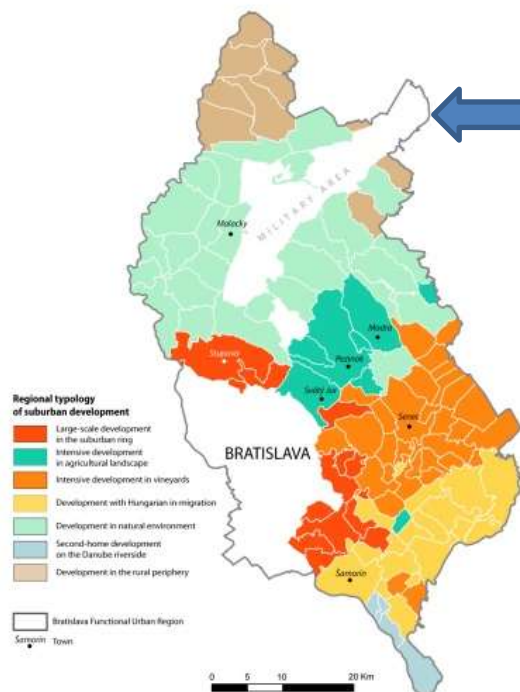


Changes in the level of regional disparities: Slovakia 2001-2011

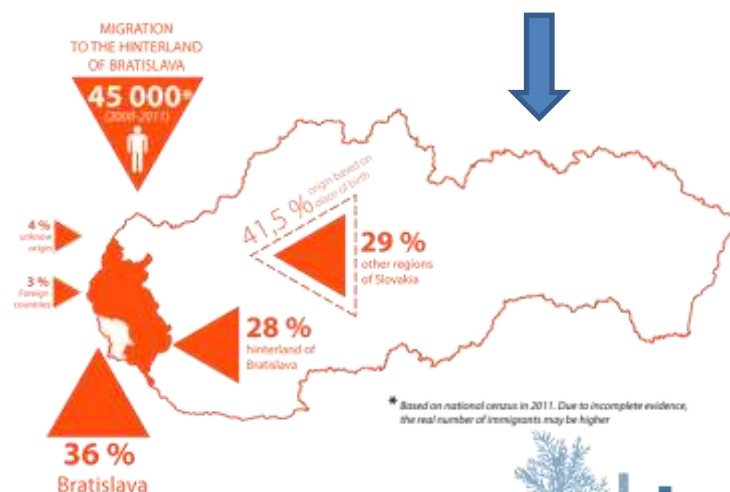
Suburbanization and deconcentration of population

The **changed traditional migration behaviour patterns of population and manifestations of unrestrained suburbanisation** (changes in traditional social-spatial structure of urban and rural communities, radical changes in land use and numerous other context) **bring a number of problems for local governments and population in general.**

Case study - the hinterland of Bratislava



regional typology of suburban development
migration to the hinterland of Bratislava



Endogenous development, regional clusters, changing commuting and time-spatial behavioural patterns

- **Identification and evaluation of the endogenous development potential of the rural territories.**
- **Regional cluster initiatives in tourism** (tool enabling the successful regional and rural development).
- **Changes in commuting in Slovakia** in the period 2001-2011 (increase of the total number of out-commuters, the increased number of cross-border commuters, strengthening of the position of Bratislava and large centres with important investments into automotive industries).
- The analysis and assessment of the **time-spatial behavioural patterns of population under the impact of socio-economic changes.**

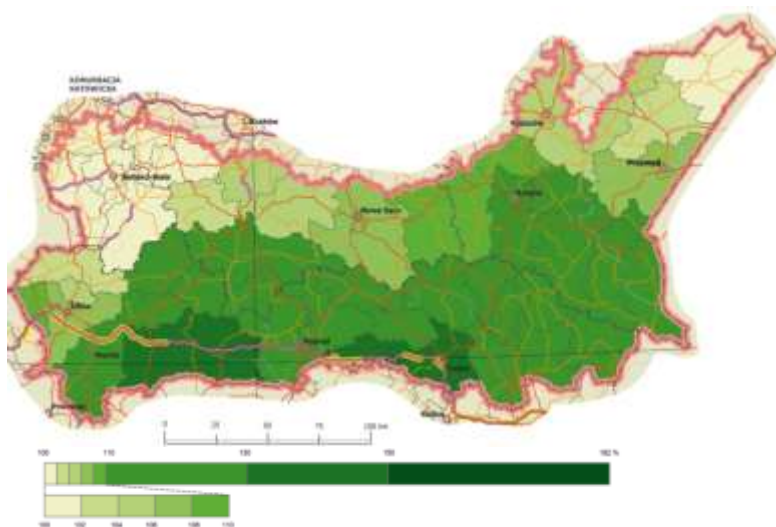


International project INFRAREGTUR

- Transport accessibility as a factor of tourism development
(Cross-border Cooperation Programme PL-SK 2007-201)
- Project leader: Institute of Geography and Spatial Organisation of the Polish Academy of Sciences
- Duration: 1.8.2009 - 30.6.2012



Conference in Cracow 2012



Changes of potential accessibility in short-term tourism in the period 2010-2030





Research cluster IV

Research cluster: Sustainability and Quality of Life in Changing Environment

(Summary of R&D activity pursued by the institute during the assessment period in both national and international contexts)



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Research of differences in sustainability and quality of life (QoL)

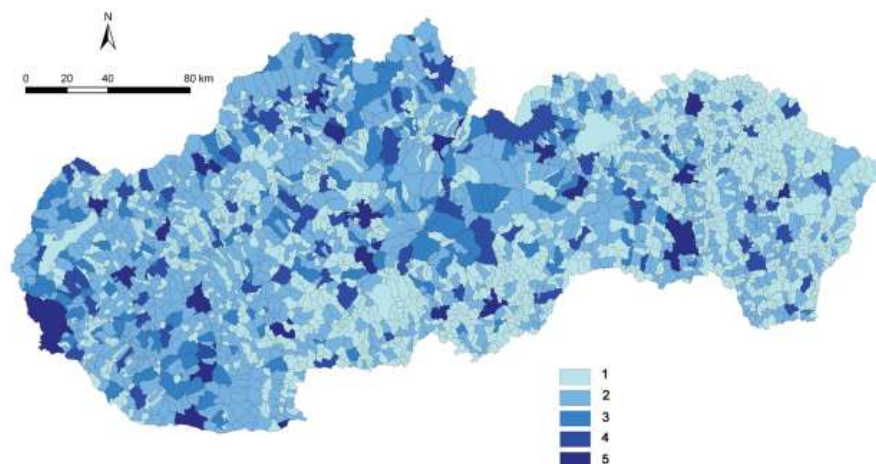
- The **geographical view of the sustainability and quality of life issue** is first of all **based on investigation of the changing „man – environment“ interaction.**



- (1) The **study of amenities, local and regional sustainable development associated with the QoL issues**
- (2) The **analysis of the changing (historical) cultural landscapes and time-space behavioural patterns in various types of environment.**

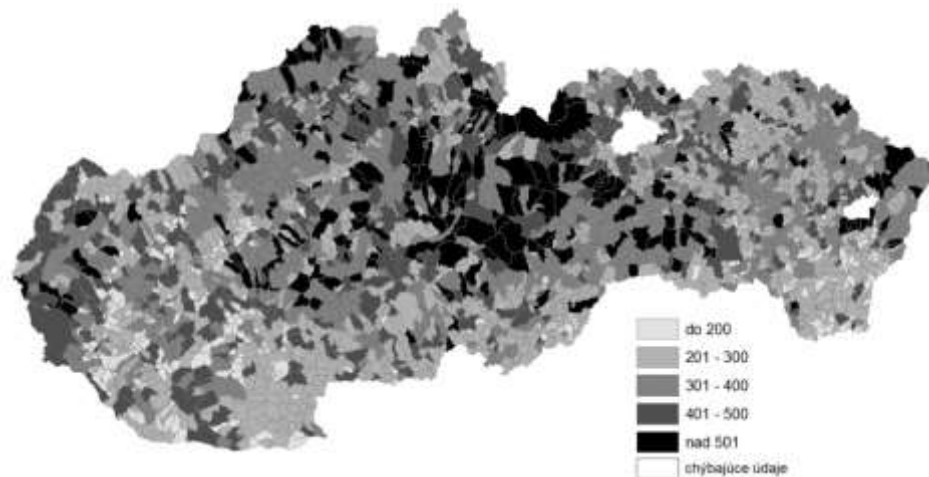


Differences in sustainability and QoL

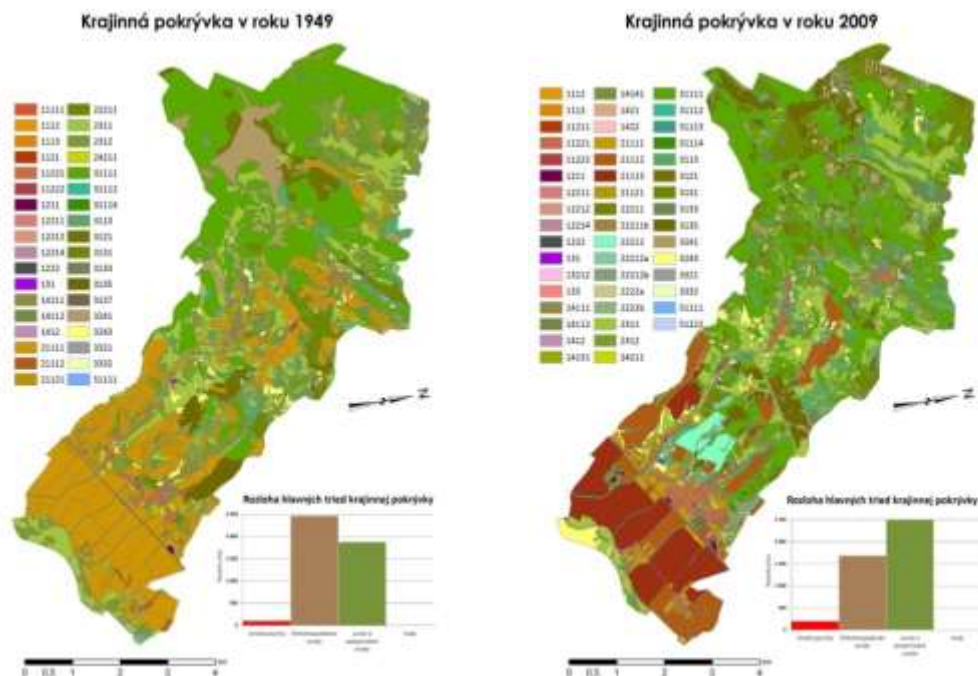


**Infrastructure Saturation Index
(Slovakia, 2007)**

**Aggregate Environmental Index
(Slovakia, 2007)**



Changing (historical) cultural landscapes



Land Cover Change: 1949-2009
ŠEBO, D., HUBA. M. (2015).



Example of Photomontage:
Agricultural Cultural Landscape
ŠEBO, D., HUBA. M. (2015).

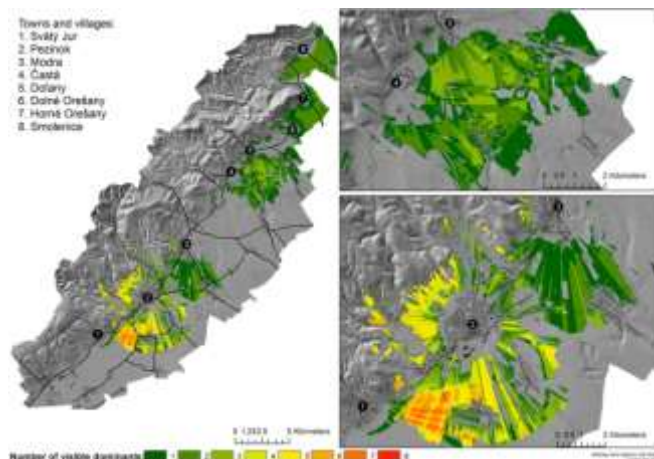
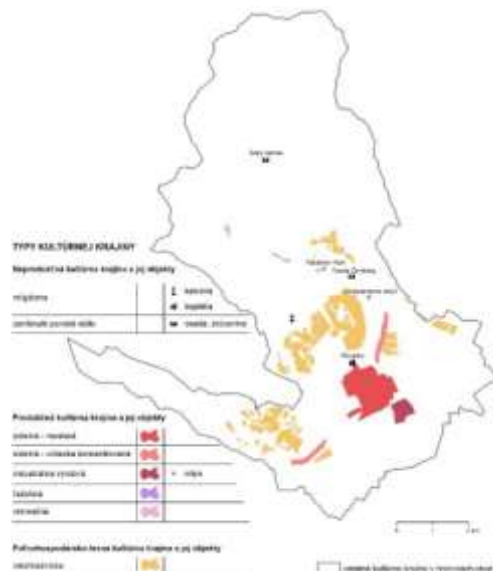
International project VITAL LANDSCAPES

- The international project within **CENTRAL EUROPE 2007-2013 Programme** - *Assessment and Sustainable Development of Cultural Landscape by Application of Innovative Participative and Visualizing Tools (acronym Vital Landscapes (IG SAS/8 research w. + 7 centres from CZ, H, D, A, SLO).*
- The pilot project of the IG SAS - *Alternative to the Development of the Sub-Little Carpathian Cultural Landscape*
- The principal aim - **protection, re-valuation, and support for sustainable development of unique cultural landscape types accompanied by promotion and propagation of innovative, participative and visualizing techniques.**
- Results - **historical cultural landscape becomes ever more fragmented, its important elements are often depreciated and some disappear altogether with the increasing anthropogenic pressure.**

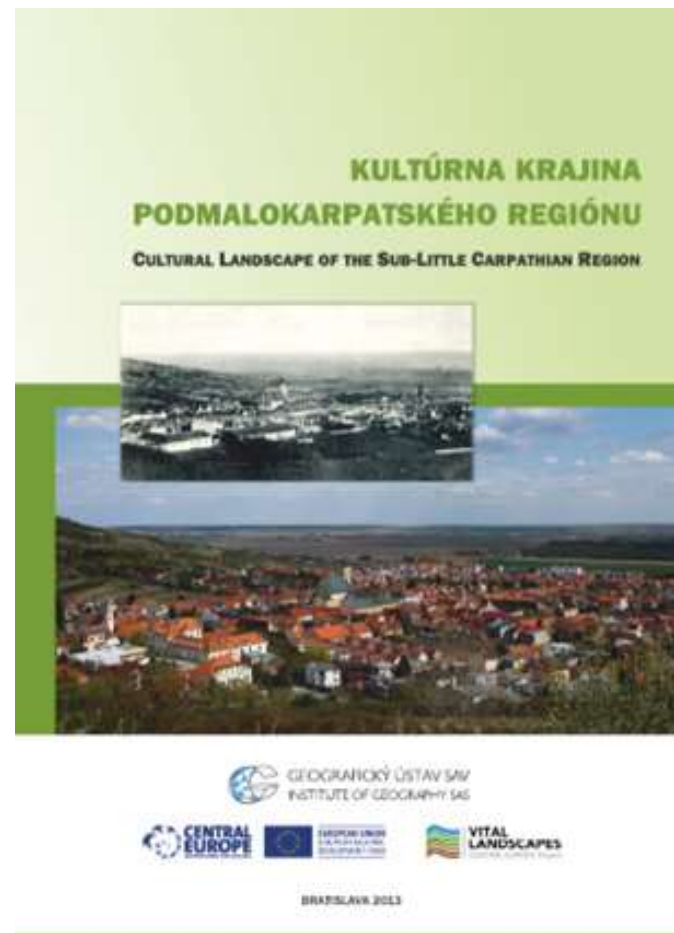


International project VITAL LANDSCAPES

Types of cultural landscape in Modra town (Little Carpathian region)



Quality of views according to the visibility of dominants in selected settlements





Development trajectories of localities and regions in the context of socioeconomic changes

(Present state and research strategy 2016-2020)



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Present state of the art in both national and the international contexts

- The economic growth in the last years led to the **improvement of economic and social conditions and QoL on the national level** (but much less important on the regional level).
- **Increase of disparities between regions. Localities and regions** with different values of their territorial capital **are subject to dynamic changes.**
- The **different development trajectories of localities and regions have been caused by the specific responses to globalisation, dynamic changes in sector and spatial policies**, which influence the strategic, spatially selective decisions of investors and common population.
- **Geographical analysis** (providing relevant knowledge about mutual relationships of actors in the spatial context) **plays a significant role in the search for possible solutions** to this complex issue.



Future research

- **Identification** of the most important **forms of inequities**, their level, **spatial differentiation and concentration**, and **mapping of changes in local and regional trajectories** (territorial units of Slovakia).
- Application of **cartographic techniques and graphic modelling using GIS software**.
- Results - **background material to the discussion about the determinants of spatial differentiation from the point of view of local and regional socio-economic and cultural development** .
- Participation in research activities related to local and regional development and spatial planning (ESPON, APVV and VEGA projects).



Challenges for the future

- Transformation to the Public Research Institution
- Gradual replacement of the strong generation of older researchers
- Improvement of conditions for young scientists
- Effort to obtain extrabudgetary funds for research
- Enlargement of research infrastructure – instruments and software
- Development of cooperation with research organisations and universities
- Effort to create a stable organisation that is respected in the SAS and useful for the Slovak society





**Thank you to all my colleagues
who contributed to the results
of the Institute of Geography of the SAS
in the period 2012-2015**

