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REGIORESOURCES 21-2018

GLOBAL MEGATRENDS AND LANDSCAPE

Abstracts

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Congress Centre of the Slovak Academy of Sciences
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Global megatrends and Landscape

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Mgr. Michaela Kalivodová
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Main Topics of the conference:

Mapping and assessment of ecosystem services and biodiversity - dealing with global trends and drivers
Modelling and assessment of global change impacts on urban and rural landscapes
Impacts of global changes on the sustainable provision of natural resources
Regional, rural and urban development - future instruments and approaches
Supporting decision and communication processes related to global change impacts on landscapes

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Abstracts

Green infrastructure in Khartoum: Theoretical and defacto improvements potentials of adequacy and equitable access

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Internationally, urban green spaces are one among fourteen measures of quality of life. Khartoum, the capital of Sudan, holds remarkably variant green infrastructure elements; however, their adequacy and equitable accessibility are questionable. The situation of green infrastructure in Khartoum is influenced by three significant consequences: i) Khartoum state incubates almost 1/3 of Sudan's population, ii) an increase in temperature of 1.5°C and iii) a significant decrease in precipitation predicted by 2050 climate change scenario. Additionally, there is a huge literature vacuum concerning typology of green infrastructure elements and analysis of their accessibility in Sudan. Examples of defacto and hypothetical improvements derived from analysis of the state of the art and review of similar case studies involve the following three approaches: 1. Governance and urban-plan development: institutional arrangements, urban plans developments, and landscape planning that manage and ensure incorporation of green infrastructure into urban development and follow equity, equality, and quality of life principles. 2. Allocation of financial and land resources: trade-off investment options in green infrastructure for the Khartoum state municipality and land tenure and land ownership systems. 3. High-quality spatial data provision and handling for its role in inventorying and typifying the existing green infrastructure. Moreover, their vital role in site selection of the underprivileged urban areas.

Keywords: *Green infrastructure, Khartoum state, equitable accessibility, urban-plan development*

Drought versus land use planning: who wins and why?

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Drought is one of the most serious environmental issues related to the climate change. Land use planning may become one of the most powerful tools to eliminate its impacts. The problem is, that the strategic documents do not implement this topic fully and their integration into the land use planning system is very poor. In this study, we evaluated a wide range of national and regional strategic documents and took a closer look at the extent how is the drought perceived. In the next step, we focused how far is drought integrated into the local land use planning policy. The results show that the strategic documents used to be a policy obligation without significant effect due to the absence of connectivity with the land use planning system. The strongest connections are noticeable in water policy. It is given by their partial binding character, which allows integrating the specific measures across governmental levels. But we are convinced, that the high level of environmental policy integration can be reached also by the clear specification of the droughts in strategic documents. The specification comes from a certain set of criteria which helps to increase understanding of the issue and its smoother integration into other sectoral policies or different administrative levels. Disconnectivity of the strategic and land use planning results in a waste of public funds and is not conducive to problem-solving. The absence of retrospective evaluation of documents points to the current gap in the practice, where there are no official requirements which criteria should be presented in strategic documents to meet the ability to be integrated into the land use planning. But this must be significantly supported by the political will, combined with a political culture and willingness to communicate.

Keywords: *drought, planning, environmental policy integration, SMART*

Cumulative effects of urbanization and intensive agriculture in periurban areas – implications for biodiversity and landscape

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Both urbanization and land use intensification are powerful global drivers of environmental change. Especially in periurban areas they can cause cumulative effects with significant impacts on ecological conditions, biodiversity, ecosystem services and landscape. For c. 10 years, more than half of the world's population has been living in cities and simultaneously the area covered by agricultural land decreased, (in EU during the last 15 years about 6.5%). Hotspots of these losses are in urban agglomerations, particularly in periurban fringes. At the same time, yields and cultivation intensity increased. These ecological unfavourable changes should be lessened, at least partly, by the growing efforts to maintain biodiversity at all levels. On the example of two cities in Germany and The Czech Republic (Dresden and Liberec), the recent development in land use change, leading to soil sealing and land use intensity increase on one side and various approaches to counteract landscape changes and to halt the loss of agricultural areas, green spaces and biodiversity will be demonstrated. In addition, the examples of mitigation measures, including three dimensions will be presented: 1. Planning dimensions: Landscape planning, following the guiding principle of a "compact city in the ecological network", leading to the incorporation of green infrastructure into urban development. 2. Legal dimensions: Natura 2000 regulations of the EU being targeted at protected areas (habitat types) and species, including ground-nesting birds (e.g., partridge and skylark), which suffer from urban development projects and surface sealing. So-called Measures to ensure the Continuous Ecological Functionality (CEF) to compensate losses of field bird habitats have

been introduced. 3. Utilitarian dimension: The assessment of ecosystem services in cities, including perspectives for urban planning and public relations work on the current German/ Czech transboundary project BIDELIN.

Keywords: *green infrastructure, ecosystem services*

Landscape impact assessment in the context of landscape sustainable development

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The scope of landscape management has broadened and diversified in response to international calls for greater landscape protection, and to existing and new challenges, such as those relating to climate change adaptation, biodiversity protection and Natura 2000 network, flood protection, environmental health, environmental information, awareness raising, education and participation. Though the scope of these challenges goes beyond landscape-specific issues, they nevertheless do impact and/or have implications on landscape planning and management. Sustainable landscape development represents a set of legislative requirements and practical steps or procedures, the main purpose and mission of which is the protection, development and reconnection of natural and man-made elements of whole landscapes. An equally important role is also taken by baseline and preventive tools that are typically part of a broader system of environmental management. Landscape (and visual) impact assessment (LIA) is an instrument used to identify and assess the significance and the effects of change resulting from development proposals on both the landscape, as an environmental resource and on people´s views and visual amenity (LI and IEMA, 2013). LIA is an effective tool for the achievement of sustainable landscape development. Since it was first introduced, the scope of landscape

impact assessment has broadened and diversified. Set within the European context, this presentation aims to provide a contemporary review of landscape impact assessment theory and practice, looking at both the project and planning levels

Keywords: *landscape, impact assessment instruments, sustainable landscape development*

National assessment of ecosystem services: Romania study case

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The mapping and assessment of ecosystems and their services (MAES process) is one priority for implementation of biodiversity strategy at European level. The members state need to accomplish the assumed targets and need to find the best way for each to fulfill the requirements. Romania has find the way using the benefit of EEA grant "Demonstrating and promoting the natural values in decision making (N4D)". The results of the N4D project can develop the MAES process at national scale based on covering the two basic needs the first one is to understand an advance conceptual model and the second is to improve continuously collaboration between scientific groups and decision makers.

Keywords: *MAES, mapping ecosystems, ecosystem services, EUNIS, CICES, Romania*

Value of ecosystem services in protected areas as a basis for climate change adaptation planning

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The ecosystem services (ES) concept can provide holistic understanding of the nature-society interactions and possibly as a reason of this is making its way into mainstream environmental policy on various levels. Protected areas (PA) are increasingly under pressure from human activities (competition over land use) and global climate change. Climate change effects such as changes in species composition, extreme events such as increased temperature and droughts can influence important ecosystem services in PAs. Therefore, there is a need for strong policy and guidance to decision-making in both designation and management of PAs. Effective decision-making and governance of PAs requires relevant information on values of ES affected by global change. Adaptation to climate change has been suggested as a necessary response option but the total benefits and costs are largely unknown. In order to successfully adapt protected areas to climate change it might be important to realize their social importance, e.g. in a form of economic valuation. We illustrate the economic assessment of ecosystem services provided by ecosystems and habitats in 25 Protected Landscape Areas (PLAs) in the Czech Republic. The total value of ecosystem services in all 25 PLAs reached €51 billion/year, with the surface area significantly influencing the total average value of a particular PLA. When transformed to value per unit area, the values varied from €1.2 to €6.5 million/km2/year. The results suggest a dominant role of forest ecosystems in the composition of the economic value provided by ecosystem services in the Central-European PLAs. Estimates of economic benefits provided by PAs can be applied in the evaluation of investments and large-scale adaptation projects. They can serve as a basis for further assessment of the role

of PAs in climate change adaptation and mitigation and other values provided to society in a changing environment.

Keywords: *protected areas, ecosystem services, economic valuation, climate change adaptation*

New elements in territorial governance identified in social-ecological systems facing uncertainty: The need for integration in new planning instruments and policies

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Global trends and drivers induce changes in rural and urban landscapes in forms and rates that are for many instances unprecedented. The consideration of such changes into future forms of planning and development instruments should take into account not only approaches for the measurement, monitoring or prediction of environmental variables, but also the perception and response of societies and, in general terms, the complexity of the social-ecological system itself. In this paper, a theoretical approach is taken for the assessment of responses to change in social-ecological systems facing uncertainty, based in two main perspectives: a) problem structuring in policies and its consequences in participatory governance processes (e.g. Hisschemöller and Hoppe, 1996); and b) organizational dynamics in complex systems (e.g. Stacey, 1996; Axelrod & Cohen, 2000; Stacey and Mowles, 2015). Using this approach, new elements of territorial governance are identified to be integrated in policy and planning instruments. Social responses and policy solutions at the regional level during cyclic wildfire episodes in Galicia (NW Spain) are used as an example case study at the regional level.

Keywords: *Territorial Governance, Rural Planning, Social-Ecological Systems, Problem Structuring, Organizational Dynamics, Wildfires, Galicia*

Environmental Development Scenario 2020 in Slovakia

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The development of scenarios is a process based on the analysis of data and trends and also on discussion. Alternative development trajectories and possible implications are considered. Sometimes they are called "alternative worlds". It is not about an exact projection of future. It is an evaluation of possibilities about where we are headed or where we might be headed. This approach aims to analyse the situation and trends in two areas of scenario development which are essential in the context of sustainable growth - biodiversity and climate change. The paper offers the reader an analysis of Slovakia's objectives as defined in the framework of the Europe 2020 Strategy and related objectives on a national level. With regard to biodiversity, the EU Biodiversity Strategy to 2020 document is considered. The progress of some indicators is accompanied by the deterioration of others. The report is based on two key areas, biodiversity and climate change and their modelling, which are essential for conducting analyses of trends developments and possible scenarios by 2020. Three possible scenarios of future developments are discussed in the key part of the monograph – Scenario 1: Baseline (Progress within trends), Scenario 2: Deregulation and post-politics (Unsustainable short-term economic growth and intensification of social conflicts) and Scenario 3: Economic crisis (Reduced production and

consumption). It is important to understand that the aim of analysis is not to show one accurate vision of the future. Instead, it presents several alternative future trajectories. They are based on analysis, however, at the same time they offer critical combinations of environmental, social and economic factors and try to support discussion about the future. Each scenario combines more or less optimistic and pessimistic predictions for future developments and deals with more but also less probable future trends. The outcomes of the analysis and scenario development indicate two opposing trends. On one hand, economic growth is separated from source consumption (a so-called decoupling). It is confirmed by indicators of energy, carbon and the source intensity of production and consumption. On the other hand, despite the crucial importance of ecosystems for the country, they are permanently threatened and degraded. The loss of biodiversity and the degradation of ecosystems and their services will most likely continue. The question is to what degree the negative trends can be slowed down and addressed. An analysis of possible future development scenarios can be perceived as a contribution to the discussion about the future public policies and measures to be adopted.

An analysis of data and indicators leads to the conclusions that most quantitative objectives and obligations defined for Slovakia within the framework of the Europe 2020 Strategy in all alternative scenarios will be fulfilled. At the same time, the trends indicate a contradiction between a relatively high success rate in addressing climate change issues and much more negative trends in biodiversity. This is the biggest challenge Slovakia is going to face in the future and when formulating objectives for 2030/2050.

***Key words**: scenario, trend, biodiversity, climate change, Slovakia*

Supporting decision and communication processes - a model to facilitate multi-actor integration

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GISCAME is a model that enables the integration of multiple data and knowledge sources and scenario development based on a different understanding how landscapes are functioning. With this talk, I wish to demonstrate how multi-actor and multiple knowledge integration can be enabled and what kind of output considers the needs of different actors.

Keywords: *GISCAME, multi-actor integration, multiple knowledge sources, regional planning*

Implementation of ecosystem services in Germany shown on the examples of TEEB and MAES process

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"Ecosystem services" (ES) have become a key word in the international debate on nature conservation / resource use. In Germany too, the ES concept is receiving increasing attention. On the research side, the topic was gratefully taken up and numerous basic and application-oriented papers were written. Nevertheless, there is still a lack of recognized, binding evaluation / planning standards. International policy initiatives and strategies such as TEEB, IPBES, EU Biodiversity Strategy 2020, SEEA were proactively received and

supported by Germany. If one analyzes, for example, the TEEB-DE reports, a neo-liberal view of nature conservation issues and challenges is expressed as economic categories play a prominent role. The efforts to implement ES are explained in the presentation using nationwide indicators. In accordance with the requirements of the EU Biodiversity Strategy 2020, a system of national initial capture of ES for Germany was developed and coordinated. The indicators provide an insight into the evaluation and resilience of nature in Germany - in various dimensions, systematically and spatiotemporally. The use of coordinated ES indicators as a measurement and control tool for sustainable development at national level would be desirable (e.g., with regard to concrete planning cases or the integration of ES into national resource policy), but needs the consideration of opportunities and risks. The establishment and legitimization of the ES indicators as well as the integration of the ES into the national environmental economic accounting are still in the beginning in Germany. Requirements, consequences of action and load limits can never be derived "automatically" from ES indicators; this always requires interpretations and political assessments with regard to functioning ecosystems and the preservation of biodiversity.

Keywords: *Biodiversity, Ecosystem Conditions and Services, Implementation, Indicators, National Scale, Policy, Relevance*

Mapping the green roofs. An approach to analyze the suitability for greening urban roofs and resulting effects in selected districts of Istanbul

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Istanbul is the third largest metropolitan area in Europe with an estimated 13.5 million inhabitants (2010) and an average population

growth of 3.3% per year. As any other big city, it suffers under the negative impacts of urbanization. This proposal tries to discuss how these negative impacts (i.e. risk of flooding, Urban Heat Island building) could be lowered or how countermeasures can influence the city's climate and water regime. The focus of the investigation will lay on roof greening as a potential mitigation strategy. Based on a short initial review of the most groundbreaking concepts published the result of this preliminary work in the following workflow acts as a guideline to estimate the potential efficiency in selected investigation areas of Istanbul. According to the characteristics of the target region, the effectiveness of green roofs in terms of hydrological and climatological impacts under Mediterranean climatic conditions are examined. In a next steps the determination of suitable roof areas is done by the means of GIS, namely by methods for collecting and extracting suitable roof areas through. In the following step deals with the large scale modelling of hydrological effects describing the water balance of a whole municipality as well as the resulting climatic consequences. Finally, the work has shown that roof greening in general will produce remarkable positive effects within the urban areas of Istanbul. Especially from the hydrological point of view green roofs seem to produce promising consequences. Apart from that a more accurate estimation of the concrete impacts is not possible, mainly because of the lack of appropriate data.

Keywords: *roof greening, GIS, Istanbul*

Pressures to grassland ecosystems – the European Union and Slovak perspectives

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EEA (2015) identified eleven global megatrends including growing pressures on ecosystems and increasing environmental pollution. The paper is focusing primarily to growing pressures to grassland ecosystems, considering the environmental pollution as one of

pressure types impacting grasslands. As main reasons for the loss of grassland habitats in Europe were identified urban sprawl and development, conversion of pastures and (semi-natural) grasslands to arable land (in areas where agriculture is profitable), and land abandonment, causing grassland to revert to shrub land or forest (in areas where socio-economic conditions are unfavourable for farming). For territory of European Union, the European Topic Centre on Urban, Land and Soil (ETC ULS) produced maps of pressures to main ecosystems types, including grasslands. Following pressures were mapped: intensive agriculture, grassland abandonment, land take, habitat loss, nitrogen input, an nitrogen deposition. We analysed where hotspots of these pressures to grassland habitats of European importance are located in the European Union and in Slovakia. On the regional level, we assessed impact of pressures to grassland habitats in the Poloniny National Park (NE Slovakia). Besides negative impacts, also positive effect were recorded, namely influence of the Common Agriculture Policy (CAP) to grassland management. Despite clear contribution to grassland maintenance, also side effect of CAP was recorded – landscape homogenisation. The air pollution and pollutant deposition belong to important pressures to grasslands. After strong reduction of sulphur pollution in 1990-ies, nitrogen deposition becomes the most important source of grassland acidification and eutrophication. We demonstrate effects of the increased deposition on example of alpine acid grasslands.

Keywords: *grassland, pressures, intensification, abandonment, pollution, nitrogen*

Synergies and trade-offs of ecosystem services provided by urban lakes

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Urban lakes are important elements of green infrastructure being capable of providing key ecosystem services (i.e., flood control, irrigation, recreation opportunities, cooling effects etc.) as a result of their aesthetic, ecological and recreational functions. The current challenge is how to plan and manage such spaces so they can be properly protected. Thus, the aim of our study is to identify the synergies and trade-offs of the ecosystem services provided by the urban lakes by investigating both lay people and experts' perspectives. We examined perceptions on various subcategories within the four types of ecosystem services (provisioning, regulating, supporting, and cultural) which urban lakes provide. Face-to-face written questionnaires with 293 randomly selected lay people and 44 experts were conducted. Lay people were selected from three Romanian cities while experts survey was implemented at the international level. A multiple correspondence analysis was carried out to explore synergies and trade-offs between the ecosystem services provided by the urban lakes. Preliminary results showed that while more provisioning services imply more cultural ecosystem services in both lay people and experts' perceptions, the trade-offs between cultural ecosystem services seem to be prevalent. Understanding the synergies and trade-offs of the ecosystem services provided by the urban lakes from both lay people and experts evaluations provide important information for the complicated planning processes which are often overriding consideration of the different interests of stakeholders.

Keywords: *urban lakes, Romania, ecosystem services*

Concept of Ecological Supply of Earth for Sustainability of Landscape

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In our opinion sustainability oriented economic science must take into consideration negentropic principle of existence of biosphere, for otherwise mankind will destroy the environment of its existence and thusopportunities for economic development will be lost. In this context we propose the spatial paradigm of sustainability management of land scapes and Concept for ecological supply of natural capital of Earth. The essence of our Concept is that the amount of natural capital consumption is limited by the spatial norm of sustainability of its orderliness (negentropic) potential. Supporting the productive biophysical function of terrestrial ecosystems is a priority task on the path towards sustainability. Annual production of living matter is an important indicator of the ecosystems productivity, which has be taken into account as a basic for evaluation of ecosystem services. Each area is landscape with a specific volume of biological productivity. This productivity is expressed as the annual production of living matter (according the theory of biosphere by V. Vernadsky). For example, while being equivalent to 76.5 tons per hectare for meadow grasslands, it amounts to 1.22 tons per hectare for birch forest and 1.3 tons per hectare for beech forests. Anthropogenic and economic pressure upon rural areas should be formed correspondingly. The innovative research approaches to environmental indicator development for sustainability and valuating approach to function of natural capital of Earth itself consumption and conservation are based on taking into account energy requirements of natural capital reproduction in the terrestrial biosphere. This gives the possibility to make a preventive managerial decisions on path to sustainability.

Keywords: *productive biophysical function of natural capital terrestrial ecosystems landscapes ecological supply of Earth biosphere living matter*

Towards a homogeneous continent? Long term land use change Trends in Europe from 1900-2010

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Land use land cover change (LULCC) generate path dependencies, with powerful inertia that can drive spatial development. In spatial terms, LULCC behave as a sum zero game, where gains in particular land use types take place always at the expense of others. This particular aspect makes the analysis of LULCC trade-offs a fundamental aspect for sustainability. In this context, the aims of this research were twofold (1) to analyse the evolution of the European landscape structure looking at LULCC in the long term; and (2) to analyse the spatial structure of changes within countries to understand such long term trends and path dependencies. The analysis performed over the basis of a historical land use spatial data set, covering 100 years from 1900 up to 2010. We compute the relative changes in the share of land uses in terms of four main land uses in 1900 and 2010: urban, forest, crops and grasslands, to highlight long term trajectories and main transitions of 26 countries within the European context. The analysis was based on the respective land cover percentages for both share and change to avoid spatial biases arising from country sizes. We used principal component analysis (PCA) to account for the endogeneity of the data and identifying structural patterns and trends, analysing the countries trends, to cluster the land use change behaviour in the long term. Our results show that Europe has experienced two tremendous spatial transformations in terms of land use structure during the last 100 years: (1) Forest became the most

relevant land cover, while urban areas have been double fold; and (2) a clear trend of homogenisation in the land cover structure of countries.

Keywords: *Spatial analysis, historical mapping, path dependency*

Environmental impacts of urbanization on the example of Trnava city

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The development of cities is linked to qualitative changes of the landscape aimed at strengthening economic, administrative and cultural-social functions, which are associated with ever-increasing pressures on ecosystems and their individual components. These pressures are subject to various factors – socio-economic, political, environmental, etc. Like many post-communist countries, Slovakia has undergone significant changes. The transformation of central planning into a market economy was the basis of these changes, which conditioned following strong pressure of investors to the landscape, construction of technological parks, shopping and logistics centers, transport infrastructure and also construction of residential complexes, etc. The conversion of natural and semi-natural ecosystems into built-up areas represents activities with significant negative ecological impacts (e. g. habitat destruction due to the reduction of forest and urban vegetation, top-quality landscapes for non-agricultural activities, etc.). Effects on ecosystems and their negative consequences are also recorded due to rapidly changing needs and consumption patterns (luxury living, transportation and

energy). These trends negatively reflect not only on the ecosystem changes and as threats of ecosystem services, but also on the deterioration of the quality of the environment. In the poster we will present the evaluation of the land use changes in the Trnava city in different time horizons (Trnava is one of the most dynamic cities in Slovakia). Land use is a basis for assessing the negative urbanization impacts in the city. Changes in land use in selected time horizons and ecological effects caused by these urbanization changes are evaluated. We will also present the main driving forces of these changes and the major ecological and environmental problems caused by these changes. The poster will present an example of an integrated approach to assessing the environmental impacts of urban development.

Key words: *land use changes, urbanisation, environmental impacts of urbanisation, natural resources, ecosystems, Trnava city*

Identification of the gap between supply and demand of ecosystem services based on the local perception in northern Ghana

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This study aims to identify the gap between supply and demand of locally important provisioning ecosystem services through an involvement of local stakeholders in two districts of northern Ghana. We define here ecosystem service capacity of land use types as supply-side and ecosystem service consumption as demand-side. Firstly, two types of indicators to assess the provision of food, fodder, energy, construction materials, and marketable products are identified. Through surveys, local stakeholders are inquired how they perceive the capacity of land use types to provide the ecosystem services, and how they actually use land use products in order to

obtain the ecosystem services. The generated indicator values are combined with a land use map in the assessment platform GISCAME that consists of cellular automaton based modelling and GIS modules. The results show the differences of regional capacity to deliver the ecosystem services depending on the types of indicators. Identification of gaps between supply-side and demand-side values allow to ascertain ecosystem services that can be potentially generated, whereas practically difficult to deliver due to restrictions and socioeconomic factors, or ecosystem services that have already been supplied by a certain land use type but have not been recognized as an ecosystem services by local stakeholders. Therefore, an insight into locally tailored options to utilize land resources for ecosystem services can be offered.

Keywords: *articipatory assessment, stakeholder, ecosystem service indicators, ecosystem service mapping, Africa*

The methodological approaches comparison of the landscape offer and ecosystems benefits evaluation for ecological tourism (ECOTOUR) development options (Bratislava IV example – cadastre Devín)

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Ecosystem services are benefits provided to human society by natural ecosystems, broadly understood as ecosystem processes that maintain human life. Cultural ecosystem services in particular represent immaterial benefits derived from aesthetic and other experiences, recreation, cognition and spiritual enrichment, as the ability to distinguish values. The study focuses on the comparison of 2

methodological approaches to the assessment of landscape offer and ecosystem benefits for the development of ecological forms of tourism on the example of Bratislava IV.
The first approach is based on the landscape ecological importance (LEI) where the criterion of the evaluation is the degree of naturalness, species rareness and biodiversity endagering. It is all based on the degree of vegetation hemeroby and their utility property. The basis for database information is the processing of secondary landscape structure. The mapping of landscape cover classes (Land Cover) is based under the legend of CORINE LAND COVER Teqnical Quide – Addendum on the 4rd and 5th mapping level in the 2014-2017 years.
The second approach is based on a creation of indicators set and their evaluation carried out under the method of the scaling. These indicators have been chosen: natural potential (including protected areas), culture-historical potential, recreational infrastructure, environmental infrastructure. It is focused on natural, social-economic and cultural conditions, possibilities or limitations based on recreational activities.

Keywords: *ecological forms of tourism, landscape cover, landscape ecological importance, culture-historical potential, natural potential, recreational and environmental infrasctructure.*

A planning framework to evaluate demands and preferences by different social groups for accessibility to urban greenspaces

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The crucial role of greenspaces in cities is the focus of a relevant amount of contemporary research on urban and planning issues.

Greenspaces are widely considered having positive implications for health and providing a complete set of ecosystem services in cities. Highly linked to the concept of ecosystem services is the issue of accessibility to the ecosystems and places providing the services. This paper presents a planning framework for urban greenspaces that considers demands and preferences for accessibility of different social groups (e.g. children and elderly people). It is designed to achieve different objectives in terms of planning and design of greenspaces and to be used in different urban contexts. The framework is structured in four phases that take place during a planning process of greenspaces: the definition of the objectives, the modelling of accessibility to the new or existing greenspaces, the interpretation of results and the definition of planning decisions. In the framework, accessibility to greenspaces is assessed through spatially explicit GIS-based indicators that combine socio-economic and land-use data with the road network information, so to take into account the interactions between social demands and the presence of greenspaces in cities. An application of the planning framework is presented for the city of Nagoya (Japan), characterized by different type greenspaces, high urban density urban and presence of particular social groups.

Keywords: *Greenspaces, Accessibility, Social groups, Urban planning*

Using of landscape indicators for identification of ecosystem services in Poland

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Land use is the direct indicator often used by researchers for assessing of human pressure. Land cover conversion and (de)intensification of land management also are often used for assessing of Ecosystem Services (ESs). Unfortunately the researchers consider changes in the spatial arrangement of land cover types very

rarely. The task of our study is to show influence of landscape structure (e.g. shape and area of patches, length of landscape borders) on the level of ESs. Nine ecosystem types on the basis of CLC for years 2000, 2006 and 2012 according to MAES classification were set. Then the landscape indicators for 10 km grids for entire Poland were counted. Based first only on surface area of ecosystems and then also on other composition and configuration indices, three chosen ESs were assessed and the differences were interpret. Present study shows possibility to use landscape pattern indicators to predict changes of ESs and it provides the reasons to consider them both in landscape ecology and in spatial planning.

Keywords: *landscape indicators, land use changes, ecosystem services, Poland*

Global megatrends, challenges, scenarios and their integration into environmental policies

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The current development of mankind is accompanied by the aggravating of global problems and related environmental risks and threats; on their solution even depends the survival of mankind itself. It is necessary to respond to such fundamental issues by formulating and refining possible scenarios of further development and related challenges (which is the role of scientists, especially forecasters and environmentalists); and by formulating, adopting and implementing the relevant priorities, objectives and follow-up steps (which is the role of politicians and planners). The article analyses the main methods of foresight, selected scenarios, related challenges and policies at different levels (global, European and national). The main

message of the article is that while scientific methods increasingly point to the risks of current human development towards its possible self-destruction, the policy response remains delayed and rather on a declarative basis. Of the three spatial levels monitored, the greatest progress could be pronounced in case of the European Union whose environmental policy is very progressive - but it is confronted with shortages on fulfilling the global commitments and, at least for some countries, with insufficient and delayed response at national level. Finally, the basic principles and tools needed for ensuring an adequate and balanced development of human society are discussed. The common premise for effective solutions is that social and economic development needs to be seen as an integrated issue including environmental implications. At the same time, addressing global and regional environmental threats belongs to the one of the key factors of further reasonable (ideally sustainable?) human development.

Keywords: *environment, global megatrends, scenarios, environmental policy*

Urban geosystems mapping and analysis for urban landscape functions assessment

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The spatial analysis for ecosystem services assessment, land management and improvement is primary based on search and selection of spatial homogeneities which may be uniform or present a peculiar pattern of heterogeneous land cover types. Urban morphology pattern imposed on land relief and geology forms urban landscape which should be studied by all research methods used in

geography. Urban geographical system is characterized by certain type of landform, sediments and urban morphology and is a unit of urban landscapes mapping. The mapping of city of Tyumen (Siberia, Russia) was performed using field survey data (150 sites), high-resolution aerial images, multispectral Landsat images and Sentinel-1 radar images. Tyumen is situated on a series of highly waterlogged floodplains and terraces of river Tura. The urban tissue consists of wooden 1-2-floor housing, brick and panel 3-5-floor buildings, new multistory buildings, parks, industrial zones and open spaces.
We studied the effect of urban geosystems pattern on some regulating (local climate and air quality regulation) and cultural (aesthetic and recreational value) landscape functions. We calculated land surface temperatures based on Landsat 8 TIRS data for different seasons of the year and linked them to urban landscapes composition. For assessing air pollution in the city we selected snow samples from undisturbed surfaces at all sites of field observation on a significance distance from the roads. The known dimensions of snow cores enable us to calculate average inflow of air dust and pollutants per square meter. Preliminary analysis showed that snow pollution is a result of multiple basic factors – relief, density of trees and the area of green zones, landscape neighborhood, – and temporarily factors, such as construction. Analysis of urban landscape metrics helped us to reveal the optimal composition of urban geosystems, including needed industrial zones, for better ecological, aesthetical and comfortable environment in the city.

Keywords: *urban geosystem, landscape pattern, landscape functions, LST, air quality*

Natural sciences, decision making and global megatren

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The deal of the decision making on the global megatrends and changes. Levels of the changes - from local turbulences up to global trends. Influence of the sciences on the decision making – are there proper instruments and procedures? Main-stream developments, integrated approach, overlaps and gaps.

Keywords: *Landscape ecology, geography, management, integration*

The impact of global megatrends on ecosystems in Slovakia

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Healthy ecosystems are the basis of life and are essential to human well-being and societal prosperity. They provide direct and indirect benefits, including food, clean air and fresh water, shelter and medicine, and they mitigate natural disasters, pests and diseases and contribute to climate regulation. Despite the irreplaceable significance of ecosystems for landscape, they are continually threatened and degraded. According to MEA, 60% of the world's ecosystems are degraded or used unsustainably; 75% of fish stocks are over-exploited or significantly depleted and 75% of the genetic diversity of agricultural crops has been lost worldwide since 1990. Deterioration and loss in ecosystems jeopardise provision of these services. A similar situation is also in Slovakia. Vulnerability of higher plants reaches 42.6% (for all threatened categories), and 30.3% (in CR, EN

and VU categories). The vulnerability of invertebrates in the SR is currently around 8.4% (and 5.4% only within CR, EN and VU categories). Up to 59% of vertebrates are at risk (and 23.5% within CR, EN, and VU categories) (MŽP SR, 2016).

Pressures on the use of ecosystems and their services have increased notably in recent years. This is accompanied by influences of global megatrends, mostly increased exploitation, especially emanating from demographic change, economic development, a resource consumer lifestyle, and changing societal behaviour. Increased demand for ecosystem products, including food, raw materials and derived energy, and subsequent land use changes and supply of regulating and supporting services will assume the same or even greater importance in the future. Climate changes are a significant factor in changing and threatening ecosystems and their services too. From the point of view of maintenance all types of REPGES and their ecosystem services, considerable attention should be paid to mapping and evaluating changes of individual ecosystems.

In Slovakia, the concept of representative geo-ecosystems (REPGES) was developed for the purposes of assessing the impacts of global megatrends on landscape and its ecosystems. REPGES are landscape-ecological homogeneous units allocated on the basis of file abiotic and biotic conditions of the territory. In total, 120 REPGES were identified in Slovakia. By comparison of the representative geo-ecosystems and current geo-ecosystems we can assess changes in ecosystems and its ecosystem services.

The paper will focus on introducing the REPGES concept and assessing the impacts of global megatrends on representative geoecosystems in Slovakia.

Keywords*: global megatrends, representative geo-ecosystems, Slovakia, biodiversity*

Regional development and green infrastructure

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Natural and cultural heritage is an integral part of the territorial capital and identity not only of the EU but also of individual member states, their cities and municipalities. Excessive use of resources is considered a threat to the territorial development. According to the European Commission (2013), the aim of green infrastructure is to harmonise human activities with natural environment and to boost the possibilities of socio-economic development in local municipalities when the provision of basic commodities and services must be accompanied by conservation of physical properties of ecosystems and landscape identity.

The knowledge of natural conditions and humane society with its regional particularities will contribute to understanding of functioning of hereof system and they will be utilized in the elaboration of their management proposal.

Evaluation of the encounters of interests in the landscape will be documented on the example of the Territorial system of ecological stability, landscape ecological plan, and sustainable landscape management in model territory Trnava district.

From the environmental aspect, the territory represents a landscape intensively used by industry and agriculture with specific environmental problems. It represents a strongly anthropized landscape with a low degree of ecologic stability.

Keywords: *regional development, green infrastructure, Trnava*

Methods of identification of soil risk by water erosion

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The condition of the environment has become a global problem which is also reflected in soil quality. Both productive and non-productive soil functions are at risk. Soil changes related to erosion are reflected in the ability of soil to perform these functions. As a consequence, changes in water quality, air quality, and biological diversity can occur. Significant soil loss caused by water erosion has become a global problem. An effective solution of this problem is conditioned by the effective identification of areas under threat of water erosion, which prevails in Slovakia. The aim is to point out the need to combine methods of identification of water erosion processes in order to objectify them for the needs of elimination of water erosion in agricultural practice. For water erosion assessment we used the method of spatial extension and digitisation of surface water erosion results using aerial photographs and modelling of water erosion processes using the universal equation for calculating the loss of soil by water erosion. Other methods of identification were based on the need for implementation of field research. The method of visual identification, verification of erosion processes by soil probes and identification of soil organic matter and soil structure were used. Each identification method has proven to be appropriate but can not be generalized and explicitly recommended for every study area. Erosion processes are influenced by specific natural and anthropogenic conditions. The methods mentioned have both positive and negative sides. Proper identification of erosion processes is possible by a combination of the presented methods. The importance is in exact localization of areas endangered by the erosion with the possibility of designing exact anti-erosion protection.

Keywords: *erosion process, modelling of water erosion, soil probe, soil organic matter, anti-erosion soil protection*

Benefits of restoring ecosystem services in urban and suburban areas of Belgrade, Serbia

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Cities are a key nexus of the relationship between people and nature and are huge centers of demand for ecosystem services and also generate extremely large environmental impacts. Current projections of rapid expansion of urban areas present fundamental challenges and also opportunities to design more livable, healthy and resilient cities (e.g. adaptation to climate change effects). We present the results of an analysis of benefits of ecosystem services in urban and per-urban areas of Belgrade, Serbian capital. Our results show that investing in ecological infrastructure in city, and the ecological restoration and rehabilitation of ecosystems such as woodlands occurring in urban areas, may not only be ecologically and socially desirable, but also quite often, economically advantageous, even based on the most traditional economic approaches.

Keywords: *environmental resources, suburban forests, ecologically and socially desirable*

Approaches to payments for forest ecosystem services in Europe

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Payments for ecosystem services (PES) is a flexible, financial mechanism for utilisation available finance for environmental improvement. Payments for forest ecosystem services (FES) has gained increasing policy acceptance at national and international levels. However, evidence on its effectiveness is limited and rather mixed. PES design is a complex task, there is a number of PES design features, which need a careful understanding of the specific ecological and socio-economic context. The purpose of this paper is analysis of main approaches to payments for FES and types of PES schemes or financial arrangements with emphasis on three basic schemes: (i) public schemes or government-financed PES (Pigouvian type), (ii) private schemes or user-financed PES (Coasean type), and (iii) public-private schemes (mixed type). Data part is based on review of PES schemes implemented in different Forest Europe signatory countries. Formulated recommendations for policy makers on the challenges related to implementation of PES schemes will serve as guidelines on deciding which PES is the best suited to which context.

Keywords: *financial mechanism, forest functions, design and schemes of payments*

Integrating ecosystem services concept in urban spatial planning in Belarusian cities

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The inclusion of ecosystem services (ES) in urban spatial planning is essential to promote sustainable urban development. However, ES concept has not yet been integrated in spatial planning in a systematic way in Belarus. In this paper, we assess how the ecosystem service framework is organized and implemented in the current spatial planning in Belarusian cities. Based on an analysis of strategic planning documents and expert interviews with local stakeholders, this paper explores (1) how is the ES concept, in explicit and implicit terms, represented in different urban planning documents and practices? (2) which ES are referred to and how broad is the thematic scope within planning documents? and (3) what is the main challenges in urban green governance? Challenges in Mogilev's urban green governance include (a) gaps and misfits in regulative documents, (b) financial constraints on the municipal budget, (c) loss of expertise and (d) low awareness of green benefits among different actors through insufficient communication. In the case of Belarusian cities and Mogilev particular, we found the list of actions to address urban ecosystem services and a variety of tools for implementation. It should be noted that a set of ecosystem services (i.e. recreation and some regulating services linked to typical urban environmental problems) are widely addressed, while others are hardly considered. We argue that urban planning documents could benefit from a further appropriation of the ecosystem service approach by practitioners and decision-makers based on the implementation of participatory approach, ecosystem mapping and involving multidisciplinary team in the development of the urban development plans.

Keywords: *Ecosystem services, spatial planning, planning documents*

Reducing urban sprawl in functional urban areas through multilevel governance

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As described by Eurostat, functional urban areas (FUAs) are "functional economic units characterised by densely inhabited "urban cores" and "hinterlands", whose labour market is highly integrated with the cores". FUAs are characterized by urban sprawl and different related to it socio-environmental conflicts (e.g. land use conflicts, human – wildlife conflicts), which lead to ecosystem and habitat fragmentation, biodiversity loss and/or conflicts between new and old residents. Urban sprawl in FUAs is a cross-boundary phenomenon and its spatial extend and influence is not limited to one administrative unit. Thus the problem of urban sprawl in FUAs requires approaches, which reflect multi-stakeholder and cross-level interactions. Urban sprawl influences many different governance actors related to FUAs. Those actors need to communicate in order to understand different points of views and to learn from each other how to tackle urban sprawl and related socio-environmental conflicts.

The research aims to propose a theoretical governance model to tackle sprawl in FUAs. The model is based on three thematic work packages (WPTs). The first WPT aims to perform peri-urban land use analyses by means of environmental mapping, and social network analyses of governance systems. The second WPT proposes to establish a transnational living laboratory, which is going to be a self-learning think tank, aiming to foster mutual learning among local governance actors. The third WPT will firstly elaborate participatory scenarios for all identified urban sprawl hot-spots and later will prepare strategies and action plans based on outcomes and in close collaboration with WPT2, aiming to sustainably guide urban sprawl along axes of land use conflicts.

The innovativeness of the research approach is based on joint quantitative assessments of land use structures of FUAs with social network analysis of local governance actors and actions. Moreover the proposed model plans to implement some elements of citizen's science approaches.

Keywords: *functional urban areas, urban sprawl, WPT*

Remote Sensing based change detection of selected urban features

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This paper deals with Remote Sensing change detection of selected features in an urban environment through exploitation of very high resolution airborne UltraCam data. The main goal was to find out whether the data and their derivate (photogrammetric surface models) are suitable to semi-automatically detect changes in cities, which are characterised by high heterogeneity and rapid change. The theoretical approaches and remote sensing change detection principles and the general discussion of the Remote Sensing based possibilities of detecting urban features are treated in the first part of the paper, too. The number of change detection methods is enormous and therefore a "state of the art" is presented. In addition environmental and sensor specific considerations, which affect the quality of change detection analyses and the applicability of the methodology for other urban areas, are discussed. The second main part is devoted to the development of a change detection method for the city of Graz. The developed change detection algorithm does not represent a complete change matrix of all changes in the city, but focuses on significant changes of selected features. The construction and demolishing of buildings, cutting trees and sealing process are in the main focus of town planners. Considering that the spatial extent of changes in

general in an urban area is very small compared to the total area of the study areas. Furthermore, most classes of a complete change matrix are highly unlikely anyway, to legal restrictions. An object and knowledge-based hybrid change detection method involving image differencing, image rationing and principal component analysis was developed and applied for three main changing features in the town. The environmental influence and data properties, which have a major impact on the accuracy of the change detection result, were also examined for three dates of the study period (September 2007, June 2011 and April 2015).

Keywords: *Remote Sensing, Chang Detection, Urban features*

Drivers and threats of traditional agricultural landscape in Slovakia

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Traditional agricultural landscapes (TAL) in Slovakia represents a mosaic of unique small-scale arable fields and permanent agricultural cultivations such as grasslands, vineyards and high-trunk orchards, which did not change during the collectivization of agriculture from the 1950s to the 1980s. Facing the disappearance of traditional agricultural landscapes in Slovakia, we wanted to collect information about their present state, distribution, and the driving forces behind their accelerated abandonment after the transition to a market-oriented economy. Our aims were to: (1) map the distribution and degree of management of TAL in Slovakia, (2) analyse the geographical preconditions of abandonment (slope, soil fertility, accessibility, isolation), (3) analyse the driving forces behind the TAL abandonment in three case studies areas. The results from the country-wide mapping shows, that 50% of the TAL area is regularly managed, 34% is partly abandoned, and 16% is abandoned.

Abandonment occurs most intensively on steep slopes and on less fertile soils. The distance from settlements is important in the case of TAL with dispersed settlements and TAL with arable land and grasslands. Interviews at the case study level showed that financial profit is the main factor, which would motivate the local people to farm the TAL. Around 30% of respondents showed no interest in management. Local farmers identified the financial instruments in agriculture, in the form of unfavourable subsidies and the financial inaccessibility of modern tools and machinery as the main barriers in ideal management, together with an inadequate market and the weak support of local government. In addition, there are other cultural factors that play a role in their abandonment such as changes in the rural culture, attractivity and diversity of other ways of living, lack of successors, health and age constraints, as well as a number of persisting problems regarding unresolved land ownership in some areas.

Keywords: *abandonment, traditional agricultural landscapes, financial instrument, natural condition, sociological survey*

Important of environmental resources of suburban forests to improving the environment of the city of Belegrade

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According to their location and character, the forests that make the forest growing stock of the city of Belgrade are special purpose forests. These forest areas are excluded from regular forest management and their prime functions include protective-regulatory and social forest functions. Environmental potentials and vital values of these natural resources have significant quantitative and qualitative

effects on the conservation and improvement of the environment in this large urban agglomeration. The paper presents the results of investigating stands of Hungarian oak and Turkey oak in the forest complex Lipovica, within the suburban forest zone of the city of Belgrade, in the period from 2006 to 2014. These stands belong to special-purpose forests and they are categorized as protective reclamation forests. The stands are of coppice origin, 65-70 years old, which means that they are at the end of the rotation. The first part of the investigations deals with environmental potentials of Lipovica forest. By applying the proposed methods of conversion, graded in time, space and intensity, the investigated stands will be converted into a high silvicultural form. They will further achieve uneven-aged structure, a favourable composition of the mixture and a sustainable mature forest. These modelling solutions for regeneration of the investigated stands are the basis of a strategic concept for the future development and current state improvement of Hungarian oak and Turkey oak special-purpose forests in the Belgrade area.

Keywords: *environmental resources, suburban forests regeneration, Hungarian oak and Turkey oak forests*

Effects of human-created terraced landscapes on ecosystem services from diverse scales: monitoring and evaluation

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For thousands of years, humans have created diverse terraces in different sloping conditions, meant to mitigate flood risks, reduce soil erosion and conserve water. These anthropogenic landscapes can be found in different ecosystems across the globe. In this study, the comprehensive role of terracing in affecting soil, vegetation and eco-hydrology were studied. The national and global distributions of terracing and their ecosystem services were also evaluated. The major

findings are as follows. First, terracing can enhance soil water status significantly, and promote evapotranspiration and vegetation water consumption. Compared to natural slopes, the average extractable soil water at the terraced sites increased from 37.5% to 325%; daily evapotranspiration increased from 4.76% to 20.4%. After terracing, soil nutrients like carbon and nitrogen increased 8.78% and 16.69%, respectively. Soil moisture and hydrologic features increased by 13.4-14.6% and 6-26.7%, respectively. Runoff coefficient and erosion modulus decreased 31.9%-60.5% and 53.9-84.7%, respectively. Based on the simulation results from WEPP model, runoff reduction rates at two-step benches and three-step benches increased from 6.5% to 61.2%, and from 10.1% to 69.7%, while the erosion reduction rates increased from 1.1% to 68.8% and from 1.4% to 68.8%, respectively. We thus suggest that the width and step numbers should be adjusted according to the real world, which helps to achieve the best solutions. Second, terraces have been found in over 30 provincial-level regions in China. The mean runoff and erosion reduction rates can reach 48.9% and 53% respectively. Globally, terraces in at least 74 countries were detected, with some ancient terraced landscapes existing over several thousand years. We found that the greater role of terracing found in erosion control (11.46 ± 2.34), followed by runoff reduction (2.60 ±1.79), biomass accumulation (1.94 ± 0.59), soil water recharge (1.20 ± 0.23), and nutrient enhancement (1.20 ± 0.48).

Keywords: *terracing, Loess Plateau, China, ecosystem services*

Biotope vulnerability indicators for landscape change

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Biodiversity loss is one of the greatest challenges of our times and habitat loss is the primary driver. The altered and in parts threatened biosphere is organized in species communities. In combination with

abiotic factors they are characteristic for a diversity of biotopes. To avoid further biodiversity losses, landscape planning and ecosystem management could make use of a condensed measure to assess the potential damage to these biotopes, as well as their capacities to recover from it. Mapping of biotope vulnerability allows tracking regional and cumulative ecological degradation by identifying vulnerability hot spots that may require specific intervention of protection or maintenance. According to the interdisciplinary vulnerability concept, an indicator set regarding landscape change was developed for biotopes mapped according to the Brandenburger mapping key (Germany). The set is structured into indicators on sensitivity, adaptive capacity, and exposure. The analysis of sensitivity and adaptive capacity is based on some typical patch metrics (size, number, shape), the connectivity to a meta-community, protection status, and naturalness of the surrounding. The exposure to a certain landscape change is intrinsic regarding past changes, and is assessed scenario-based regarding plausible future changes. The indicator calculation and mapping for such a large amount of patches involved ArcGIS (version 10.2.2), the add-in Patch Analyst, and the Geospatial Modeling Environment (GME). Primarily for nature conservation purposes, European biotopes are already mapped for large areas. These biotope maps provide spatially explicit data on natural and semi-natural systems, with details on characteristic plant and animal species that form a community. The vulnerability indicator set is intended for application on large spatial scales and hold the potential for a straightforward transfer to biotope maps from other European regions.

Keywords: *habitat, biodiversity loss, landscape ecology, sensitivity, adaptive capacity, exposure*

Integrating green-blue infrastructures into the urban planning

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The green-blue infrastructures protect biological diversity and species habitats, decreases susceptibility to the natural disasters of the city, which also reduces the dependence on the grey infrastructure of the city. It is vital to integrate the green-blue infrastructures into the urban master both the national and city level. Along with high-speed urbanization and rapid economic growth in China, cities are confronted with ecological deterioration and environmental pollution. Integrating green-blue infrastructures into the urban planning has important practical significance. While, in the existing urban planning system of China, there are few clear and specific rules about green system and ecosystem service. This research aims to study good practices in European Cities, including identify regulations and planning relevant to the urban green-blue infrastructure, and the feasible obligatory indicator and target about improving ecosystem service. The institutional and coordination mechanism about designing, monitoring and implement the green-blue infrastructure. Best practices related to incorporating green system into the urban master planning will be also addressed in this paper.

Keywords: *green-blue infrastructure*

Evaluation of ecological integrity in landscape context based on spatial analysis using Sentinel-2 and Landsat 8 data

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Maintenance of ecological integrity on global as well as regional scale is the prerequisite for sustainability as well as beneficial ecosystem services. Ecological integrity is a globally acknowledged concept (Paris Agreement, 2015), although there is a no consensus on a generally accepted theory or a unified measurement method to evaluate integrity. This contribution aims to develop and test a first method of integrity assessment on a regional level, based on freely available data from remote sensing (Landsat 8, Sentinel-2). The method is tested in two study areas, representing two different management regimes as well as scales (Protected Landscape Area Třeboňsko in Czech Republic and member state Schleswig-Holstein in northern Germany), and further validated using a land cover map (CORINE LC 2012, Consolidated Layer of Ecosystems ČR). The results of measurements, based on three variables (photosynthetic potential, evapotranspiration potential and texture heterogeneity), provide a simple and consistent method for identification, assessment and quantification of the integrity gradient in a regional context. Permanent vegetation, wetlands and forests perform the best in terms of the selected integrity indicators, while arable land and urban areas the worst in both case study areas. Naturally valuable localities can be reliably identified using the presented method in medium/high resolution (10m). An integrative Regional Index of Ecological Integrity (RIEI [%]) is derived as an estimate of the relative distance between potential top and bottom performance in regional context. The explanatory power of the tested method can be used in nature conservation, ecosystem management as well as setting ecological targets and goals for policy makers.

Keywords: *Ecological integrity, Remote sensing, Environmental management, Ecosystem ecology, Landscape ecology*

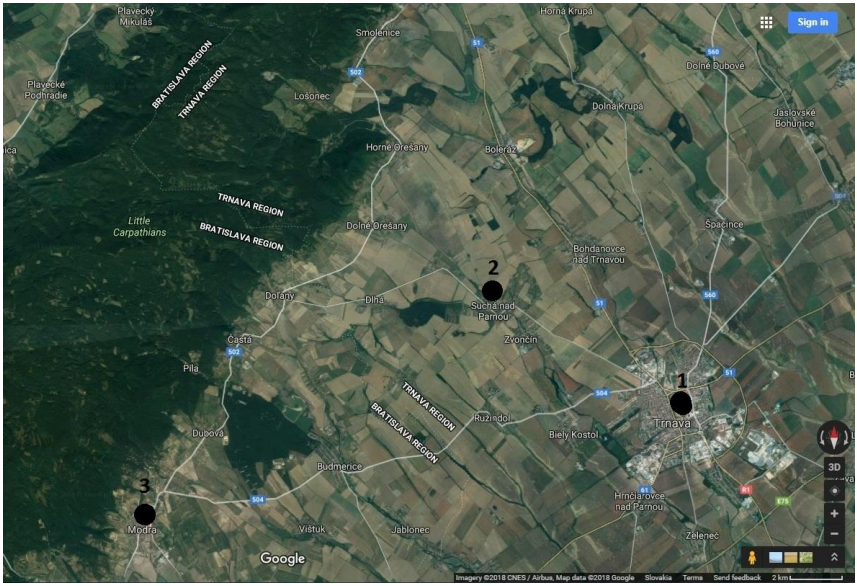
Information about the Field Trip:

Excursion will be realised in the Trnavsko-Malokarpatský region on Malokarpatská Wine Route. There will be presented impact of global megatrends on the landscape and its ecosystems. We will visit following locations:

1 Trnava

2 Suchá nad Parnou

3 Modra

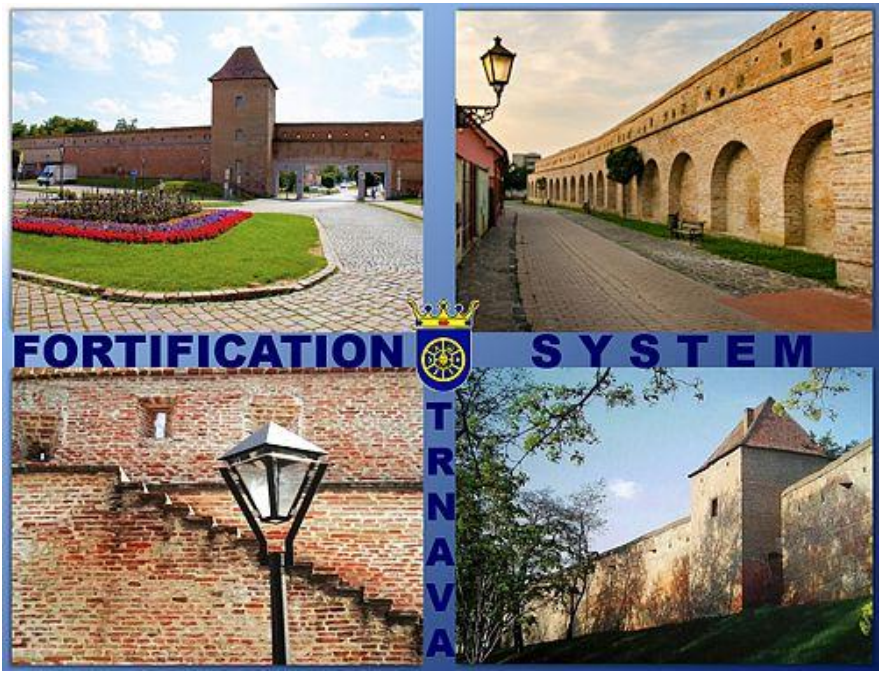


PROGRAM

9:00	Departure from Smolenice castle
10:00 – 12:00	Guided tour in town (Trnava)
12:00 – 13:00	Lunch (Suchá nad Parnou)
13:00 – 14:30	Visit of Environmental laboratory (Primary school, Suchá nad Parn
15:00 – 17:00	Guided tour in town and vineyards (Modra)
17:0 – 19:00	Wine tasting and dinner (Modra)
19:30	Arrival to Smolenice castle

1. Trnava - oldest free King Town, jewel among Slovakian cities, often named as "small Rome". City is rich in cultural and historical monuments. Especially valuable is historical centre, which was in the year 1987 declared an urban conservation area. Architectural treasures are protected by preserved fortification, what is quite rare among the cities in Middle Europe. Behind the fortification are already visible negative impacts of pressures of urbanisation on the landscape and change of natural landscape to industrial and agricultural landscape (conflicts between nature protection and urbanisation, conflicts between urbanisation and protection of natural resources, conflicts between agriculture and protection of eco-stability and biodiversity, etc.).

Pedestrian zone, City hall and city tower



Visit points in Trnava

1. **City arena = Football stadium of Anton Malatinský**
2. **Rose park** (Ružový park**)**
3. **Monument of liberators** (Pomník osloboditeľov)
4. **The lower gate** (Dolná mestská brána)
5. **St. Helen´s church = Helenka** (Kostol sv. Heleny = Helenka)
6. **Pedestrian zone** (Pešia zóna), **City hall** (Radnica)
7. **Bernolák´s gate** (Bernolákova brána), **Bernolák´s park** (Bernolákov sad)
8. **St. Jacob´s church = Franciscan church** (Kostol sv. Jakuba = Františkánsky kostol)
9. **Trinity square** (Trojičné námestie), **Theatre** (Divadlo), **City tower** (Mestská veža)
10. **University square** (Univerzitné námestie)

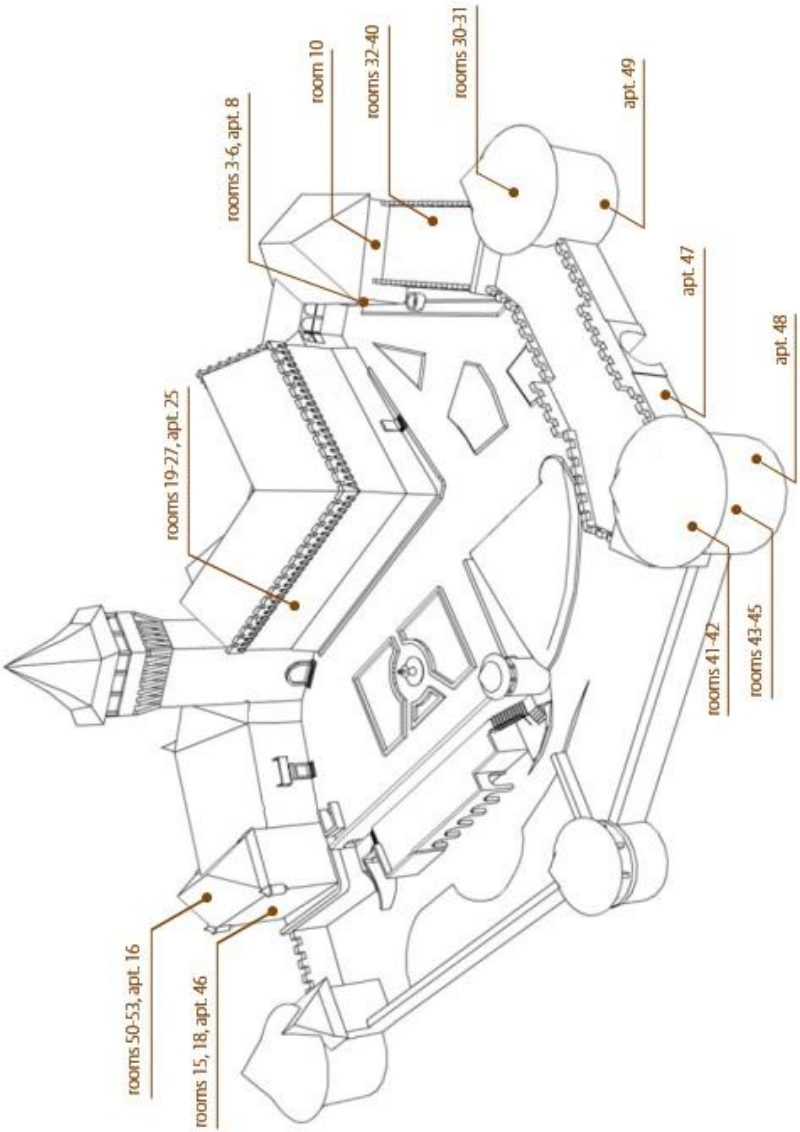
11. **St. John the Babtist´s church = University church** (Kostol sv. Jána Krstiteľa – Univerzitný kostol), **Statue of Pope John Paul II. (**socha pápeža Jána Pavla II)
12. **Park of Belo IV.** (Park Bela IV.)
13. **North-East tower** (Severovýchodná veža), **Fortification** (Hradby)
14. **Basilica of st. Nicolas** (Bazilika sv. Mikuláša), **Bishop´s palace** (Biskupský palác)
15. **Square of st. Nicolas** (Námestie sv. Mikuláša)
16. **Synagogues** (Synagógy)

2. Suchá nad Parnou – village in Malokarpatský region with rich wine making tradition, preserved historical viniculture landscape structures and bio-production of wine. Village is also known by breeding of Suchovy goose. Wine making tradition in village was documented by feature film Červené víno. Village is model research area - LTSR of Institute of Landscape Ecology. We will see negative impacts of intensive agriculture on stability and biodiversity of landscape. We will also visit natural environmental laboratory, which was created under the aegis of ILE SAS.

3. Modra – picturesque viniculture town with rich history. Urban structure of historical core of the town is unique document of development of small rural wine-growing town to town. The most important parts of original viniculture houses were cellars, where quality Modra wine was made and stored. Peculiarity of these houses is that to them were attached gardens and to the gardens were attached vineyards. Currently are picturesque vineyard structures under the constant urbanisation pressure. We will see negative impacts of urbanisation development on these rare historical landscape structures.

Modra is famous by production of unique pottery "modranská keramika".

Plan of the Smolenice Castle



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