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Landscape ecological conditions of the Bratislava city and proposals supporting sustainable development

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Abstract

The contribution is aimed at the complex landscape-ecological evaluation of the city of Bratislava. The aim of this evaluation was to specify and characterize the basic landscape-ecological and environmental problems resulting from the unsuitable use of resources and potential of the area. The evaluation resulted in the elaboration of the proposal of measures of elimination of landscape-ecological and environmental problems of the town, elaboration of a proposal of its komplex revitalization and specification of landscape-ecological and environmental regulations of the spatial development of Bratislava in sense of the pronciples and criteria of sustainable development.

Key words: landscape ecology; sustainable development; urban environment; Bratislava

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1. Introduction

The development of every urban unit is determined by the properties of landscape-ecological conditions. On the one side the properties of landscape ecological conditions supported the development of individual human activities, on the another side properties of the landscape-ecological conditions influence as landscape-ecological and environmental limits and restrictions (regulations). For example, soil with very good quality and favourable climatic conditions strongly determine the development of agriculture. Steep slopes condition the development of erosion-accumulative processes.

Ignoration of the landscape-ecological and environmental regulations resulting from the properties of the landscape-ecological conditions is the basic cause of landscape-ecological and environmental problems of the cities. The contribution is aimed at the evaluation of landscape-ecological and environmental problems of Bratislava resulting from the unsuitable use of resources and potential of the area and as well as is a presentation of the proposal for their elimination with the aim to ensure the sustainable development of Bratislava.

2. Methods

The methodological procedure of landscape-ecological evaluation of Bratislava consisted of the following basic steps:

(1) Analyses - analyses of the properties of natural and cultural-historical resources and potentials of the territory and evaluation of human activies (stress factors), which negatively influence the natural resources

(2) Evaluation - specification of the landscape-ecological and environmental problems resulting from noneffective utilisation of individual resources of the landscape

(3) Proposal - proposal of the measurements for elimination of the specified problems and determination of landscape-ecological and environmental regulations of the territorial development of Bratislava city.

2.1 Analyses of the natural resources

The area of Bratislava is formed by differentiated geographical conditions. There can be isolated the following basic geographical units:

- West Carpathian Mountains – Malé Karpaty Mts;

- Viedenská kotlina basin – Borská nížina lowland;

- Little Danube basin – Podunajská nížina lowland, Danube lowland, Dunajská rovina plain, Šúr.

The mentioned natural units condition the differentiation and diversified occurrence of single natural resources. The lowest positions of the study areas situated in the warm zone are characterized as dry even very dry with moderate climate, while the climate of the hill land is warm to cool and humid. Land use is significantly determined by landscape-ecological conditions. The agricultural landscape is a dominant element of the land use of the territory. It is mostly used as arable land. Its area is 11 154 ha (30.3 % from the total area). Forests on 8 109 ha (22,1%) are also significant. Built-up areas are the third most extent element of the study area (18.3 % of the study area). Vineyards present only 2,2 %, orchards 1.3 % and 441 ha grasslands 1.2 % of the total area. Grasslands are not agriculturally utilized, they form mainly the borders around the technical elements or they form mountain grasslands in the forest complexes.

In spite of that the study area is an urbanized landscape the territory dispones with significant and valuable natural resources, and in certain sites also with rich biodiversity. Here are two large-scale protected areas: Protected Landscape Area Malé Karpaty and Protected Landscape Area Dunajské luhy. The area is important also from the viewpoint of location of the so called small-scale protected areas. From them can be found there the following categories: natural reserve (6 sites), national natural reserve (1 site), natural monument (3 localities), national natural monument (1 locality) and protected area (19 sites), as well as the sites of protected trees. These areas are significant from the viewpoint of protection of biodiversity and landscape stability. From the viewpoint of biodiversity protection and landscape stability the territorial system of ecological stability (TSES) and the biotopes of European significance are important, too. In the study area are localised the following elements of the territorial system of ecological stability:

- 1 provincial biocentre – Devínská Kobyla Mt.

- 2 supraregional biocentres – Dolnomoravská niva flat, Bratislavské luhy alluvia

- 10 regional biocentres

- 1 provincial bioccoridor - river Dunaj

- 3 supraregional bioccoridors – Morava river flat, SE hillsides a NW hillsides, Malé Karpaty Mts

- 2 regional bioccoridors – 1 hydric, 1 terrestrial

From the aspect of creation of the elements NATURA 2000 in the study area are localised the following elements:

- 2 Ramsar localities – Morava river flat, Dunajské luhy alluvia

- protected bird areas of European significance (4) – Dunajské luhy alluvia, river Morava, Malé Karpaty Mts, Sysľové polia site

- biotopes of European significance (10).

Many elements of TSES and NATURA 2000 are bound to the localities of protected areas or localities of forest resources protection.

Representation of forest resources is also significant. The total forest area is 8 109 ha (22% of the whole town area). There can be found mainly the remnants of floodplain forests along the water courses (Danube, March, Mláka etc.), forest of the Protected Landscape Area Malé Karpaty and the forest complex Bažantnica situated in the middle of the agricultural landscape. In the area we can limit two basic forest zones:

- Danube meadow forests – willow, poplar, oak, maple, elm

- Malé Karpaty Mts forests – with dominant species oak, beech, hornbeam.

From functional aspect the forest of the study area can be divided into three basic groups:

(1) protected forests - forest with the prevailing function to protect the soil – they represent 6% of the forests,

(2) forests with special mission – forest in the protected areas, protected zones of water sources, forests in the park – 93%.

(3) commercial forests – they represent the rest of the total area of forest.

Large part of the forests of the study area have been changed. Native forests create only 2 % of the total forest area.

The area is important also from the viewpoint of underground waters, bacause in its south-western part lies the Protected Water Management Area Žitný ostrov. There are also 6 local underground water resources. The resources of surface waters are represented by hydrologically significant streams and water reservoirs. According to the Generel of Waters of the Slovak Republic were declared the rivers Danube, Malý Dunaj, March, Vydrica and Mláka as hydrologically significant streams.

The study area has the most fertile soils in Slovakia. Cambisols and Rendzinas are characteristic for the mountain or sub-mountain parts of the study area. The most fertile soils particularly Chernozems and Chernitsas dominate in the greater part of the lowland. These soils of the highest quality are agriculturally utilized and it is necessary to ensure their further protection against occupation by non-agricultural activities.

The study area is an important area due to for occurrence of raw minerals, above all construction sandstone and raw material. These sites appear especially in the surroundings of the municipality Devínska Nová Ves. Stone mining from water streams and reservoirs is unavoidable, too.

2.2 Analyses of the stress factors

These included assessments of human activities negatively impacting on the landscape quality and/or on qualities of single landscape components. Both primary and secondary stress-inducing factors were analysed. Primary stress-inducing factors included pollution sources, while secondary stress-inducing factors included polluted/harmed landscape components – polluted air, contaminated soil, areas exposed to noise load, damaged vegetation, etc.

- Air pollution – the area belongs to the most loaded areas in Slovakia. Here can be found some large and medium sources of pollution significantly damaging the air quality of the town. The most significant are the chemical plants Istrochem and Slovnaft. Besides stationary sources especially of industrial character air quality is negatively influenced also by mobile sources of intensive traffic. In Bratislava the areas of air pollution

create concentric zones in the surroundings of industrial operations (Istrochem a Slovnaft),

- environmental noise load – the situation is unfavourable. In many sites the acceptable concentration of noise load are overstepped by 25-30d(B). Traffic is the main source of noise. Besides parking places and stations also industrial plants and mining sites are stationary sources of noise. The most significant source of noise is the airport of Milan Rastislav Štefánik,

- water contamination – in this category the quality of surface and underground water was evaluated. Similarly as in the case of air quality the unfavourable situation is conditioned by high concentration of industrial sources of water pollution. Surface water quality is negatively influenced also by the discharge of municipal waste waters to watercourses.

- soil degradation – it is physical, chemical and biological soil endangerment. From among degradation processes especially soil contamination and threat to soil by erosion are the most significant. Water erosion endangers mainly the soils of the Malé Karpaty Mts, while wind erosion the open part of the Podunajská nížina lowland. Soil contamination is connected with industrial sources producing significantly polluting imissions.

3. Results

The basic result of the landscape-ecological evaluation of the territory was the determination and specification of the landscape-ecological and environmental problems resulting from non-effective utilisation of the individual resources and potential of the territory. In the area the following landscape-ecological and environmental problems were identified:

- *Problems of endangerment of the complex ecological stability of the area* – they are the result of territorial collision of endangering phenomena (stress factors) with the elements of high degree of ecological stability as TSES elements, protected areas. The following types of problems are included: endangerment of Protected Landscape Area Podunajské luhy and the elements of TSES in the central and south-eastern part (area of Staré mesto, Podunajské Biskupice, Trnávka, Ružinov) by load of secondary stress factors (air pollution, heavy damage of vegetation, soil contamination etc.), disturbance of spatial stability of the area by intensive anthropization (central part of the intensively built-up study area) and creation of monofunctional agricultural landscape mainly with large-block arable land in the south-eastern and north-western part of the study area (Jarovce, Rusovce, Čunovo, Devínska Nová Ves, Záhorie municipalities), endangerment of hydric biocorridors by water contamination in the streams appearing as the biocorridors of different stages (Mláka, Malý Dunaj, Dunaj, Morava), disturbance of the elements of TSES by barrier influence of anthropic objects – fragmentation of biocentres and biocorridors by built-up areas, traffic corridors etc., endangerment of the elements of TSES and protected areas by waste dumps, endangerment of protected landscape areas by the development of tourist activities, endangerment of the CHKO Malé Karpaty by erosion processes etc.

- *Problems of endangerment of natural resources* - they appear due to spatial collision of endangering phenomena with single natural resources. The following problems are included: endangerment of soil by industrial air pollutants especially in the neighbourhood of industrial plants as significant sources of air pollution (Slovnaft, Istrochem, Volkswagen etc.), by mining of minerals (Devínská Nová Ves), by traffic air pollutants along the most loaded traffic corridors (Bratislava-Trnava, Bratislava-Viedeň, Bratislava-Györ), by erosion processes (area of Záhorská Bystrica), often by unsuitable soil management, endangerment of surface waters by industrial and urban waste waters (Západoslovenské tehelne, Volswagen, Slovenské závody technického skla, Vodárne a kanalizácie – sewage treatment plan etc.), endangerment of water sources of the Protected Water

Management Area Žitný ostrov by industrial and agricultural sources of pollution, location of inert waste dumps, soil contamination etc., increased content of pollutants in underground waters used as drinking water – increased content of Mn and low content of waterlogging by oxygen in the water source Ostrovné Lúčky, collision of water pollution of the rivers Danube, Malý Dunaj, Morava, Mláka as significant streams of hydrological significance, endangerment of floodplain forests by air pollution and endangerment of a part of forest ecosystems in the Malé Karpaty Mts in the buffer zone by industrial imissions,

- *Problems of endangerment of inhabitants and their environment* – they appear due to the influence of endangering phenomena on man and his immediate surroundings in settlements and recreation places. They are: endangerment of people by strong concentration of polluting materials in air (central part of Bratislava, Podunajské Biskupice, Trnávka, Ružinov etc.), by increased electromagnetical smog (selected sites in Staré Mesto, Vinohrady, Lamač, Dúbravka, Karlová Ves), by increased intensity of the magnetic field in the central part of the town, excessive noise and negative impacts of the intensive traffic (sections Stromová ul. street, Staré Mesto, Vajnory, Rača, Dúbravka, Petržalka, Podunajské Biskupice), intensive railway traffic (residential parts in the areas: Main railway station-Rača, Bratislava-railway stations Nové Mesto-Podunajské Biskupice, Lamač, Devínska Nová Ves, Vinohrady-Bratislava Vajnory etc.), endangerment of inhabitants by agricultural production on contaminated soils (municipalities Jarovce, Rusovce, Čunovo, Devínská Nová Ves etc.), by potential radon risk (Dúbravka, Karlová Ves, Záhorská Bystrica, Rača, Vajnory, Petržalka etc.), high violation of noise level from intensive traffic in public health institutions and schools (Radlinského, Mickiewiczová, Americké námestie, Legionárska, Vazovová, Mýtna streets etc.) and from intensive railway traffic (Patrónka - Krásna Hôrka, hospitals Kramáre, Lamačská cesta, Institute of social care etc.), air traffic load in the dwelling areas (Vinohrady, Rača, Vajnory, Nové Mesto, Ružinov, Vrakuňa, Podunajské Biskupice, Petržalka etc.), negative hygienic and aesthetic influence of technical elements in urbanized environment (industrial operations, selected areas of complex housing – housing estates Petržalka, Dlhé Diely etc.),

4. Proposals

It represents the final phase in the solution of landscape-ecological problems. Its goal is to eliminate the accumulation of landscape-ecological problems. The solution of these problems has two aspects:

- Aspect of spatial organization representing the proposal of the ecologically optimum land-use

- Technological aspect, which represents the ecologization of technology used in the landscape

The proposals include set of measures aimed at (i) eliminating the identified landscape-ecological and environmental problems in the target area and (ii) establishment of ecologically optimal spatial and functional organisation of the target area. The elimination of the environmental problems and prevention of the occurrence of new environmental problems is the basic precondition of the sustainable development.

The proposals can be divided into the following basic groups:

- *spatial-organizational* – aimed at the changes of the land use elements on the sites where land use does not correspond with the landscape-ecological demands, mainly completion of ecostabilizational areas - creation of the functional outline of TSES especially in agricultural, monotonous, intensively used landscape (Jarovce-Rusovce-Čunovo, Záhorská Bystrica and Devínska Nová Ves) and in the built-up area of the town, increase of the share of ecostabilizational (park, line etc.) vegetation within the settlement, ensurance of the buffer zone in the surroundings of streams in the width 20–50 m with the aim to protect them against the

downwash of polluting materials, afforestation or grassing of soil endangered by erosion, or introduction of erosion control of soil management, stabilization of vineyards by erosion control measures in the intravillain of the municipalities Rača, Vajnory, Karlova Ves, Devín affected by increased erosion, planting of isolation vegetation around stationary and mobile imission sources, planting of isolation hygienic vegetation in the surroundings of industrial areas and animal farms in order to eliminate the negative hygienic impacts on the environment, liquidation of waste dumps etc.,

- *technological-functional* – aimed at the proposal of technological measures to reduce the influence of the secondary stress factors - installation of new filtering apparatuses or improvement of effeciency of the existing ones (plants SZTS a.s. Bratislava, Matador a.s., Slovnaft etc.), reconstruction and gasification of heating stations (STEIN a.s., Matador a.s.), reconstruction of sludge and waste incineration plants, installation of separators or changes of old producing technologies, creation of effective technologies for water resource protection, realization of new sevage disposal plants (SDP) or make effective and recontruct the existing ones (a.s. Slovnaft, SDP Devínska Nová Ves etc.), construction of the drainage system (in municipalities Záhorská Bystrica, Vajnory, Jarovce and others villages without drainage (situated mainly in the Protected Water Management Area Žitný ostrov), finish building of the drainage (Prievoz, Rača, Vrakuňa, Devínska Nová Ves etc.) or reconstruction of existing drainages, solution of the problem with sludge removal (SDP Vrakuňa, SDP Petržalka, SDP Devínska Nová Ves), ensurance of the special management of contaminated soils, application of integrated forest protection based on the use of effective technology within ecological forest management and use, introduction of effective technologies from the viewpoint of recycling and waste disposal,

- *revitalizational* – prior ensurance of stream revitalization used as hydric corridors - Mláka, Dunaj, Morava etc., revitalization of the disturbed environment in threatened localities, e.g. surrondings of mining sites situated in the immediate neighbourhood of protected areas, arm system of the Danube etc., removal of unlegally built week-end houses in the Protected Landscape Area Malé Karpaty, revaluation of environmental risks resulting from the location of waste dumps in the Protected Water Management Area Žitný ostrov as potential sources of underground water contamination and rearrangement of dumps and consequent recultivation of the area,

- *spatial-protective* – aimed at the proposal of legislative protection of ecologically valuable landscape structures and their components – ensurance of protection of biocentres at all levels, biocorridors and other ecologically significant elements on the basis of their real significance,

- *diagnostic-preventional* – finish building of the complex monitoring system aimed at information about the biota, state of forest ecosystems, monitoring of oxides of sulphur, nitrogen, ozone and other harmful materials, finish building of the complex monitoring of water system mainly in the area of large capacity underground water resources of drinking water supply as well as improvement of the monitoring of the quality of underground (Žitný ostrov) and surface water, ensurance of regular control of quality of agricultural crops for direct consumption as well as forage in order to stop the entry of contaminated crops to the food chain, in the areas influenced by secondary stress factors - Podunajské Biskupice, Jarovce-Rusovce-Čunovo etc.,

5. Establishment of landscape-ecological and environmental regulations

The aim to establish the landscape-ecological and environmental limits is to define the limiting factors of spatial development of single socio-economical activities following from the landscape-ecological conditions of the town. The development of every urban unit is defined by the properties of landscape-

ecological conditions. On the one side the properties of landscape- ecological conditions supported the development of individual human activities, on the other side the properties of the landscape-ecological conditions act as landscape-ecological and environmental limits and restrictions (regulations). For example, soil of very good quality and favourable climatic conditions strongly determine the development of agriculture.

We understand the determined indicators excluding the carrying out of a human activity in a given area as landscape-ecological limits. This concerns the determination of indicators, which, from the point of view of environmental principles, do not allow the use of a certain area for a given activity. For example, one of the limits for the development of housing is the quality of individual landscape-ecological components – air quality, noise load of the area etc.

We understand the determined values and indicators, which significantly restrict the intensity of the given activity in an area, although they do not absolutely exclude it, as restrictions. For example, in an area with air pollution agricultural production is not excluded, but its structure and intensity is significantly restricted by the recommended structure of crops, restriction of use of chemicals and mechanisation etc.

Determination of the landscape-ecological limits and restrictions allows objective and scientifically based decisionmaking on location of human activities in the landscape. It is necessary to add that this is a very complicated and time consuming process, demanding a multi-disciplinary and synergetic approach. Determination of the limiting values requires an extensive collection of data about the functioning of the landscape system as a whole, and about its individual components, since the successful and conflictless fulfillment of every human activity, is to a certain degree dependent on a wide variety of factors in the landscape where they are carried out

The aim of application of landscape-ecological and environmental regulations of spatial development of the town is the protection of nature, natural resources and environment. The main principles of limitation in the area of Bratislava are:

- it is necessary to support mainly the development that does not endanger the natural values of landscape complexes (development of scientific, protective or treatment-recreation activities etc.) in protected areas, ecologically valuable and stable areas (localities of territorial system of ecological stability),

- it is necessary to exclude the development of such socio-economical activities that could negatively influence single natural resources and first of all to develop the activities aimed at the support of protective functions in the areas with legislatively limited protection of natural resources,

- it is necessary to realize such land use that mitigates the negative manifestation of the mentioned primary stress factors in the localities (sites sensitive to erosion-accumulation processes, landslides, earthquarkes etc.) sensitive and vulnerable to socio-economic activities,

- to exclude the activities sensitive to hygienic environmental parametres in the areas with strong load of stress factors as air pollution, soil and water contamination, excessive noise load. In these zones are limited: development of dwelling, hygienic-treat areas, areas of civil services, cultivation of agricultural crops for direct consumption, building of animal farms etc. The most suitable is to use these zones for industrial, mining and storage activities or to situate there activities limiting their negative influence on the landscape.

- heavily contaminated surface waters are not suitable for water management purposes – supply of inhabitants by drinking water, irrigation, special purpose waters, development of recreation etc.,

- zones of vegetation damage needs a special regime of management, especially selection and coppice mood. Similarly these

localities exclude the development of recreation activities and collection of forest fruits bound on forest ecosystems,

- areas without load by stress factors are not suitable for location of plants that could endanger the present suitable hygienic quality. They are suitable mainly for the development of activities with high demand for hygienic parameters. Here are suitable conditions for the development of dwelling, health-treatment centres, recreation, areas of public services, cultivation of agricultural crops for direct consumption etc.

6. Conclusion

The elimination of environmental problems and projection of landscape-ecological and environmental regulations into the spatial-planning processes contribute to sustainable development of land-use as a form of implementation of the program of sustainable development defined in Agenda 21 at the Rio Summit 92.

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The Summer School "A Metropolis with a Green Heart"

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Abstract

In the period of July – September 2009 the project of the International Summer School "A Metropolis with a Green Heart" and follow-up activities were organised and managed under the leadership of two Slovak universities: the Comenius University in Bratislava (Faculty of Natural Sciences) and the Slovak University of Technology in Bratislava (Institute of Management) in close cooperation with partner universities from Visegrad countries.

The Summer School "A Metropolis with a Green Heart" was organized in Bratislava (July 6-11, 2009) as an accompanying event of the European IALE Conference 2009 (Salzburg, Austria, July 12-16, 2009) and was open to Master/PhD students and early stage scientists. The school was also supported by the International Association for Landscape Ecology (IALE).

The Summer School represented the activity supporting exchange of information in the field of education and sciences (e.g. planning system, protection of the environment) and cross-border cooperation among participants and lecturers from Visegrad countries but also other countries.

Five follow-up activities were organised (in Salzburg, Austria; in Lednice and Ustí nad Labem, Czech Republic and in Bratislava, Slovak Republic) with the aim to disseminate the information about results of the Summer School.

All participants of the Summer School and visitors of follow-up activities also received a lot of information about Visegrad cooperation and examples of common projects of the Visegrad countries with its neighbors from the Central European Region (e.g. Austria). Very important examples of the best practice were presented from transboundary cooperation between Bratislava and Vienna about new visions for cooperation in the central European region (e.g. project JORDES+ and CENTROPE).

Key words: summer school; landscape ecology; urban ecology; landscape planning; metropolis; sustainable cities; regional cooperation; Visegrad countries; central European region

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1. Introduction

In Europe, around 80% of the population lives in cities. Their quality of life thus reflects the development of the European continent, which is mainly characterised by urban culture. The European Union approved several key documents supporting sustainable development of the cities e.g. "Cities and the Lisbon Agenda" (European Commission, 2005) and "EU Renewed Sustainable Development Strategy" (Council of European Union, 2006). The European Commission considers cities to be at the heart of European Union sustainable development efforts (EurActiv 13/06/07). In January 2006, it launched a "Thematic Strategy on the Urban Environment" (Commission of the European Communities, 2006), stressing that "to monitor and up-date the effectiveness of the Strategy, accessible urban data is needed" and the EU Parliament demands "common core indicators to allow for comparisons and benchmarking between European cities…"

In 2007 the Informal Ministerial Meeting on Urban Development and Territorial Cohesion, approved the "Territorial Agenda of the European Union – towards a More Competitive and Sustainable Europe of Diverse Regions" (European Commission, 2007). Informal Ministerial Meeting adopted also the "Leipzig Charter on Sustainable European Cities" in May 2007. The central message in the Leipzig Charter is the necessity of "integrated strategies and coordinated action". It means that, to achieve the objective of sustainable cities, different policy agendas must be implemented in a balanced way: social, economic and environmental objectives must be aimed at simultaneously". In 2008 the Commission of the European Communities approved the Green Paper on Territorial Cohesion: Turning Territorial Diversity into Strength (EC, 2008).

There is also needed to identify several important examples of initiatives supporting the idea of sustainable cities. In June 2004 the Aalborg commitments were passed at the Aalborg+10 Conference taking place in the city of Aalborg. The conference commemorated the 10-year anniversary of the Aalborg Charter (1994) and renewed the commitment towards local sustainability. In the course of the last decade about 2300 of local authorities signed the Aalborg Charter. Aalborg commitments engage signatories "to cooperate with the European Sustainable Cities & Towns Campaign and its networks to monitor and evaluate progress towards meeting sustainability targets".

In a relation to these European activities and in a relation of our scientific projects Slovak landscape ecologists from the Comenius University in Bratislava, the Slovak University of Technology in Bratislava and the Institute of Landscape Ecology of the Slovak Academy of Sciences submitted in 2007 a first proposal for organising the Summer School "A Metropolis with a Green Heart" as an accompanying event of the European IALE Conference 2009 in Salzburg to the Executive Committee of the International Association for Landscape Ecology (IALE). This proposal was approved in 2008 and the Comenius University in Bratislava and the Slovak University of Technology in Bratislava started to prepare detailed programme. In the end of 2008 these two Slovak universities in a close cooperation with partner universities from Visegrad countries (Czech Republic: Mendel University of Agriculture and Forestry, Brno, Faculty of Horticulture in Lednice; Jan Evangelista Purkyne University in Ústi nad Labem; Hungary: Central European University, Budapest; and Poland: Gdańsk University of Technology, Gdansk) elaborated a proposal of the small project: The Summer School "A Metropolis with a Green Heart", which was approved by the International Visegrad Fund in January 2009

The Summer School was organized in Bratislava (July 6-11, 2009) with the aim to educate young people, disseminate new scientific information and promote regional cooperation in the central European region. The School was organised as an accompanying event of the European IALE Conference 2009 (Salzburg. Austria, July 12-16, 2009) and was open to Master/PhD students and early stage

scientists. The School was open to all those interested in urban ecology, landscape ecology, landscape planning, urban planning and management, ecological sustainable cities, landscape in planning policies and governance and other related issues. The final programme was elaborated with respect to the main aims of the new approved project: "SPECTRA Centre of Excellence for the Settlement Infrastructure Development of the Knowledge Based Society" (No. 26240120002) supported by the Research & Development Operational Programme funded by the ERDF and established in the frame of the Slovak University of Technology in Bratislava in May 2009.

25 experts and lecturers were engaged to the Summer School: 17 from 4 Visegrad countries: Czech Republic (2), Hungary (1), Poland (3) and Slovak Republic (11) and 9 from other countries: Austria (4), Germany (3), the Netherlands (1) and China (1). Together 31 participants (students and early stage scientists) participated at the Summer School. 21 participants came from 3 Visegrad countries: Czech Republic (8), Poland (4), Slovak Republic (9), and 10 from other countries: Italy (1), Japan (1), Macedonia (1), Portugal (1), Sudan (1), Sweden (4) and Russia (1) (see Fig. 1).

Fig. 1 Lecturers and participants of the Summer School "Metropolis with a Green Heart" (Bratislava, July 6-11, 2009)

2. The objectives of the Summer School

The Summer School gave participants background to understand multidimensional character of sustainable spatial development in metropolitan areas integrating social, ecological and economic aspects and the position of landscape ecology in the optimisation of development processes. The School provided an interdisciplinary learning space offering training and the possibility for mediation of know how / expertise among outstanding professionals, researchers, practitioners and students. Very important was concrete example the metropolitan region of the Twin City Bratislava and Vienna, which provided a framework for the demonstration of cross-border cooperation in the central European region and confrontation of variety of different aspects, problems and their possible solutions in practice.

Two important events were organized in the frame of the Summer School:

- The meeting in the Vienna City Planning with the aim to present of visions and their confrontation with the reality of metropolitan development in Bratislava and Vienna

- The field trip (excursion) focused on present situation and best practice in the Vienna – Bratislava region.

The Summer School offered the participants a new quality of learning based on competencies represented by invited outstanding experts and teaching staff. Detailed information about transformation processes in urban landscapes in the central Europe, with respect to Visegrad countries were discussed and examples of common projects and activities realized in the Visegrad countries together with their neighbors from the central European region (e.g. Austria) are presented. Examples from other part of the world (e.g. Asia) were also presented and it created a possibility to compare different aspects of ecologically oriented spatial development of metropolitan areas and to identify of different perspectives, approaches and issues concerned. Overview of key objectives of the Summer School is in box 1.

Box 1 Key objectives of the Summer School "A Metropolis with a Green Heart"

- To explore different aspects of ecologically oriented spatial development of metropolitan areas

- To identify threats and to compare different perspectives, approaches and issues concerned

- To demonstrate ways and means of how landscape ecology can be addressed by variety of problems of metropolitan development

- To allow participants to confront their knowledge and experience in an international interdisciplinary environment, to develop their ability to discuss different approaches, their own thinking critically in the context of other approaches and perspectives

- To give participants background to understand multidimensional character of sustainable spatial development in metropolitan areas integrating social, ecological and economic aspects

- To give participants opportunity to participate in the Panel Discussion of young landscape ecologists and the Workshop of the Landscape Ecology Education Network (LE_NET) in the frame of the European IALE Conference 2009 (Salzburg, Austria, July 12-16 2009)

3. Role of "Visegrad partners" and partners from other countries in the project of the Summer School

Partner's cooperation had important role in the preparatory phase and in performance of the Summer School and follow-up activities. The Comenius University in Bratislava, Faculty of Natural Sciences and the Slovak University of Technology in Bratislava, Institute of Management (Slovakia) had responsibility for coordination and managing of the Summer School activities (including managing of web page of the Summer School) and contact to the European IALE Conference 2009 (collaboration in the preparation of the LE-Net workshop). Both universities had great share in contribution of development of training activities, participation in teaching, preparation of meeting in Vienna and excursion, presentation of the Summer School results at the European IALE conference 2009, coordination of the reviewing of lecturer and student papers for their publishing in the scientific journal GEOSCAPE and dissemination information about the whole project. Together 9 lecturers and managers (B. Lehotská, Z. Moravčíková, Ľ. Papajová Majeská, D. Petríková, J. Ružičková, F. Žigrai, including three authors of this article – M. Finka, M. Kozová and K. Pavličková) and other co-workers from both universities helped in organizing and managing of the Summer School.

Important position in developing of training activities for the Summer School had other Slovak collaborative organizations: e.g. Institute of Landscape Ecology the Slovak Academy of Sciences (Z. Izakovičová, J.

Oszlányi), Bratislava Self-Governance Region (J. Hudcovská, L. Olekšák) and Bratislava City Local Self-Governance (M. Babiar).

Other universities from Visegrad countries (from Czech Republic, Hungary and Poland) also contributed significantly in development of training activities and participation in teaching (together 6 lecturers: P. Lorens, L. Nyka and J. Szczepański, Poland; T. Oršulák and A. Salašová, Czech Republic; A. Skharuba, Hungary/Belarus) and dissemination information about the project in the frame of their universities. Colleagues from the Jan Evangelista Purkyně University in Ústi nad Labem collaborated in the preparation and publishing of the scientific journal GeoScape (issue with papers of participants and lecturers). Colleagues from the Mendel University of Agriculture and Forestry participated in the preparation of the excursion and together with colleagues from Gdańsk University of Technology and Central European University offered us their long term experience with organizing of summer schools. All universities from the Visegrad countries participated very actively in elaboration of the proposal of the small project: The Summer School "A Metropolis with a Green Heart", which was approved in January 2009 for financing from the source of the International Visegrad Fund.

Box 2 Overview of the thematic sections, interactive and practical parts of the Summer School

Thematic sections:

- Landscape ecology in urban planning and management (lecturers: B. Bunce, J. Breuste, F. Žigrai)
- Transformation processes in urban landscapes (lecturers: F. Žigrai, J. Li)
- Introduction to the twin city Vienna - Bratislava landscape and drivers of landscape change (lecturers: M. Finka, Z. Izakovičová, J. Oszlányi, W. Kvarda, M. Babiar)
- Theories and methods how to assess urban areas; urban growth (risk and reduction of landscape functions); governance as a challenge (lecturers: B. Müller, P. Schiappacasse, L. Nyka, A. Skharuba, J. Szczepański)
- Analysis for green space structure; ecosystem services of green spaces; forests function in the metropolis (lecturers: A. Salašová, J. Ružičková, Z. Moravčíková, A. Skharuba)
- Transdisciplinary approaches in strategies for sustainable development in cities and criteria for sustainable cities (lecturers: M. Kozová, M. Finka)

Interactive and practical parts:

- Round Table discussions with lecturers. Opening discussion/Introductory lecture of P. Lorens: General development strategies of the metropolitan cities in relation to the concept of sustainable development – compact cities vs sprawling cities, global vs local orientation, development – redevelopment- intensification
- Presentations of all participants (they presented e.g. final reports on their Master / PhD thesis / related topics projects / course outputs, discussion and poster presentations) – see fig. 2. Participants had possibilities to discuss their posters and papers before presentation with tutors / lectors of the Summer School. Participants also be encouraged to use all their skills in theoretical seminars, lectures, workshops, exercises, group discussions and even in a field trip.
- The meeting in Vienna City Planning (lecturers: K. Puchinger, W. Kvarda, J. Hudcovská, L. Olekšák) and the excursion focused on present situation and best practice in the Vienna – Bratislava region (guides: J. Ružičková, Z. Moravčíková, B. Lehotská, W. Kvarda, J. Hudcovská, A. Salašová)
- Practical approaches, best practice examples, progressive methods, and problem solutions in landscape and urban planning: case studies (lecturers: P. Lorens, D. Petríková, T. Oršulák, K. Pavličková)

Great role had the partners from Austria especially in the preparatory phase. They helped us with elaboration of the first proposal of the Summer School (which was submitted to the Executive Committee of IALE), with contact to the European IALE Conference 2009 organisators (J. Breuste, University of Salzburg) and preparation of the LE-Net

workshop (H. Klug, University of Salzburg). They were key partners in the preparation and managing the meeting in Vienna City Planning (K. Puchinger, the chief of the Vienna City Planning Department and W. Kvarda, University of Natural Resources and Applied Life Sciences, Vienna). But important role had all foreign lecturers, because each of them brought in the lectures new ideas and experience e.g. about critical points of monitoring system for identifying Annex I Habitats in Europe (B. Bunce, Wageningen University and Research Centre, the Netherlands), urban resilience and urban environmental governance (B. Müller and P. Schiappacasse, Institute of Ecological and Regional Development, Dresden, Germany) or urban forest planning in the specific condition of Shaghai (J. Li, East China Normal University in Shanghai, China).

Fig. 2 The Summer School in Bratislava - presentations of the participants

4. Thematic sections and practical parts of the Summer School and their benefits for participants

The programme of the Summer School consisted of several thematic theoretical sections, meeting with practitioners from city planning departments, round table discussions, presentations of all participants, poster session and excursion (field trip).

Overview of the thematic sections (with name of lecturers), interactive and practical part of the Summer School with short description is in box 2. For further details about the programme of the Summer School, please visit the webpage at http://summerschool. iale.sk.

In the frame of the meeting in Vienna City Planning K. Puchinger (the chief of the Vienna City Planning Department) together with W. Kvarda (from the University of Natural Resources and Applied Life Sciences. Vienna) explained a vision about the joint regional development strategy for the Vienna – Bratislava – Györ Region (JORDES+) – see fig. 3. Participants discussed also about CENTROPE joint initiative and strategic vision for the "Central European Region" representing region surrounding Vienna. This comprises, in addition to Greater Vienna, two further Austrian federal provinces, namely Lower Austria and Burgenland, as well as Győr in western Hungary, south-west Slovakia around Bratislava and southern Moravia

around Brno. CENTROPE is the lead project, which aims to create a multilateral, binding and long-lasting co-operation framework for district authorities, enterprises and social bodies in the whole "Central Europe Region".

In the frame of the excursion the participants visited Bratislava green points – Devínska Kobyla, Moravia River (see fig. 4), and Danube River (e.g. part of the Donau-Auen National Park situated between the European capitals Vienna and Bratislava preserves the last remaining major wetlands environment in Central Europe), and highway ecoducts and ecotunels between Vienna and Bratislava.

Fig. 3 Meeting in Vienna City Planning. From the left: K. Puchinger and W. Kvarda during presentation about the project JORDES+

Fig. 4 Explanation in Devínska Nová Ves about flood plain forests along Moravia River. In the left J. Ružičková, one of the excursion guide

The Summer School brought for participants - except of participation at the lectures and excursion - a few additional benefits. Participants got an additional financial support for registration to the European IALE Conference 2009 (10 participants of the Summer School used this opportunity). During the workshops of the European IALE Summer School the participants had opportunity to participate in the Panel Discussion of young landscape ecologists (on July 12, 2009) and the Workshop of the Landscape Ecology Education Network (LE-Net) with special emphasis on the recent Summer School education activities (on July 15, 2009) (see below more details in 6. chapter). At the end of the Summer School participants received a certificate, which is useful for future careers. Participants from the Visegrad 4 countries were provided with special financial aid from the Visegrad Fund (Small Project No. 10840145, category: Education), which concluded reduced registration fee, accommodation grant and travel expenses.

5. Key topics of discussion in the frame of the Summer School

Great part of the Summer school was open for formal or informal discussion. There is a summary of key open questions which obtained the best attention and were intensively discussed during the Summer School:

- What are the mechanisms to achieve sustainability in urban development? What are specifics for metropolitan regions?

- How to find a comprehensive understanding of the term sustainability?

- How can transdisciplinary research contribute to more sustainable spatial development?

- How to understand the term „region“ for the future?

- How to increase transboudary cooperation in the Central European region? What is the role of Visegrad countries?

- How to assess development quality / living standards / quality of urban governance?

- How to assess governmental effectiveness?

- How to achieve the implementation of new planning methodology and strategic planning principles with strong participation of the local communities?

- How to motivate people to participate? How to increase awareness of the local communities? How to create atmosphere for active participation?

- How to increase power of local authorities and where is the right balance between participatory and direct democracy?

- How to monitor the way towards sustainable development? What kind of tools and indicators are the most appropriate? What should be necessary to measure?

- How to monitor quality of planning and decision-making processes; quality of life, quality of governance?

A lot of questions were focused on “ideal planning and decision-making processes”. The participants agreed, that these processes should be open, transparent, long-term oriented, with respect sustainable principles, including environmental, social, economic and cultural aspects, respecting principles of good governance and transdisciplinary approaches.

One of the aims of sustainable urban planning is to develop new concepts for achieving resilient land use and adaptable social and economic structure in cooperation of scientists, local practitioners, local community and other key groups of stakeholders Transdisciplinarity is expressly the core/heart of the proposed comprehensive approach to sustainability.

All participants agreed, that both approaches the top-down and bottom-down are needed and none of them can replace the other. Concerning good governance it is still “open term”. Participants agreed that governance consists of the traditions and institutions by

which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them (see Evans et al., 2005).

6. Follow-up activities

The aim of the follow-up activities was to disseminate information about the small project of the Summer School co-financed by the International Visegrad Fund (IVF) and about regional cooperation among students, planners, researcher and planners (e.g. in the frame of partner's universities from the Visegrad countries and in the frame of the European IALE Conference 2009). We expect that total number of visitors of the students' panel sessions was about 230 visitors. The follow-up activities were organised in Salzburg (Austria), in Lednice and Ústí nad Labem (Czech Republic), and in Bratislava (Slovak Republic).

6.1 1st follow-up activity - Venue: University of Salzburg (Salzburg, Austria)

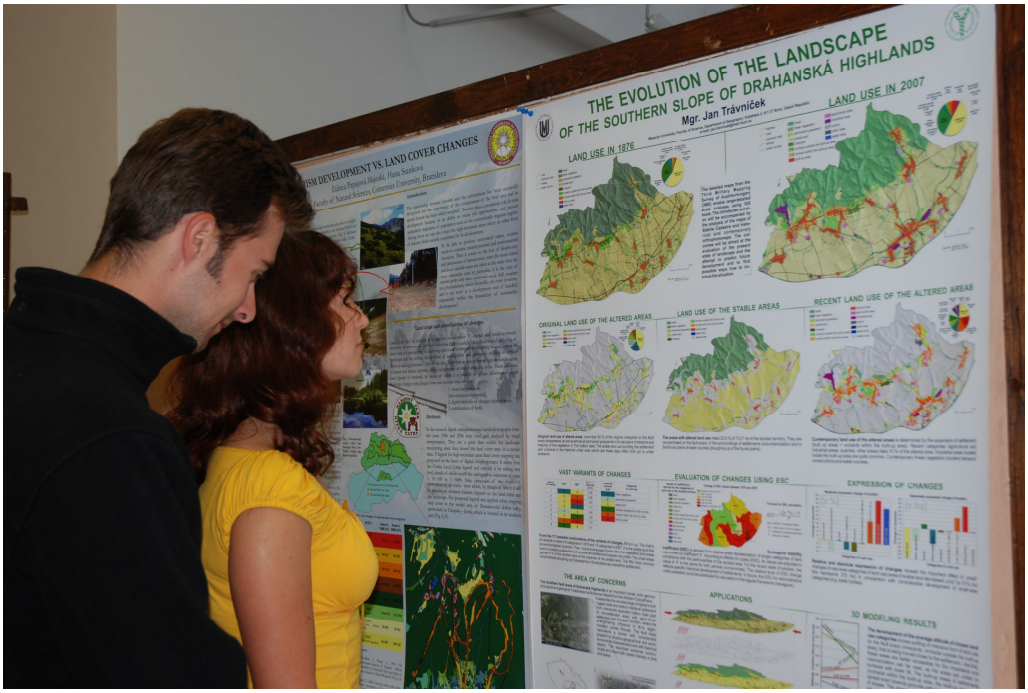
Students' panel session (poster session) for disseminating results of the IVF project, development aspects of Visegrad countries and presentation of the IVF project was organized in University Salzburg in the frame of European IALE Conference 2009 (Salzburg, Austria, July 12-16, 2009). The first day of the conference (July 12, 2009) a special Panel Discussion of young landscape ecologists with distinguished researchers in the domain of GIS, Landscape Ecology and Remote Sensing was organized (see fig. 5). In the frame of the Workshop: LE-Net (Landscape Ecology Network, July 15, 2009) results from the Summer School in Bratislava, experience with financing of summer schools and information about the Visegrad cooperation were presented. Organizers: University of Salzburg together with the Comenius University in Bratislava and the Slovak University of Technology in Bratislava.

Fig. 5 Participants of the Summer School in Bratislava during the Panel Discussion of young landscape ecologists in the frame of the European IALE Conference 2009 (Salzburg, Austria, July 12-16, 2009)

6.2 2nd follow-up activity - Venue: Mendel University of Agriculture and Forestry, Faculty of Horticulture (Lednice, Czech Republic)

Students' panel session for disseminating results of the IVF project and development aspects of Visegrad countries was organized in the frame of the Scientific Conference: "Trends and Tradition 2009". Opening of the panel session was on 10 September 2009, but the exhibition was available for persons interested in since September 10 until 25, 2009 (see fig. 6). Organizers: Mendel University of Agriculture and Forestry, Faculty of Horticulture, Lednice, Czech Republic and Comenius University in Bratislava.

Fig. 6 Students' panel session for disseminating results of the Summer School in Lednice (Mendel University of Agriculture and Forestry, Faculty of Horticulture)



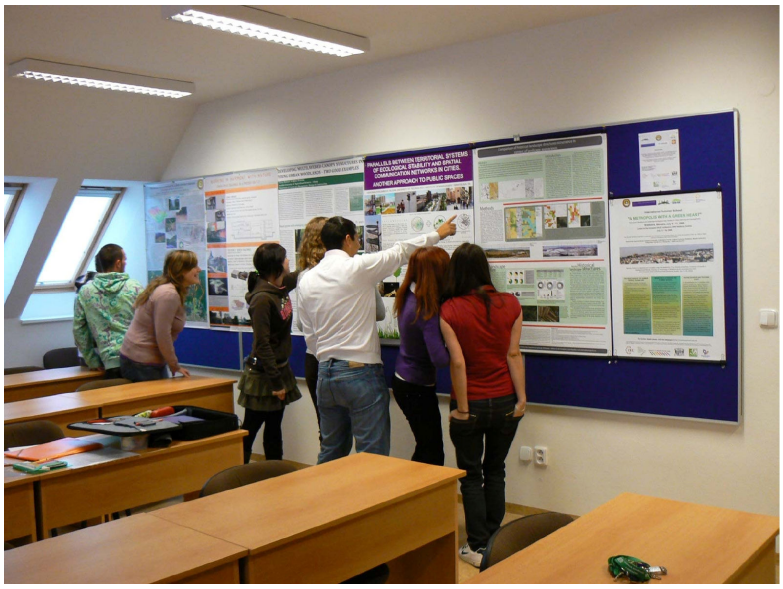
6.3 3rd follow-up activity - Venue: the University of J. E. Purkyně in Ústí nad Labem, Faculty of Natural Sciences, Dept of Geography (Ústí nad Labem, Czech Republic)

Students' panel session for disseminating results of the IVF project and development aspects of Visegrad countries was organized since September 23 until 30, 2009. The exhibition continued on 11-20 November 2009 in the frame of the Week of the Geography. Organizer: the University of J. E. Purkyně in Ústí nad Labem, Faculty of Natural Sciences, Department of Geography.

6.4 4th follow-up activity - Venue: Institute of Management, Slovak University of Technology in Bratislava (Bratislava, Slovak Republic)

Students' panel session for disseminating results of the IVF project and development aspects of Visegrad countries was organized since October 2 until 9, 2009 (see fig. 7). Organizers: Institute of Management, Slovak University of Technology in Bratislava.

Fig. 7 Students' panel session for disseminating results of the Summer School in Bratislava (Institute of Management, Slovak University of Technology in Bratislava)



Venue: Comenius University in Bratislava, Faculty of Natural Sciences (Bratislava, Slovak Republic).

Students' panel session for disseminating results of the IVF project and development aspects of Visegrad countries was organized on November 6, 2009 in the frame of the Week of the Science and Technology" as a part of the seminar of doctoral students "New trends in the ecological and environmental research". Organizers: Comenius University in Bratislava, Faculty of Natural Sciences, Department of Landscape Ecology.

7. Conclusions

The Summer School provided an interdisciplinary learning space and offered training and the possibility for mediation of know how / expertise among outstanding professionals, researchers, practitioners and students and young researchers. Very important was concrete example the metropolitan region of the Twin City Bratislava and Vienna, which provided a framework for the demonstration of cross-border cooperation in the central European region and confrontation of variety of different aspects, problems and their possible solutions in practice.

Participants had the opportunity to understand the multi-dimensional character of sustainable spatial development integrating social, ecological and economic aspects and critical linkages between planning and practices. Examples of the best practice realised in Visegrad countries and from other part of Europe and Asia were presented. There was also possibility to confront these examples with practice in Germany, Austria, Netherlands and other countries (e.g China).

There is a list of "hot issues" which were recommended for further research and for discussion with all responsible stakeholders:

- New perception of the city – city as a living organism,

- Urban planning and management as control interventions into the urban development processes,

- Shift to new urban development paradigms: from quantity to quality, from development to sustainable development, from urban sprawl to compact cities, from government to governance,

- Slower life in the cities: „slow" city with high quality,

- Bratislava and Vienna growing together between imbalances and similarities: new visions for cooperation,

- Sustainability indicators and criteria for urban landscape / urban management / environmental governance etc.,

- Transdisciplinarity as a core of the proposed comprehensive approach to sustainability,

- Governance indicators (for processes, capacity, rules etc.),

- New planning methodology: public involvement, processual management,

- A landscape's value is created by its identity, importance of a feeling of identity to landscape, that we belong somewhere, and an awareness of landscape values.

The Summer School and partner's cooperation established a very good background for the summer schools with similar topics and to support multiply effect. All partners agreed to organise a next Summer School in 2011 with similar issue (e.g. at University in Gdansk). For further details about the Summer School, e-learning materials for participants and posters of the participants please visit the webpage at http://summerschool.iale.sk

On behalf of organizing committee we would like to thank all partners, lecturers, participants and sponsors of the Summer School and follow-up activities for their valuable input to the programme of the Summer School and their support to improving quality of all events. We believe, that papers of the lecturers and participants of the Summer School published in this issue of the journal GEOSCAPE bring new ideas and visions to the "hot topic" how to achieve sustainability of big cities (metropolitan cities).

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All photographs are from the archive of the Summer School "A Metropolis with a Green Heart".

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"Responsible use of soil and land - new challenges for the region of the future"

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Abstract

Our common soils are ´per excellence´ very important for sustainable development, ever since the World Summit for Environment and Development in Rio de Janeiro in 1992, where Agenda 21 was adopted and the Framework Convention on Climate Change was signed.

The trend towards uncontrolled sealed surfaces and damage of an asset that is extremely short and cannot be reproduced, is continuing. The targeted reduction in the growth rate of permanently sealed surfaces is to be achieved by looking for concrete measures and solutions.

For understanding the case of soil and land use problems, we will analyze practical and theoretical regional examples. The key for successful work is synthesis and conceptualizing applications of knowledge integration. Territorial development planning as a ´empowering dialogue´ accepts the complexity that arises from the interaction among different agents at different territorial levels for explaining the region of the future.

Therefore we want to achieve a cooperative network of universities, cities and towns in the Centrope region and along the Danube, emphasising a common vision of measures against uncontrolled sealing and damage of soil and land, intending to develop concepts for integrated land utilisation and to initiate a ´learning region´.

Key words: soil management; land management; territorial development and planning

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1. Introduction – What are the problems?

Soil, water and land-use as one of the key natural elements are the key victims of Mans´ acting upon the Nature and most exploited and threatened resources in Europe. The main reasons for this include the dynamic process of green-field investments, (re)privatisation of land, lack of an appropriate and well organised cadastre, the outdated land use planning and low awareness of the soil problem in local communities and their governance practices.

Space is an asset that is extremely limited and cannot be reproduced, and which has always been the subject of strong conflicts with regard to its utilisation. European soils are under pressure by non-sustainable land use

practices. The trend towards uncontrolled sealed surfaces and damage of an asset that is extremely short and cannot be reproduced is continuing. The targeted reduction in the growth rate of permanently sealed surfaces is to be achieved by looking for concrete measures and solutions. Wolfgang Holzner argues, the results will be a disintegration of European landscapes in Conservation Wilderness and the over-utilised, over-civilised rest will certainly be very harmful for the quality of life of Europeans.

There are many discussions going on describing the approach to nature, should it be more human oriented or nature oriented. Tomaz Prus covers this issue, the anthropocentric (utilitarian, shallow even technocratic) approach is cost-benefit oriented accounting natural resources. The bio-centric approach is based on supposition that each part of the nature and the nature as a whole have an intrinsic value, a value by itself, which is independent from actual or potential human benefits (Prus 2007: p.14-15). An analysis of the rapid change of landscape inventory requires ordering different types of arguments and reasoning inherent in transdisciplinary processes and knowledge integration.

The three general principles of ecological design and integrated land utilisation are learning to understand the patterns on a real world level, conceptualizing which means synthesis and integration of knowledge and explaining for making the results comprehensible to the public. Therefore for understanding the system, we will elaborate for future network of communication, analyzing practical and theoretical examples from the five research clusters (Blum et al, 2004b: p. 4.), for understanding the case. The key for successful work at this stage is synthesis and integration, conceptualizing applications of knowledge integration. Finally explaining territorial development planning as a ´empowering dialogue´ which accepts the complexity that arises from the interaction among different agents at different territorial levels and recognizes the ´interests´,´reasons´ and ´motives´ underlying their ´rationalities´ and strategic conduct. (Henriques 2006).

2. Understanding soil and landuse system

"Sustainable use of land is a complex issue, which must be based on scientific knowledge. But complex issues are difficult to understand, specifically for those at grass root level, e.g. stakeholders, as well as for those who provide solutions such as politicians and decision makers. The question is therefore how to bridge between the available scientific knowledge on one side and those who need it for defining policies, and operational procedures, such as stakeholders, and politicians and decision makers on the other side" (Blum 2004a). On the basis of the soil indicator framework – the *DPSIR approach* - and its application in practice helps to understand complex systems and processes and react by developing responses and solutions for strategies and operational procedures, to create landscapes involving with great responsibility. The DPSIR approach, is distinguishing between Driving forces, Pressures, State, Impacts and Responses (European Environment Agency: 1999).

The UN proclaims with the Decade for Education for sustainable Development from 2005 to 2014 that education will help to develop widespread understanding of the interdependence and fragility of planetary life support systems. Many countries now pursue active policies to help their cities, regions, towns and neighbourhoods become more attractive. But most countries find that this requires new skills, new ways of thinking and new ways of working. At the "European Skills for the Sustainable Communities Symposium"[1] for making better places in Europe, Jose Manuel Henriques from Portugal was mentioning the Lisbon strategy for Europe and he was emphasizing the challenge of a paradigmatic transition in the social sciences and how municipalities can improve their contribution to anti-poverty action in a context

[1] In Leeds – 9.-10.Nov.2006
http://www.ascskills.org.uk/pages/home

of global restructuring (Henriques 2006). The background for generating the relevant knowledge which implies cooperative research driven by social needs and through mutual learning is *generic skills* - such as leadership, community engagement, project management, partnership working and effective communication - that underpin the technical and specialist expertise, helping people to overcome obstacles and leading to a greater understanding of how to make places truly sustainable.

The traditional university with a positivistic approach is prepared for creating scientific knowledge. But real world problems often cut across existing disciplines. Therefore transdisciplinarity offers the prospect of generating the relevant knowledge which implies cooperative research driven by social needs and through mutual learning. When we were preparing this new kind of learning within a Sokrates Erasmus Intensive Program[1], Rosa Strasser was creating the social field of a project on living soil and generating social capital from learning by experience through a special learning culture. "It was quite clear from the beginning, for most of the participants the kind of transnational and transdisciplinary cooperation in this project would be new territory. Especially the cultural, communicative and social challenges of such an endeavour are usually not the preferred topics of reflection among scientists. Yet to deal successfully with them would be crucial for the effectiveness of the programme.

The *core-questions* guiding the preparatory work are the following:

How and by which means can trust be built within the participants? *Trust*, we supposed, is necessary for the kind of relationships that is needed to allow open dialogue on difficult issues within the project, but also when the project addresses its´ external environment.

- How is to promote the ability to contemplate the social phenomena occurring during the process - with regard to the content, but most of all to the intercultural and interdisciplinary cooperation? We become aware of - mostly unconscious - cultural phenomena and individual beliefs or assumptions especially when cultures encounter. How can such a not necessarily comfortable moment be turned into a fruitful experience?

- In which way can the experience in the project allow to be more aware that, what generally is seen as "scientific facts" is the product of many actions, influences, conversations, selections and decisions within a process in a certain field? In which way can this process of production of scientific facts become itself the object of reflection *within an intentional space*?

- What would be the best way to support the emergence of a new international scientific community as a holding space for understanding, for generation of new experiential knowledge about the complex issue of soil protection and for mutual support among pioneers in this field? We suppose new values could be created if that network were perceived as a high-quality-field from outside.

Most helpful is to create together the context for the learning endeavour in a conscious way and to agree on carefully designed procedures of action and reflection giving enough safety to permit the next steps into unknown spaces. Having experienced this form of learning together fosters relationships and generates a unique kind of social capital that cannot be created in another way." (Strasser 2005: p. 7).

3. Conceptualizing new models of integrated land utilisation

Today we need a new approach of mutual learning between science and society. If we want to do joint problem identification and solving among science, technology and different stakeholders in society we have to learn about transdisciplinarity.

[1] IP SOIL "Responsible Use of Soil and Land and Regional Development" http://www.academia-danubiana.net/publications.html

Transdisciplinarity is a new form of learning and problem solving involving cooperation among different parts of society and academia in order to meet complex challenges of society. Transdisciplinarity requires methods that allow integration of knowledge with respect to at least four dimensions (Klein 2001).

- The first dimension involves structure and procedures for systematically linking of knowledge from different sciences to establish an *interdisciplinary* approach. For our example we need soil scientists, economists, ecologists, tourismexperts and architects to work together.

- The second dimension entails subdivision into different systems and compartments to allow an emcompassing**,** *holistic* consideration (such as water, air, soil, fruits, animals). The principle is bringing the whole together, preparing a diagnostic map by making a data overlay of soil quality, orchards, built up areas etc., as we can see it in the pattern language.

- The third dimension is integrating different qualities of thought distinguished in the *complementarity* between intuitive and analytic modes, indicated by the right and the left brain hemisphere. We need to ask questions, to intervene, to render visible what has so long been hidden from public discussion.

- The fourth dimension of knowledge integration shifts from methodology to *epistemology*. Different interests of stakeholders with different types of arguments. City planners, engineers, and other design professionals have gotten trapped in standardized solutions that require enormous expenditures of energy and resources to implement. These standard templates, available as off the shelf recipes, are unconsciously adopted and replicated on a vast scale, that we call dump design.

Models of integrated land utilisation with a circular metabolism should be developed to create a multifunctional and integrated patchwork of ecological design projects, like residential areas which are connected with greenways, agriculture and forestry and related to wilderness, which can be applied at all levels of scale to create new patterns of buildings, landscapes, cities and technologies.

Ecological design treats an area, region or landscape as an entity, investigating the interdependence of its ecological, social, economic and cultural variables to provide insight and understanding of the functioning of the whole system. Ecological design is a system of assembling conceptual, material and strategic components in a pattern which functions to benefit life in all its forms. It implies any form of design that minimizes environmentally destructive impacts by integrating itself with living processes to minimize resource depletion, preserve water cycles and respects species diversity, etc.

If we want to solve the problems of soil degradation and develop an understanding in the society for creating a sustainable use of the soil and a *multi-functional land management*, we have to choose an interdisciplinary and transdisciplinary method. Multi-functionality land use means to substitute the zoning principle of the physical separation of urban and rural activities with a true mix of patterns, which functions in order to benefit life in all its forms. Multi-functionality of soil means that soil can be used in all its main functions, such as biomass production, filtering, buffering and transformation, as a gene reserve and as a geogenic and cultural heritage and also as a physical basis.

We will also take *art as a metaphor*, for working on common ground with different disciplines, describing elemental parts of life, for showing multifunctional regions like an aquarelle. Explaining ´Multifunctional spatial management systems´ should be the integration of different topics of science, which are an integration of land utilization: *"Like patches of watercolours on wet paper, different regions soft overlapping will intermingle in an ecotone, to create, like a new spectrum of colours, the landscape of the future."* (Holzner et al 2002).

4. Explaining the region of the future

The *communication between disciplines* of different scientific traditions depends mainly on communication among persons with different disciplinary backgrounds. Therefore, the quality of interdisciplinary knowledge cannot be independent from the quality of interpersonal relations within the planning teams. Common values and emotional or political commitment may be determinant conditions for the quality of interdisciplinary results. The pleasure of interacting inside the group may be the determinant of the imagination and of the creativity that the group may be able to develop. The possibility of non-defensive behaviour and attitudes becomes essential. It may be easier to accept the areas of ignorance, which may stimulate further progress (Henriques 2006).

For explaining soil use problems in transitional societies Prof Borislav Stojkov is recognizing five key factors: People, Land ownership, economy, local administration and soil. The relations between the single factors are constant. Mutual and interdependent, making a flexible system with five angles – a pentagon. The *soil use pentagon* is a complex and dynamic system and as a result all other factors will change their position, but if the soil will be the victim, the ultimate victim will be the people (Stojkov 2008).

To manage our continually changing activities in land use planning, new ´polycentric governing styles´ may support the dialogue between all the players, in an ongoing process to create effective governance toward a *´learning region´* democratically by everyone affected. This concept for a ´learning region´ will establish a sustainable learning support and mobilise regional and local actors, authorities, local business and small industry to a committed and effective involvement, utilisation and support for developing new concepts of responsible land use. The local and regional actors will work on cooperation agreements for finding ´common ground´ for future development. It should enable all the institutions related to environmental and nature protection to release the potential of public agencies and enable each of these to contribute to the achievement of awareness of a desirable and responsible soil and land use in the region.

Territorial development planning as a *´empowering dialogue´* accepts the complexity that arises from the interaction among different agents at different territorial levels and recognizes the ´interests´, ´reasons´ and ´motives´ underlying their ´rationalities´ and strategic conduct. This requires knowledge about the field of forces in the context of which the ´discursive field´ and the ´organisational´ field´ gain their relevance for the deployment of Municipal ´causal powers´ and the effectiveness of action.

If we want to bring society into the art of *governance* and to encourage the creativity of all social groups, than they should realize their intellectual potential for solving complex land use problems. The ´learning region´ should be seen as a continuous learning process, that provides the region with a cross-sectional platform to discuss sustainable land use development as a precondition for ecological awareness for collective action. It requires good levels of trust between regional and local administration and the different elements of stakeholders in the region based on the experience of working successfully together.

Against the background of a knowledge based economy and accelerated structural changes human capital is becoming more and more important. A *Learning Region* combines the pragmatic execution of learning and regional development. (Centrope[1], Uniregio) The regional education and science institutions are aligned with the regional development objectives and accordingly qualified inhabitants have to train the trainers and activate and integrate the stakeholders of the region for pushing the development. (Spachinger et al. 2005).

As an example the *Centrope* vision aims at combining these two objectives and to establish a Learning Biosphere – Growth Region, in which renewable resources and

[1] http://centrope.com/centropestart/

technological know how (new professions) contribute an essential part to the competitiveness of the region and in which urban and rural areas are functionally linked according to this vision. The sustainable use and protection of biogenous resources and a Green Centre settlement principle characterize this region in which compact settlement locate along public transport axes and in which the valuable natural space as well as a recreational and agricultural space is conserved (Puchinger 2005).

5. Conslusion

Europe has become a giant freewheeling experimental laboratory for rethinking human conditions and reconfiguring human institutions in the global era (Rifkin 2004, p. 83). Sustainable development over unlimited material growth means to protect the interests of those who will come later, because we have loaned the land from our children.

We are considering the region of the future as a contribution for an intercultural dialogue by interacting. Scientific preparatory work is creating the basis for a future network of communication on the soil, water and land use issues. We always should keep in mind and ask questions, because problems cannot be resolved by the same level of consciousness that created them, noted Albert Einstein. The three old methods of operating: executing without improvisation and mindfulness (reactive action); endless reflection without a will to act (analysis paralysis); and talking without a connection to source and action (blah-blah-blah). These three enemies share the same structural feature, instead of balancing the intelligence of the head, heart, and hand, one of the three dominates-the hand in mindless action, the head on endless reflection, the heart in endless networking. Therefore as Otto Scharmer is pointing out, connecting to ones´ best future possibility and creating powerful breakthrough ideas requires learning to access the intelligence of the heart and the hand-not just the intelligence of the head.

Sustainable development for responsible use of soil and land requires new solutions with the help of education, life-long learning and good stewardship. A new paradigm of planning and design needs to establish all kinds of empowering, democratizing and partnering within a transdisciplinary management. Therefore we want to achieve a cooperative network of universities, cities and towns for ecologisation of the Danube region (Kvarda 2004), emphasising a common vision of measures against uncontrolled sealing and damage of soil and land, intending to develop concepts for integrated land utilisation and to initiate a ´learning region´.

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Assessment of landscape-ecological values of vegetation in Bratislava

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Abstract

The quality of environment in urban area is in close connection with the amount of green spaces. Decision makers, researchers and mainly inhabitants appreciate green spaces quality and its positive contribution to their life. The tradition of urban settlement in Bratislava has continued for more than 2000 years. Urban green spaces as a multifunctional system are important for sustainable development, including human well-being, but these values are not fully understood by city planning authorities (Sandström, 2009). Nowadays, Bratislava is characterized by continuing urban development and increased pressure on quantitative and qualitative properties of urban vegetation. Yet, some of Bratislava city parts are characterized by absence or lack of valuable urban vegetation and despite of its signification is urban greenery underrated by town-planners. The paper is dealing with methods applied in assessment of natural and man-modified urban green spaces.

Key words: urban vegetation; Bratislava; vegetation quality, vegetation functionality

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1. Introduction

The growing number and density of inhabitants in urban areas induce higher need and concurrent strong press to green spaces. On the other hand the quality of environment in urban area is in close connection with the amount of green spaces. Decision makers, researchers and mainly inhabitants appreciate green spaces quality and its positive contribution to their life. Following Dislich, Pivello (2002) in most cities that have experienced recent and rapid development, urban expansion has not always been properly planned, leading to destruction of almost all natural environments.

Bratislava, the capital city of the Slovak Republic is localised in south-west part of the country and belong to Europe's oldest cities but youngest capitals. The tradition of urban settlement in Bratislava has continued constantly for more than 2000 years. In 1291 Bratislava received town privileges and in 1405 became free royal town. In 1782 number

of inhabitants reached 29 223, high expansion of the city occur during 20th century, in 1930 population reached 12 thousands of inhabitants and in 1984 already 400 thousands citizens (http://bratislava.region.sk/history/milestones.html). Bratislava now represent quickly developed metropolis with about half a million citizens (City of Bratislava, 2008). Native environment of the city shaped Danube and Morava Rivers as well as the range of Small Carpathians Mts. The area of Bratislava is 36 766 ha (GKÚ SR, 2009). Continuing urban development and increased number of inhabitants generates pressure on quantitative and qualitative properties of remaining urban vegetation. According to Reháčková (2000) the quality of urban vegetation is represented by its functions, for example ecological, aesthetic, climatic or hygienic. Yet, some of Bratislava city parts are characterized by absence or lack of valuable urban vegetation and despite of its signification is urban greenery underrated by town-planners.

The paper is dealing with assessment of forest fragments and modified urban green spaces as remnants of natural vegetation.

2. Assessment of urban vegetation

Following Dislich, Pivello (2002) small forest fragments in urban areas must be constantly monitored and managed in order to direct succession processes towards maintaining species and habitat diversity. Successful ecological management requires a comprehensive understanding of the structure and dynamics of remnant forest patches and knowledge of past and present processes. The mentioned authors monitored tree structure and species composition of forest fragments in urban area of Sao Paulo (Brazil). Forest communities were indentified and classified according to succession stage, trunk perimeter of trees, diversity and succession groups of species. Potential problems were predicted in competition of invasive and native species.

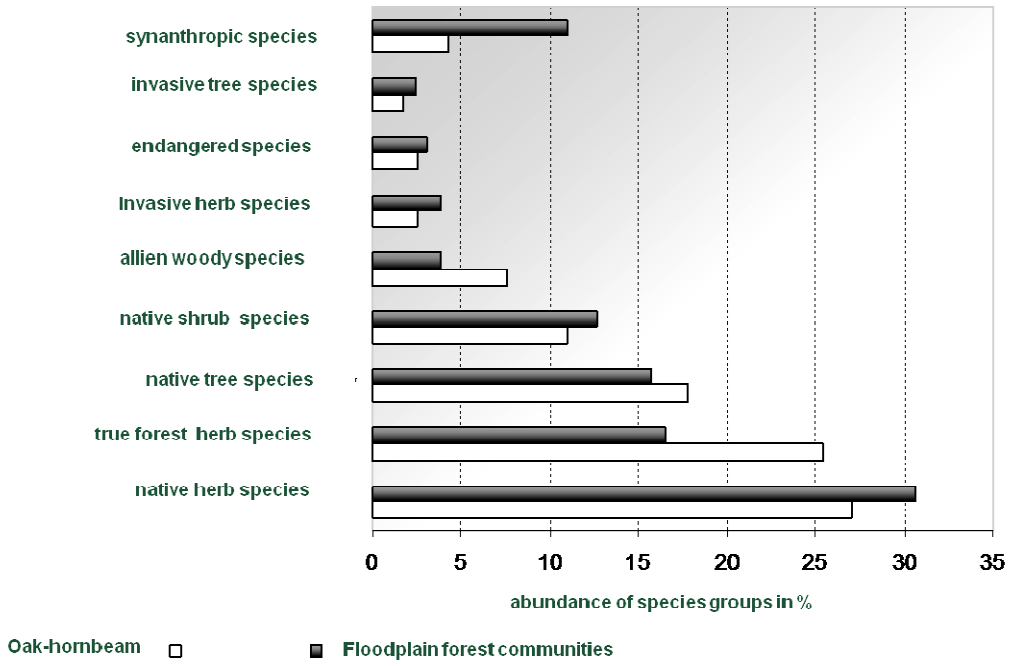
In Bratislava six fragments of natural Carpathian oak-hornbeam forest vegetation and seven fragments of riparian poplar-willow forests were analysed during years 2002-2007 (Reháčková, Ružičková, 2003, 2007). The following indicator groups were chosen for monitoring: natural plant species, alien species, true forest species, protected, endangered and rare species, synanthropic and invasive species (fig. 1) and diaspore dispersal. Data collection from the forest communities was done by Zürrich-Montpellier phytosociological method in the sense of Braun-Blanquet (1964) and Westhoff, van der Maarel (1978). Forest fragments in the city of Bratislava still have natural character. Six forest fragments in the north part of Bratislava were classified as association *Querco petraeae-Carpinetum* Soó et Pócs (1931) 1957 em Miadok 1980 and seven floodplain forest fragments in the southern part of Bratislava belong to associations *Fraxino-Populetum* Jurko 1958, *Fraxino pannoniceae-Ulmetum* Soó in Aszód 1963 corr. Soó 1963 and *Ulmo-Quercetum* Jurko 1958. Very important is the high ratio of true forest species which create 25.4% in oak-hornbeam and 16.5 % in ash-poplar floodplain communities (fig. 1), what indicates long-lasting remaining of these remnants on given sites.

Greenery represent highly important component of any urban settlement. Its importance reposes upon decreasing of dustiness and noisiness negative effects, creating of optimal microclimatic conditions and also has an aesthetic and recreational value. Urban vegetation provides specific functions (such as ecological, climatic, aesthetic, hygienic, recreational water-conservation, and soil-conservation) which are responsible for life quality increase in urban settlements. Green spaces in Bratislava are endangered by building activities and purposes to change remnant woods to parks with change of species composition.

The mapping of Bratislava green areas functionality was carried out by Reháčková and Pauditšová (2004) during period 2002-2003. Green spaces were evaluated at 2 levels – in areas larger than 10 ha (e.g. forests and forest parks, complexes of private gardens) and in areas with 0.5 – 1 ha expanse (e.g. remnants

of natural vegetation, tree-lined avenues, alleys, cemeteries). The share of all green surfaces mapped at both levels accounted for 29.91 % out of entire area of Bratislava. Functionality assessment was carried out by six selected functions from the anthropocentric aspect (hygienic, isolation and recreational functions) and biocentric aspect (ecological, trophic and topic functions), where functionality of green areas from the anthropocentric point of view achieved lower values compared to the biocentric functions.

Fig. 1 Percentage contribution of indication group of species according number of species in forest communities



A decision framework for urban green spaces and quality of life in Leipzig was proposed by Leeuwen, Vreeker and Rodenburg (2003). During the evaluation critical threshold values of selected ecologic, economic, social and planning indicators was used and compared with normative reference values. Proposed set of indicators created a foundation for application of Flag Model that helped to evaluate quality of life in Leipzig District Park Reudnitz.

3. Methods

Urban vegetation in Bratislava capital city is represented by various types of green areas: as remnants of natural ecosystems e.g. forest fragments, riparian vegetation along Danube and Morava rivers and man-created or managed areas such forest parks, historical parks, gardens, tree lined avenues, cemeteries, public greenery of housing estates etc.

For evaluation of urban vegetation functionality and quality in the cadastre Staré Mesto (the central, historic part of Bratislava) three categories of green spaces were identified during the field research in 2005 (Marušincová, Moravčíková 2006):

(a) Arranged parks and squares – 11 areas – represent squares and public parks;

(b) Alleys - 64 areas – lines of greenery along roads, sidewalks and riverside of the river Danube;

(c) Courts - 6 areas – surroundings of houses.

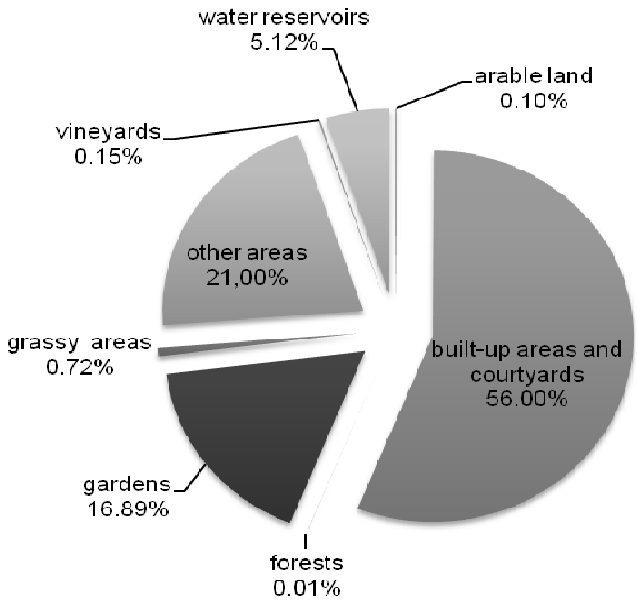
In the individual categories of urban vegetation followed criteria were evaluated according to methodological approach of Reháčková (2002): ratio of native and outlandish species, criterion of climatic regionalization and ratio of allergen species. Evaluation based on abundance of native species emerges from knowledge of potential natural vegetation (ratio of potential natural species from total number of species is evaluated), while evaluation based on abundance of outlandish species represents assessment of outlandish species ratio from total number of evaluated trees and shrubs species. Percentage abundance of outlandish species (expressing retraction from potential natural vegetation optimal status) is compared with percentage abundance of potential nature species. Evaluation based on climatic regionalization use wood species regionalisation that defines utilization of outlandish species in proper climatic region (Benčať, Maglocký, Supuka, 1991). According to climatic regionalisation three regions can be identified – warm (more than 50 summer days, and more than 25 °C), medium warm (to the 50 summer days, and more than 25 °C) and cold (average July temperature under 16 °C). Based on the urban greenery enlistment into climatic regions planted trees and bushes can be classified into the scale of suitable, suitable with limited application and unsuitable for planting in selected area. Within the frame of allergic potential evaluation, we can identified three degrees of allergens – strong allergens (family *Fagaceae*, *Betulaceae*), medium allergens (family *Tiliaceae*, *Ulmaceae*, *Oleaceae* – genus *Fraxinus*) and mild allergens (family *Salicaceae*, *Pinaceae*, *Taxaceae*) (Hrubiško, 1995).

4. Results

4.1 Evaluation of functionality and quality of urban vegetation

The smallest component of Bratislava, cadastre Staré Mesto (Old City) has total area of 959 ha; land use is dominated by built-up areas, which create 56.00 %, gardens cover 16.89 %, water reservoirs 5.12 % and grassy areas 0.72 % (fig. 2).

Fig. 2 Land use in the cadastre Staré Mesto (Bratislava) (following ÚGK, 2009).



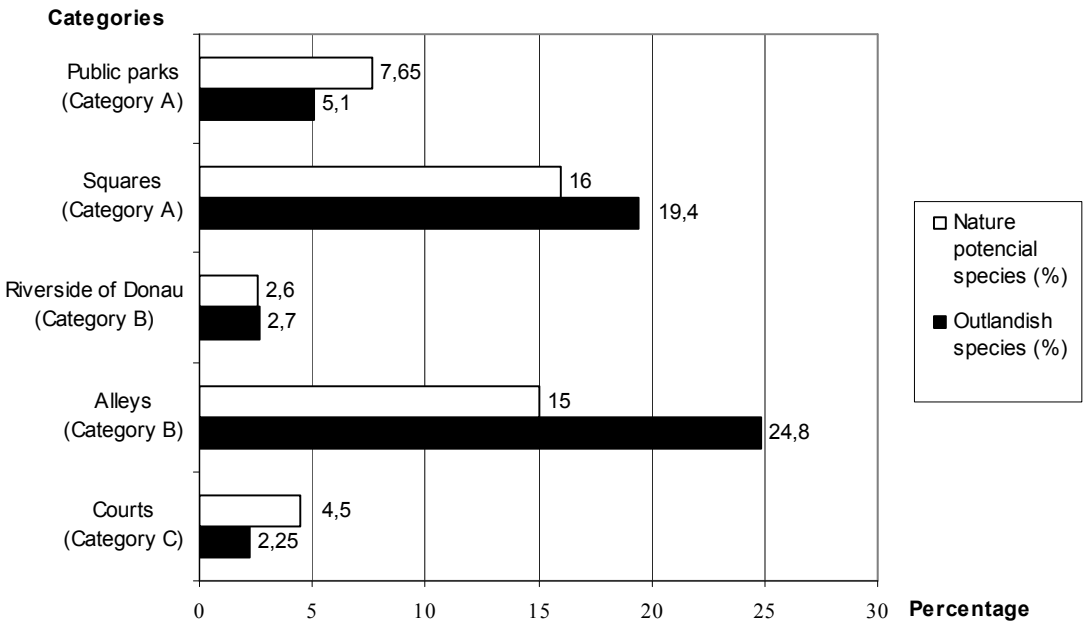
Greenery under public administration of Staré Mesto covers 64.4 hectares, what represent 6.74 % from the whole area. According to Ekojet (2000) 3 847 individuals

of trees and shrubs are maintained by public government of Staré Mesto. Ratio of deciduous and coniferous trees and shrubs is 85.6 % to 14.4 % (3 293 of deciduous individuals and 554 of coniferous individuals).

4.2 Evaluation based on abundance of native and outlandish species

Percentage ratio of native and outlandish species is 45.75 % to 54.25 % (1 759 native individuals and 2 088 outlandish individuals of trees and shrubs). Biggest abundance of native species was recorded in category A – arranged parks and squares with total of 911 individuals of trees and shrubs. Dominant native species are Norway maple (*Acer platanoides*), sycamore maple (*Acer pseudoplatanus*), small-leaved lime (*Tilia cordata*), silver birch (*Betula pendula*); less common are large-leaved lime (*Tilia platyphyllos*), black poplar (*Populus nigra*) and Scots pine (*Pinus sylvestris*). Highest number of outlandish species can be found in category B – alleys, with 1 057 individuals of trees. From the outlandish species common hackberry (*Celtis occidentalis*), Japanese pagoda tree (*Sophora japonica*), Austrian pine (*Pinus nigra*) and horse chestnut (*Aesculus hippocastanum*) are most common in the cadastre Staré Mesto (fig. 3).

Fig. 3 Ratio of native and outlandish species in cadastre Staré Mesto (Bratislava).



4.3 Evaluation based on climatic regionalisation

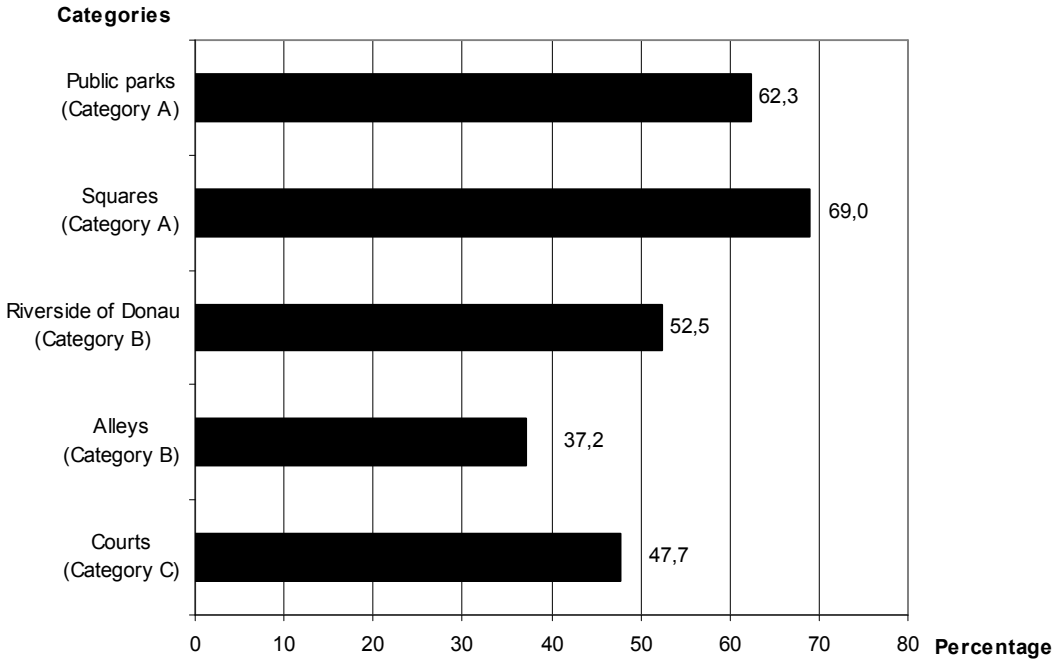
According to climatic regionalisation by Benčať, Maglocký and Supuka (1991) cadastre Staré Mesto (Bratislava) belongs to warm region with more than 50 sunny days, average July temperature above 25 °C. Ration of climatic properly regionalised species is very high and it didn't droop below 95 % in selected categories.

Norway spruce (*Picea abies*), silver fir (*Abies alba*) and European larch (*Larix decidua*) belongs between species that are from the viewpoint of climatic regionalization unsuitable for planting in cadastre Staré Mesto (Bratislava). White beech (*Fagus sylvestris*), Serbian spruce (*Picea omorika*), common yew (*Taxus baccata*), white cedar (*Thuja occidentalis*), red gedar (*Thuja plicata*) have limited utilization in the area. Nevertheless, health state and viability of these species is adequate.

4.4 Evaluation based on allergic potential

Biggest abundance species with allergen potential was recorded in category A (especially genus *Betula*, *Tilia*, *Fagus*). Percentage abundance is presented in fig. 4. From the point of view of landscape ecological quality maximum ratio of nature potential species in urban vegetation is suggested. On the other hand, in many cases are these species strongest allergens. Reháčková (2000) suggest planting of species from family *Rosaceae*, e.g. genus thorn (*Crataegus*), sorb (*Sorbus*), hackwood (*Padus*), since this family have almost no allergic potential.

Fig. 4 The percentage of allergic woody species in the cadastre Staré Mesto (Bratislava).



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Re-thinking the city in the context of suburban landscapes. The case of Visula River delta water - landscapes and urban transformation processes in Gdańsk

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Abstract

The text draws attention to the significant role of landscape formations surrounding the city and their role in marking out directions for the transformation and development of urban areas with the particular emphasis on public spaces. The article presents the need for a more conscious design strategies that are based on connectedness of urban spaces, which is built on landscape's characteristics, as an essential starting point for developing a strategy of urban transformation in such a way that development would not contribute to the loss of landscape identity but enhance it. The article refers to the case of Gdańsk, including an analysis of the role of water in its development and its transformations. It stipulates the advantages of re-defining the city and searching for its once-lost relations with the embracing landscapes, particularly with the landscape of the Vistula River delta's polder.

Key words: urban landscape; water landscapes; public spaces connectedness; urban development

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1. The city as a landscape

Revealing connections with the surrounding landscape as a starting point for urban transformation processes is still not sufficiently valued. How to recognize and to expose the potential of this landscape, understood in the geographical and cultural aspect? How to transform its features and to transfer them in their most sublime form into urban conditions? The landscape surrounding a city, important in the past, today once again can be an essential point of departure for urban development projects

The choice of locations for towns resulted from important reasons; apart from the extended connections with the region, it usually had to do with access to water or convenient conditions for building defence fortifications. Geographical characteristics of the land were used naturally in the city's

development; its form was negotiated in the landscape. However, emerging understanding of city planning, especially powerful since the end of 19th century, as a work of art subordinated to composition rules, has meant that this connection has ceased to be perceived and finally was neglected.

At present, after a functionalist approach based on many oppositions, a tendency toward joint perception of ecological systems and the built environment can be observed. Objective criteria of space analysis, however necessary, are more often found as insufficient. In effect, analytical approaches are complemented with the value of the direct experience. This kind of thinking seem to dominate today's architectural attitudes and are frequently developed into the concept of the city as a landscape.

It should be emphasized though, that many ideas that have emerged since the beginning of the 20th century can be regarded as a continuously repeated attempt to develop an interpretation of the city as a special kind of landscape. Georg Simmel, strolling through the labyrinths of the metropolis, interpreted it as a landscape in which many heterogeneous elements, through fading some of them and emphasizing others, constitute one coherent whole. The 1960s and 1970s enhanced and developed the concept of the city as a landscape. A city was revealed in the dynamics of the observer's movement and in various environmental impacts – as a result its image was created even by unstable shadow lines and water tides.

Today, in architectural concepts blurring oppositions between the built environment and nature is emphasized once again. It brings spectacular results: rock formations, unstructured topographies are treated as components of architectural form. Even water becomes its powerful constituent (Nyka 2007). The value of the presence of elements is stressed in urban space projects. Various public places are created whose characteristics are based on enhancing and revealing environmental impacts. It triggers a new kind of architectural imagination. In effect, encompassing nature in public space does not result only from rational reasons but also from aspiring to reveal a deeper layer of the city, where water sounds or half-natural, half-constructed landscapes are an important element of urban experience. Additionally, at the same time many studies confirm that these are not attributes of the built structures but the way in which natural features of the land are transformed into usable urban spaces that builds the identity of the city and determines its identification (Roberts 2001: 39).

Consequently, cities are more often interpreted in categories of the landscape – the environment of natural and anthropogenic features, social processes and ecosystems which intertwine. Detlev Ipsen and Holger Weichler underline that referring to landscape allows one to consider relations between forms, land use, lifestyles, cultural models and the dynamics of ecological systems. The authors demonstrate that urban landscape is not only a metaphor but a useful "theoretical construction that opens an interdisciplinary approach both to analysis as well as city-region planning." Space, society, build-up forms, nature and environment are presented in this construction not as oppositions but as a new whole (Ipsen 2005: 42). Also Bart Lootsma, introducing the expression "landscape urbanism" indicates failures of strategies based on space fragmentation, which results from the traditional scope of the profession (Schafer 2003: 8). What is important, is the shift in urban planners' attitudes, who start to realise that the traditional tools are more often not sufficient since urban environment is active and susceptible to many not always predictable impacts. The notion of landscape opens new ways to working out adequate tools for this active urbanism.

What is essential, the perspective of a city as a landscape creates new possibilities of defining its connections with the surroundings and in fact is tightening them. Manfred Kuhn even claims that the model of the "urban landscape" is based on and results from the concept of the city and surroundings which interpenetrate (Cultural landscapes… 2005:

120). The need to redefine understanding of cities, to free them from isolation and to show them in a wider context of the environment, is today presented within many disciplines, from archaeology, architecture to the humanities. According to Christopher Tilley's book *A phenomenology of landscape. Places, paths and monuments*, which is groundbreaking for many disciplines, only through the narrative experience of the landscape, it is possible to achieve understanding of a place as well as to present it in a wider sense. By creating continuity with the landscape, sites appear to be more capaciously defined; they acquire new values and references (Tilley 1994). This extended understanding of the city in relation to a landscape can be a vital point of departure for developing strategies for its development and urban transformation.

The subject of the research presented in this paper is the case of Gdańsk, an analysis of its transformations and possibilities for improving urban space quality by retrieving interconnections with a wider context of the landscape, in particular the landscape of the Vistula River delta.

2. Gdańsk in the context of landscape

Gdańsk came into being and developed on the border of two large ecological systems: moraine hills and fens of the Vistula River delta (fig. 1). These two landscape formations were mainly used for practical and defence purposes. To the west the town bordered with hills which gradually were changed into fortresses. Water from the lowland river Motława filled moats and passed through Gdańsk, becoming the centre of the town's functional programmes as well as the core of its urban structure. Already in the Middle Ages the depression areas of Żuławy started to be reclaimed into a polder. Gradually the characteristic image of the Vistula delta started to appear – crisscrossed with canals with windmills for water pumping and locks (fig. 2). The whole rich canal infrastructure was formed. This was also a settlement area of Mennonites – members of a Dutch minority who had knowledge and experience with element of water.

Fig. 1 Cartographic reconstruction of the Vistula River Delta in XIII c. according to Bertram

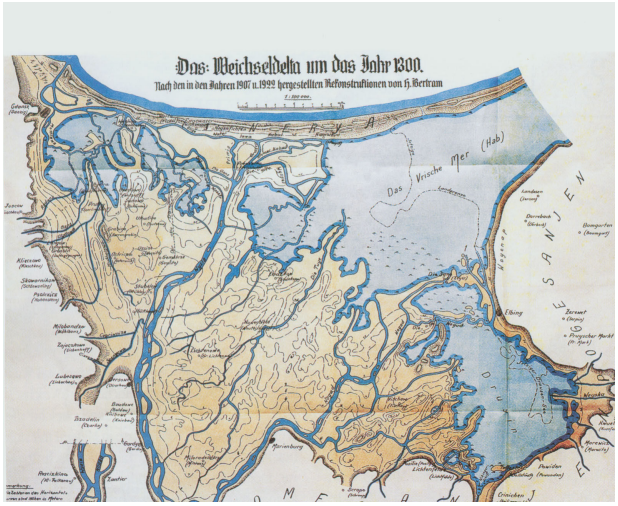
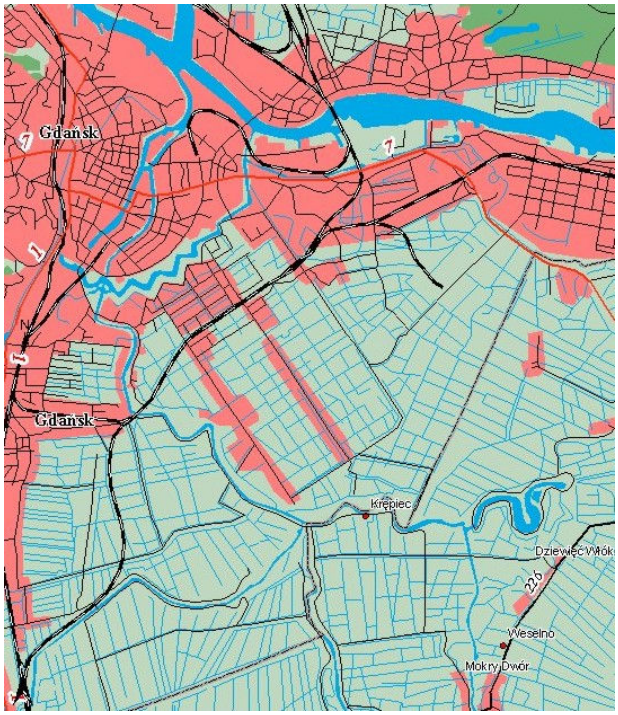


Fig. 2 System of canals, the Vistula River delta, 1780

Characteristics of this landscape were transferred to the city of Gdańsk, determining its spatial development. Water gates, locks of different construction and boats crowding the Motława canal, waiting for entry to the harbour were typical attributes of the city. Gdańsk expanded beyond its former area and drained

marshes, transforming them into an urban landscape. The numbers of consecutive causeways have remained in the street names until today. In the 17th century bastion fortifications were built together with moats filled with Motława's waters. The area of Dolne Miasto (Low Town), crisscrossed by canals, was drained by windmills. In the depressed area situated behind the bastions a settlement started to grow, today Gdańsk's district of Olszynka, which is a direct continuation of the polder landscape of Żuławy (fig. 3).

Fig. 3 Gdańsk and environs. A current land use map with urban and sub-urban canals (Source: Gdańsk Municipal Office 2006)



In the 19th century when both the fortified hills as well as the bastions started to lose their military significance, they became a part of urban public space, and as green areas they were used for recreation purposes (Nyka and Szczepański 2004). In Joseph Stüebben's project, a green alley, which was planned in place of former city walls, linked the fortress areas with distant parts of the city as far as Motława canal (fig. 6). At the same time, the city dwellers walking along canal boulevards could reach the bastion fortifications whose moats were changed into urban beaches. The water routes linking Gdańsk with other towns of the Żuławy region were functioning very well. Vistula River delta canals network entering the city brought the broader sense of connections with the region. In this way, as the town was being developed and new perspectives of public space and recreation areas were marked out, they were subordinated to the logic of wider relations with the landscape.

3. Re-gaining water-landscapes for urban development

After the wartime destruction, only isolated parts of Gdańsk were restored. Due to functionalist concepts the issue of water was marginalised – once the centre of the city, it suddenly became its peripheral edge. Former green alleys linking different distant urban spaces were made into dual carriageways, a barrier to pedestrians. Lack of understanding of the potential resulting from the integration of surrounding landscapes led to their neglect. They are cut off and unfrequented, outside the system of public routes. The ratio of green areas to build-up areas is high in Gdańsk, but the green areas are patches that do not make a whole. The subject of Żuławy was suppressed after the war for political reasons, mainly regarding their German history. Additionally, it should be emphasised that the Żuławy area was severely damaged during wartime: the main polders were flooded and their drainage took over two years (Klim 2008).

When the water became the city's periphery and was deserted it also lost its power to create connections. Many areas of Gdańsk, despite their natural, cultural and historical values, became out-of-the-way places. Isolated from the city centre, they were degraded in a material and social sense. Today they are considered to be the most dangerous territories in the city. Gdańsk as a city started to consist of disconnected parts.

Methodologies of revitalization which are static and view the city in terms of separate

areas are a deterrent to improvement. Additionally, and paradoxically, water in these studies is usually a border of the delineated research area. As a result, the bastion fortifications have been undergoing regeneration for some years now, profiles of earth formations have been improved, characteristic flora has been restored, but nobody comes to visit those places. A historical fortified hill Gradowa Góra with unique redoubt started to serve as an educational and cultural centre, the Hevelianum centre was created there, but due to the lack of visible natural connections these places remain empty. Water systems exist, indeed, but nobody can reach them as they are not integrated within the system of public spaces. Due to their fragmentary nature they do not encourage efforts to establish continuity of the urban landscape, either in the natural or in the spatial aspect. There is a lack of comprehension of the necessity of joint management of natural forms and the built environment. In effect, despite their direct proximity and even overlapping they are treated separately and developed by different project teams.

At the same time a need for wider perception of the city emerges, a need to regard it not only as a built environment but also in a wider context of topographic and landscape conditions. The rejection of Gdańsk's inclusion on the UNESCO Word Heritage List initiated a discussion on what constitutes a city's identity. The discussion clearly revealed how important it is to redefine a city and to show it in the context of the landscape. For many years the World Heritage List has included "natural sites", "cultural sites" or so-called "mixed sites". At present, and this is something Christopher Pound pays attention to, these categories are more deeply analysed, which resulted in the acceptance of sites described as "cultural landscapes". These are sites where "cultural and natural values mix together and erase borders of earlier judgements" (Pound 2001: 90).

Regeneration of relations with the landscape would allow the linking of broken parts of urban space, simultaneously enhancing the most important, constitutional characteristics Gdańsk's identity is made of. And these are, first of all, the unique connections with water, canals, with urban polder areas and the anthropogenic landscape of Żuławy region. Redefining the city and showing it in this wider environment could be a base for developing more specific concepts of its urban transformations (fig. 4).

Fig. 4 Polder area within the city – Olszynka district, on the left The Stone Lock – the water gate to the city (foto: L. Nyka)

Emphasizing the role of water, and integrating the public space system with it, is a starting point for the processes of re-defining the city and changing it into well-connected environment. Apart from other advantages, it would allow for encompassing peripheral areas, for a long time neglected. The bastions and their surrounding moats are unique European monuments and acknowledged landscape heritage site. This is the place, where

sophisticated engineering constructions steer water flow and where city canals have their beginning. On the polders a special type of settlement is still visible which is characterized by the relation of buildings to canals. It is neither possible to understand the city without it nor to write a scenario for its further development. Development strategies for these areas are of crucial importance since the polder part of the city will find itself within the new city ring so the investment pressure on it is steadily growing (fig. 5).

Fig. 5 Gdańsk. A connection strategy for the polder area, fortifications and the centre of the city. The concept developed in frames of the Erasmus IP *Bridging the City – Water in Architecture, Urban Spaces and Planning*, Gdańsk 2007 (Source: Bridging the City archives)

There are many such sites that gain deeper understanding in the perspective of the landscape-water relationship. For many years the connectivity between them was hindered by industry, but today their isolation can be broken. One of the results of the Polish-Dutch workshops *Water in the City* which took place in 2006 in Gdańsk was to show how much the spatial and landscape integration of the city is dependent on integration of existing water systems. To link them, apart from connecting of the city, would re-introduce these very special areas. This includes, for example, the city district of Przeróbka, where buildings stretch down as far as the water line, just like in Dutch towns, or Martwa Wisła, the river entering the city, together with quays and in future also houses on water. At present these sites are not included in the city's walking tour routes and are not part of the urban experience. The lack of appropriate relations impoverishes the city and leaves the urban spaces of Gdańsk torn apart.

After many years of neglect the water landscape of Żuławy Wiślane, a unique area of cultural and natural heritage, is being restored. Former water routes leading to Gdańsk and connecting the whole area of the Vistula River delta are being regenerated. Thanks to many hydro-engineering devices and equipment which are situated here, such as flood banks, locks, pump stations and other water and land reclamation equipment, the whole region gains a much wider perspective. The landscape's regeneration is accomplished in natural historical, cultural, economic and social categories at once, which gives a chance for long-term sustainable effects (Gola 2008).

It is distinctive that integrating Gdańsk's water systems and looking for their relations with the landscape is largely stimulated by regional programmes. Thus, planning defects on the scale of the city itself, too focused on isolated areas, are compensated by planning on the regional scale, which in a sense encourages comprehensive thinking. It could be significant that regional programmes are very often European Union supported initiatives which generally require one to exceed the local dimension and favour an integrated approach – including natural, social and cultural issues.

In effect, regional and multiregional projects have a major impact on changing the way of thinking about urban spaces of Gdańsk, linking them with the landscape and first of all with the Vistula delta water route system. Preparations for such programmes as *Infralandscape* and *Floating Architecture* showed the development potential for Gdańsk and Żuławy, resulting from taking advantage of landscape's characteristics, its cultural, topographic, physiological and functional

values. The project *In-Water*, which has been implemented for some years now, reveals Żuławy, Martwa Wisła, Gdańsk, and Motława embankment as unique travel environments and stopovers on the water ways connection Antwerp – Berlin – Gdańsk – Kaliningrad (fig. 11). Instead of planning isolated areas a new logic for creating continuity has appeared.

Redefinition of the city form through the category of the landscape which presents a city as a complex environment and shows it in the perspective of relations with the "outside" is an essential starting point for integrating diversified urban geography. Such an approach allows the city to be shown in terms of its characteristic topography, ecological systems, build forms, as a meeting place of many cultures and supporting them economies. Planning which presents the city in the perspective of enhancing relations with a wider context of the landscape is nowadays necessary and it is the most authentic means of the city's development, a way which brings sustainable and long-term effects.

4. Conclusions

In the case of many cities their relations with features of the broadly understood landscape have been erased. Gdańsk is a good example of how such relations are lost. The exchange of population, the deliberately overlooked subject of Żuławy, many years of a functional approach to water and reducing the city image merely to a built environment, brought serious consequences. The public space which had grown around water and topographic systems that embraced the city for many years were cut off and fragmentized and their meaning are difficult to understand. Redefinitions, the approach in which the built and natural environment are one whole, redefinition of the city by looking for its relations with the landscape, is an opportunity to create a sustainable project of public spaces and to start a process of spatial and cultural integration of the city. Undertaking an attempt to redefine cities by reconstructing their relations with the landscape is very important today. It is a starting point not only for improving existing public spaces but also for determining directions and characteristics of further urban development of cities. Preliminary concepts based on applying this approach in studies and urban project have brought promising results. However, apart from theoretical recognition, the important objective is to introduce these values into formal procedures of urban planning. This is a task and a challenge for the nearest future.

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Transformation of Brownfields and Cultivation of Landscape

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Abstract

Brownfield redevelopment and transformation should consistently be part of a coherent spatial and strategic land management approach. The paper deals with brownfield redevelopment and sustainable revitalisation of landscapes from the point of view of local potentials, as the process of brownfield redevelopment brings several opportunities for local development.

Keywords: brownfield site, landscape, redevelopment

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1. Introduction

Brownfields represent a significant problem as they can have a negative impact on the surrounding area, landscape and community, especially when concentrated within a given locality, increasing the difficulty of achieving effective regeneration and transformation.

Brownfields are sites that:

- have been affected by the former uses of the site and surrounding land,

- are derelict or underused,

- may have real or perceived contamination problems,

- require intervention to bring them back to beneficial use.

Brownfield sites may also have one or more demographic or socio-economic issues in common: an ageing population, poor health status within the population, low employment levels, few amenities and lower than average incomes. With population decline and health, sport, culture security or educational systems restructuring there will be all sorts of institutional, leisure and cultural brownfields entering the real estate market.

Taking into account the complexity of this spatial problem, brownfield redevelopment should consistently be part of a coherent spatial and strategic land management approach, where particularly with respect to the wider issues of economic, environmental and social dimensions of sustainable development. When considering sustainable development objectives, brownfield opportunities and redevelopment responsibilities can be characterised as follows:

Economic: mobilising human resources, using existing sites and infrastructure to modernise and improve the urban fabric. Generate economic growth in urban quarters, increase public and private income.

Environmental: cleaning up, restoring previously used land. Placing brownfields regeneration at the forefront of regeneration strategies and using this programme as a driver for the clean-up of contaminated land. Reducing land consumption and urban sprawl by encouraging sustainable brownfield regeneration projects.

Social and cultural: ensuring the long-term sustainability of brownfields redevelopment by including socio-cultural dimensions. Mobilising communities to ensure representative and equitable sustainable development which may reduce the potential for subsequent decline and re-creation of brownfields, improve the quality of life and preserve local culture and memory of the places.

There are several kinds of brownfields, e.g. post-industrial brownfields, like harbours and ports, mining and landfill areas, railways, chemical works, increasingly also rural brownfields as numerous agricultural fields that can be found in smaller Czech, Slovak, Polish communities as remains from the era of collective farming. In terms of characteristics, some of the most problematic brownfield sites have poor infrastructure, abandoned buildings and have disadvantaged and possibly fragmented local communities.

Table 1 Types of brownfields according to localization (Source: Cabernet project, 2005)

Type of Brownfields	Type of localization	Economic criteria	Environmental criteria	Social criteria	Urban fabric criteria
A Sites	Beneficial location	+++	+++	+++	+++
B Sites	Less Beneficial location	++	+	+	++
C Sites	Non-Commercial location	- -	- -	+	- -
D Sites	Accident situation	0	- - -	- - -	- - -

To characterise different types of the sites in terms of their economic viability and highlighting how status can change, based on variation in location standing, site treatment costs and other economic conditions, can help local policy makers identify strategies that can improve the economic viability and status of sites.

Different types of brownfield sites, based on evaluation of economic, environmental, social and urban fabric criteria can be illustrated by the A-B-C-D conceptual model (based on the CABERNET project, 2005) that identified types of sites according to their economic and location status:

- A Sites – these represent sites that are highly economically viable (e.g. healthy urban fabric, sound social structure, low environmental risk, profitable project)

- B Sites – these sites are characterized as being on the borderline of profitability (e.g. some environmental risk, some social problems, good urban fabric)

- C Sites – are not in a condition where regeneration can be profitable (contaminated area, high costs for the project, social problems and deteriorated urban fabric)

- D Sites - these are sites that are risky to public safety or health and must be saved in order to avoid accidents.

2. Methods

The framework for the transformation process in the old mining area brownfields consists of the process of identification of the problems, their assessment, definition of their hierarchy and their tackling following the wide range of approaches, from different forms of scanning and following individual planning experience to central decision-making, with the particular case of the event-oriented transformation.

Physical environment and landscape were identified as the subjects of the decline, as the matter and potential, and in some cases as the potential for the rehabilitation of the former mining areas. Key factor is not only the physical structural environment of the former mining area itself, but the character of the landscape as well. The experience of particular cultural aspects, as mining museums or hosting special exhibitions, shows the role of events as the catalyst for the redevelopment processes.

Whilst much of brownfield land is being brought back into beneficial use solely by the market (i.e. category A sites), in other cases, vacant and derelict brownfield land persists (i.e. category B and C-D sites). These persistent sites can often be concentrated in areas of social deprivation, and so policies to deal with the backlog of vacant and derelict brownfield land is clearly a crucial component of urban regeneration – and the challenge is to accelerate the pace at which the market is able absorb brownfield land.

If the perceived value of a site is less than anticipated costs, the site will remain vacant or under–used for the foreseeable future (category B and C-D sites). This can only change if there is some means of creating a surplus of value over cost. Local policy initiatives can variously seek to raise market values or to reduce anticipated costs or combine both approaches.

Only modest adjustments to perceived costs and values are required for the market to redevelop category B. Therefore, a proportion of brownfield sites in category B can be taken forward by the private sector if the public sector is able to assist with the costs, risk division or other support, rather than requiring leading investment to be made by public agencies. In contrast, the market is highly unlikely to be able to respond with category C-D sites, implying a more leading role for the public agencies (whether at national, regional or municipal level).

C-D sites represent a significant problem as they can have a negative impact on the surrounding area and community, especially when concentrated within a given locality, increasing the difficulty of achieving effective urban regeneration. C-D sites generally require substantial pre-investment from the public sector before they can be handed over to private developers or redeveloped using public/private partnership approaches or put to soft end uses. These sites with their high reclamation/redevelopment costs and low market values, constitutes a specific challenge for many cities and regions. The problems associated with these sites particularly relate to:

- Market forces are not able to drive redevelopment of these sites.

- Future uses are often limited to soft-end uses.

- Reuse is only considered relevant if they are related to long-term options.

- Many major public programmes focus on redevelopment to stimulate direct economic growth.

One possible option or basic solution for these sites from the landscaping point of view are soft-end uses, whether permanently (i.e. with a definitive loss of development opportunities), or as an interim use (i.e.

affording the sites some form of reserve status). In response to this issue, at the beginning of 1990s, French regions of Lorrain and Nord-Pas de Calais have concentrated public funding on C-D sites by bringing them into a reserve status, focusing on projects that draw in local organisations to create new "green amenities", providing benefits both for people and nature.

When examining the "reserve status" approach, no final or binding decision is made regarding the future use of a site. It is perceived that the transition of a site from abandoned or derelict status to a reserve status can be realized fairly quickly, especially for sites already publicly-owned, and this approach can also be a cost-effective strategy. There is, therefore, a need to explore specific planning and technical approaches for transferring brownfields from an unutilized form to a reserve status. Options of this nature can be developed and implemented by affected regions and municipalities as part of their spatial planning responsibilities.

The C-D sites which could be definitively excluded from further developments for technical reasons, market conditions or planning goals could be reclaimed for soft end-uses as a way of managing the potential social costs of doing nothing. However, most of these sites will require long-term maintenance. Therefore, any short-term treatment will need to be linked to a maintenance strategy that will be managed by the public sector.

Sites with a future prospect of redevelopment could be transferred into reserve status. A number of initial planning, technical and financial concepts have been tested in different European regions. The main goal of any reserve status redevelopment should be the limitation of treatment costs in the first step of remediation, demolition and interim landscaping.

Anyway, a significant proportion of brownfield land – D sites, specifically in areas with low market values, is not commercially viable to bring back into beneficial use. These sites can be risky to public safety or health. Without some form of public intervention these sites will remain unused, and potentially dangerous for the foreseeable future. The consequence is a blight on the surrounding areas and communities, and the loss of an opportunity to renew the area and the community in a sustainable manner.

Without some form of public intervention these sites will remain unused, and potentially dangerous for the foreseeable future. The consequence is a blight on the surrounding areas and communities, and the loss of an opportunity to revitalise the area and the community in a sustainable manner.

3. Results

A possible option or basic solution for transformation of these brownfields is softend use that means bringing the sites into a reserve status, cultivated with greenery. This approach is possible particularly in the old mining areas where there are not many opportunities for business. In such situation it is important to focus on projects that draw in local organisations to create new "green amenities", providing benefits both for people and for landscape.

The issue of brownfield redevelopment is a long-term issue. Only well-educated professionals can continue in the process with maximal effectiveness. Involvement of universities in dealing with theses issues within their curricula is limited**.** Therefore the educational project BRIBAST and its results are based on development of study materials and preparation of professionals on various aspects of brownfield regeneration processes.

The Leonardo da Vinci II project CZ/08/LLP-LdV/TOI/134005 "Life-Long Educational Project on Brownfield Redevelopment in Baltic States", acronym: BRIBAST that has started in October 2008 under the coordination of VSB Ostrava, CZ and will run for two years, is based on transfer of experience and know-how on brownfield redevelopment. It brings the project participants a possibility to exchange the information and knowledge on the issue of

brownfield redevelopment. Transfer of experience will occur both through the common work on prepared project sites and through participation in meetings and seminars in Latvia and Lithuania. The BRIBAST project aims at increasing the awareness of brownfields redevelopment issue and transfer of the acquired knowledge to countries where this problem has not yet been tackled too much.

4. Conclusion

In the context of understanding the limited possibilities for safeguarding the sustainability in the mankind development, the role of space/land as one of the limited resources has increased. The greenfields outside the built area of the municipality and even as well inside the urban structure are no more unambiguously interpreted as the vacant or underused land, as they used to play important role in the ecological and psychological quality of urban environment and urban life. The sustainable development strategies via orientation towards intensification of the functional exploitation of the plots inside the built areas of the municipalities follow the goal to prevent the urban sprawl. In general, there is still low awareness about what brownfield regeneration really means and why the greenfield developments are in the long term effects in the contradiction not only with the environmental but also with the economic dimension of sustainability.

Successful regeneration of brownfields is a complex endeavour, requiring the joint effort of different stakeholders. Although the local level is crucial for achieving the coordinated approach, it is also vital to cooperate with the state governmental bodies, regional bodies and neighbouring municipalities. If one of the municipalities in the region sets stringent regulations against greenfield developments, but the neighbouring municipalities allow the development on their greenfield sites, it will be really difficult to get developers to use brownfield sites. Regional cooperation and the pro-active policy of the state supporting the brownfield regeneration in the combination with the planning initiative at the local level seem to be preconditions for safeguarding the sustainable urban development, including the regeneration of brownfields.

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Urbanism and environmental protection: the case of National Park Mavrovo, Macedonia

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Abstract

Industrialization in the second half of the 20th century had a dramatic impact upon population distribution in the world frame, as well as in Macedonia. Attractive life opportunities enhance the process of population migration, from rural areas into big industrial centers. Depopulation process was often used by the governments for proclaiming nature protection mainly in large mountain areas. In the same time as opposite process to depopulation, the process of urbanization of some protected areas started. The urbanization process typically occurs in famous scenic spots and beautiful landscapes in the protected areas. The search by local governments for short-term economic benefits and administrative gaps form the main driving force for over-urbanization. Over-urbanization has considerable impacts on the aesthetic qualities of many mountain tourist resorts and sometime destroys the natural state of landscapes and ecosystems.
The present article follows the conflict between regional development and environmental protection, in the area that surrounds Mavrovo reservoir. Due to the fact that area around Mavrovo reservoir represents the most urbanized part of whole National Park Mavrovo, the impact of urbanization on nature resources in this area is most visible. In this paper an urbanization of the area with its strategic documents, legislative framework of environmental protection and created conflicts are presented.

Key words: National Park Mavrovo; Mavrovo reservoir; urbanization; natural resources; environmental protection

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1. Introduction

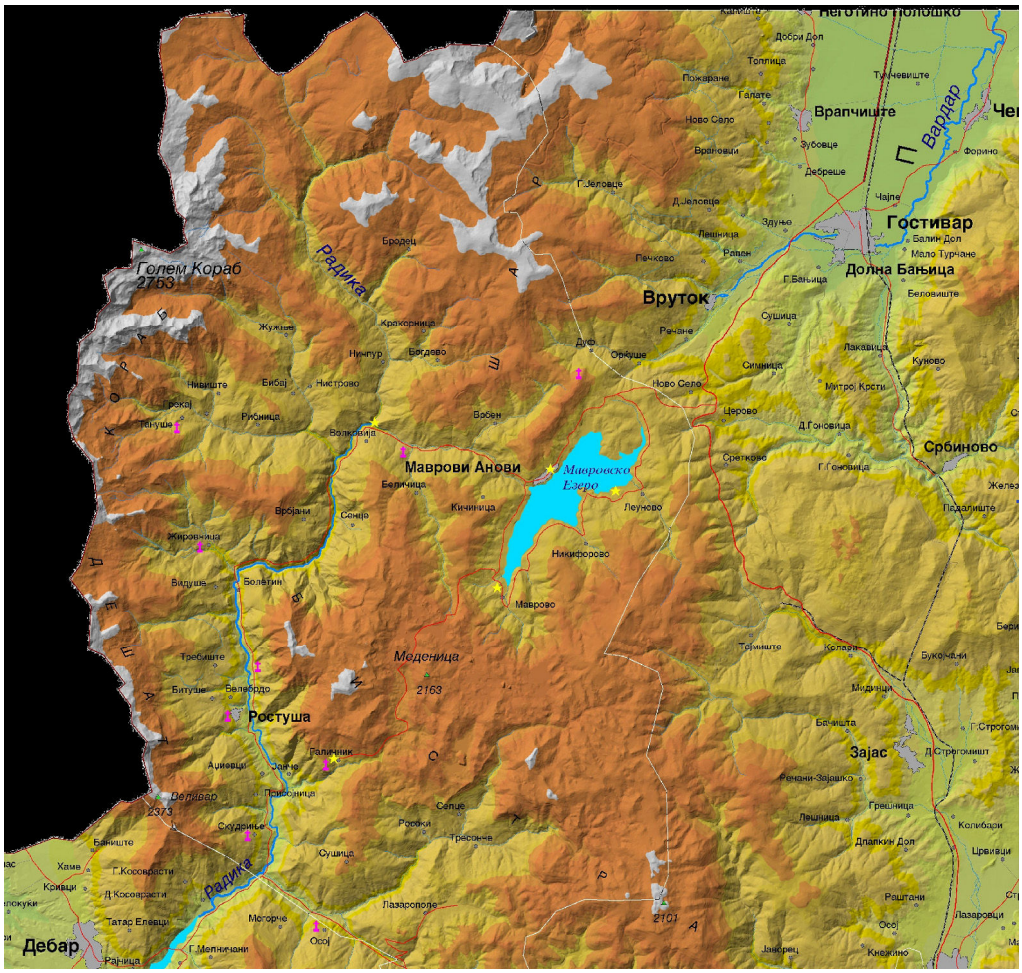
Previously an area of the National Park Mavrovo (later NPM) stretch on a fire and technical wood sale has been the main source of finance. Tourism seems to be an opportunity to diversify of Park income and to become an alternative to out-migration. Nowadays the settlement system around Mavrovo reservoir impacts on natural resources through waste water, solid waste, wood demand and illegal land development.

2. Characteristic of the case study area

Located in southwestern parts of Balkans, the NPM was established in 1949 with a special Law No. 10/49, calling for the "protection of exceptional natural beauty as well as the scientifically and historically important forest around Mavrovo valley". Mavrovo reservoir is located within the borders of NPM and represents the biggest reservoir in Macedonia completed in 1953, with water surface area of 13.3 sq. km. Nowadays NPM presents the biggest and most populated national park in Macedonia with territory of 730, 8 sq. km and 8,612 inhabitants (according the 2002 Population Census).

The surrounding of Mavrovo reservoir is spread over the area of 20 sq. kilometers, and host almost the all of the tourist infrastructure in NPM with its many hotels and around 2,000 cottages built all over the area. The population of this area counts 350 (2002 Population Census) permanent inhabitants located in four villages on the shores of Mavrovo reservoir: Mavrovi Anovi, Mavrovo, Nikiforovo and Leunovo. The surrounding slopes are covered with dense oak, beech and fir forests.

Fig. 1 Location of the National Park Mavrovo and Mavrovo reservoir (Source: Tiepolo M., 2007)



3. Results

3.1 Urbanization

With the construction of Mavrovo reservoir in 1953, the surrounding area gained big potential for tourist development. Several facts contributed for gaining the development potential, like:

- Close distance to several cities (25 km to Gostivar, 50 km to Tetovo and 90 km to Skopje)

- Connection to regional road from Skopje to Ochrid

- Preserved forest and nature resources

- Mavrovo reservoir with its multifunctional dimension

- Possibility for development of winter tourism

Fig. 2 Mavrovo reservoir

For the purpose of controlling this development processes, several plans for further urbanization had been developed. The first development study was conducted by the AKAU architectural studio from Paris in 1976 (Zan Iten AKAU, 1976). According to this study, complete ski center, including whole tourist infrastructure, was planned. The study also included an action plan for its realization. The development study influenced all the later planning documents for the area and in the same time it gave a solid basis for its further development. This study was followed by the first Spatial Plan for NPM (Institute for Urbanism, 1988). As a result of analyses of natural resources, spatial distribution of settlements, infrastructure and soc-economic activities, Spatial Plan introduced zoning in the park area. The area surrounding Mavrovo reservoir was classified as Tourist-Recreational zone. It meant that this zone possess special natural features and beauties that are used for tourism and recreation. In this zone, different objects with recreational function can be built only with approval given by the Park Authorities (article 15 from the law on protection of natural parks).

According to the Law n. 39/2004, "*for implementation of spatial plan in the Republic of Macedonia"*, all four villages adopted following planning tools:

- General Urban Plan (GUP). GUP has a life span of 10 years and is essentially a land use plan. GUP does not cover the whole municipal territory.

- Urban Plan for Village (UPV). UPV has a life span of 10 years (art. 43). It has to specify (art. 13): built up and to be developed areas, building regulations, building plots, equipments and infrastructure, protection measures for constructions of historical importance.

A new Spatial and Management Plan of NPM, is in preparations. According to its working paper, it will be focused on three relevant topics in National Park planning and management (Tiepolo, 2007):

- settlement system and its impact on natural resources,

- National Park and municipal planning consistency;

- Revitalization of old settlements and vernacular architecture heritage, for the purpose of lowering the tourist pressure in the area of Mavrovo reservoir.

The present situation considering the urbanization can be illustrated within several facts:

- Mavrovo is the most famous winter resort in the country and a popular summer and week-end spot. Hotel overnight stay capacity is estimated at 135,000 persons/per year. The ski center has eight ski tracks, eleven ski lifts and three chair lifts with capacity of 11,000 persons per hour (Ministry of Economy of Macedonia, 2009)

- Four villages around the Mavrovo reservoir host all the tourist spots of the NPM, while the rest of the park is under developed

- Almost all the available building plots seem to have been developed. According to local sources, around 120 building plots have been sold last year.

3.2 Environmental protection

The Mavrovo reservoir is surrounded by exceptional and thick forest belt. This belt mostly is created by beech forests from the west, south and east side of the lake. Only on the north side the biggest part is created by mixed beech-fir forests and small areas of fir forest (Krstic, 1968). Additionally in the closer surrounding of this Mavrovo reservoir there are four scientific research areas with total territory of 90 ha (Institute for Urbanism, 1988). These scientific research areas are used as open laboratories for foresters and other scientists. Thanks to the limestone basis, the area is also rich in caves. One of the most incredible caverns called "Margo" can be found near the village of Mavrovo and smaller one named Mavrovitsa, located further north.

Basic issues related to environmental protection are regulated under the 1996 *Law on the Conservation and Promotion of the Environment and Nature*. The original text has been modified and supplemented (Revision: 51/00; modification and supplementation: 96/00 and 45/02).

Issues relating to protected areas are regulated by laws as well as plans, studies and strategies:

- *Law on the Protection of Natural Rarities* (41/73, with its modifications and supplements, 42/76, 10/90 and 62/93);

- *Law on the Protection of National Parks* (33/80, with its modifications and supplements, 10/90 and 62/93);

- *Law on Declaring a Portion of the Forested Areas around Mavrovo Lake as a National Park* (10/49, with its modifications and supplements, 23/52 and 16/65)

- Country Study for Biodiversity (Ministry of Environment and Physical Planning, 2003)

- The National Biodiversity Strategy and Action Plan (Ministry of Environment and Physical Planning, 2004)

- Second National Environmental Action Plan (Ministry of Environment and Physical Planning, 2005)

3.3 Conflicts of interests

Conflicts between urbanization and environmental protection started at the same time as the construction of Mavrovo reservoir. Namely, the construction of Mavrovo reservoir caused two species, *Gentiana pneumonanthe* and *Lysimachia thyrsiflora*, which originated on the Mavrovsko Pole Plain, to become extinct (Ministry of Environment and Physical Planning, 2003). Constructed on limestone rocks Mavrovo reservoir, immediately take effect on karst process in the area in a way that some abysses appear in the cracks on the bottom with following water loses (Dragićević, Milevski, 2009). Further more, for the need of hydroelectric plant several Alpine rivers were capped, leaving their lower beds dry during most of the year (Georgiev, 2003). The existence of a large water body in the middle of the park, seriously affected the climate of the region.

Second phase of the conflict began with the construction of the ski resort and surrounding settlements. The process of forest destruction started, due to construction activities such as buildings, expansion of tourist settlements, roads, ski-lifts, transmission lines, etc. Construction around mountain peaks often causes degradation of some plant communities such is the case with the communities of the alliance *Edriantho-Seslerion* on Bistra mountain (Ginovska, 2007).

One of the most serious and most evident environmental issues affecting Mavrovo reservoir area is waste disposal problem. In the regions with tourist activities,

besides the waste water coming from the local population, the waste water pollution is increased because of the sewage coming from the hotels, recreation and other facilities used by tourists. Namely some lodging seems to evacuate waste water directly into creeks or dispersing it into the soil (Tiepolo, 2007). The popular tourist destinations around Mavrovo reservoir and skiing resort are covered with liter.

4. Conclusions

The threat of the loss, modification and fragmentation of habitats in protected areas is largely attributable to increasing developmental pressures from the illegal (and legal) spread of recreational facilities and holiday homes. This is further intensified by the increasing demand for bulk infrastructure such as roads, electricity, bulk water supply and waste management to service this growth. Everybody is familiar with the sustainable concept of nature conservation to create opportunities for economic growth for local communities in protected areas. In the case of human greed and administrative gaps, the line between sustainable development and over urbanization is small. This can lead to land degradation, loss of natural habitats and deterioration of the scenery. The primary protection measure in such situations would be a plan to control the urbanization of tourist settlements by combining Management Plan and business plan.

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Landscape transformation as a multiple challenge for landscape ecology (Some theoretical-methodological remarks)

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Abstract

All activities landscape transformation not excluding, for its effective application need their particular scientific background. The scientific background of landscape transformation, from landscape ecological point of view is represents first of all by landscape ecology and urban ecology. Landscape ecology, as the ecological scientific subdiscipline on the intersection of geographical-spatial and ecological-functional sciences has the great potential ability to apply the results of the basic landscape ecological research in practice and in our case to solve the problems of landscape transformation. Considering the great diversity of the European landscapes with various natural and socio-economic reasons and the course of their transformation the obtained landscape-ecological results have simultaneously a universal nature of a considerable validity. The multiple challenge of landscape ecology for landscape transformation research depends on the inner structure of their, it means a certain demand to for identification of causes, course and consequences of the landscape transformation processes, as well as on landscape ecological infrastructure or facility which presents a certain scientific offer to solve this problem. The socio-natural landscape transformation can be understood as the complex scientific research topic too. Its study presents currently a great challenge for many sciences, not excluding landscape ecology. In this context the burning question is to what extent landscape ecology is prepared as the science with its theoretical basis, methodological infrastructure, quantitative - qualitative nature of empirical knowledge, applied experiences and educational ability, and successful to solve issues of the landscape transformation from the landscape ecology point of view. This relationship between landscape ecology supply and landscape transformation demand should be presented by matrices. It is important to outline a more effective mechanism of modification, implementation and argumentation of obtained results by the landscape ecological research about changed properties of ecosystems and its processes at the landscape scale for the needs of landscape transformation and for the decision makers and stakeholders.

Key words: landscape ecology; landscape transformation; spatial and temporal dimension of landscape; interdisciplinary and transdisciplinary approaches; metascientific principle

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1. The landscape transformation as the current global phenomenon

Transformation of landscape which presents an open hybrid natural-anthropogenic system with its dimensions and attributes must be understood above all in its time-spatial context. Time and space, as a matter of fact, represent the two most important universal dimensions, in which the natural and human forces are jointly formed and permanently recreate or change natural landscape with its structure, function, physiognomy and genius loci to the cultural one and imprint its unique nature. Cultural landscape can be then understood as a material reality, which is the result of permanent action of man and society upon natural landscape and social construction, which in turn is the reflection this action in the human society itself. Meanwhile, these two sides of cultural landscape mutually influence and enrich each other in space and time. The typical feature of landscape changes in time and space is that they are realised permanently, in parallel and complementary way (Žigrai, 2000, 2006a).

2. The landscape transformation as the scientific research topic

The socio-natural landscape transformation can be understood as the complex scientific research topic too. Its study presents currently a great challenge for many sciences, not excluding landscape ecology. In this context the burning question is to what extent landscape ecology is prepared as the science with its theoretical basis, methodological infrastructure and quantitative - qualitative nature of empirical knowledge, applied experiences and educational ability, successful to solve issues of the landscape transformation from the landscape ecology point of view.

Landscape ecology, as the ecological scientific subdiscipline on the intersection of geographical-spatial and ecological-functional sciences has the great potential ability to apply the results of the basic landscape ecological research in practice and in our case to solve the problems of landscape transformation. They are two ways how to apply the results of landscape ecological research to solve the problems of landscape transformation. Firstly, the inductive way (the changed landscape ecological properties as results of man's impact on the transformed landscape) and secondly, the deductive way (the changed landscape ecological properties as the indicators for landscape transformation) are presented. Considering the great diversity of European landscapes with various natural and socio-economic reasons and the course of their transformation the obtained landscape-ecological results have simultaneously a universal nature of a considerable validity.

3. Some notes to the processes influencing the proper transformation of landscape

As said above, formation and transformation of landscape takes place in space and time. Man or human society and its activities are the initiators of the proper change of landscape. Through the social processes such as innovation, diffusion, migration, adaptation and the like single impulses spread in landscape and act on single landscape elements of natural, anthropogenic or mixed origin. Meanwhile certain secondary or even tertiary landscape structures originate, which are typical for a particular human society and landscape (see more in Žigrai, 1996a). Material and spiritual carrier of these landscape structures are the above mentioned anthropocentric perceived forms and ways of land use. In the framework of research of transformation of landscape it is then possible

to determine based on ratio and intensity of single land use forms the corresponding coefficients of originality and exploitation of landscape.

4. Some notes to significance and mechanism of spatial and temporal dimension of landscape for its transformation

Time and space are two inseparable and mutually complementing media in which transformation of landscape is taking place. It follows that one of most important tasks to understand the nature of landscape is research of its transformation mechanism in time-spatial context. Properties of time e.g. time accumulation potential, continuity and the inertia, and spatial dimension as situation, distance, shape, of transformation of landscape enable the action of the proper mechanism of the time-conditioned transformation of landscape. (Žigrai, 2006a). The spatial change of urban landscape take place in the course of a specific time ($t_1,t_2,...,t_m$). In this case we talk about the time conditioned transformation of urban landscape. The temporal changes are simultaneously linked to the single points of space ($p_1,p_2,...,p_n$). Then we mean spatially conditioned transformation of landscape. From the methodological point of view it is more appropriate to observe these changes of landscape first separately i.e. at the temporal and spatial analytical levels and then in their time-spatial synthesis.

All landscape elements created by land use forms with their temporal and spatial co-ordinates, are fixed within the intersection of time and space. Certain set of these landscape elements creates the corresponding time-spatial landscape layers. Every landscape layer has simultaneously certain composition of these elements or mutually overlapping landscape layers, which were formed or influenced by single variable landscape-cultural dimensions as socio-cultural, economic, technical and ecological-environmental. It means that every landscape is characterised by specific quantitative-qualitative structure of single landscape elements, layers and dimensions set in time-spatial context (Fig. 1).

Fig. 1 Scheme of time-spatial landcape layers (Source: F. Žigrai, 2006a)

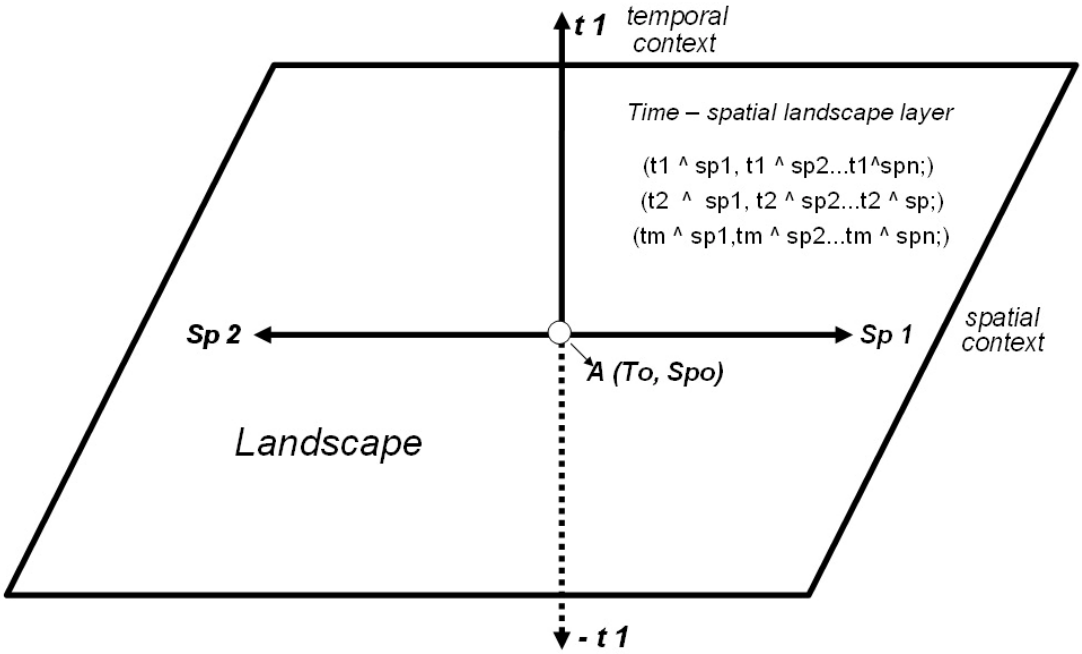
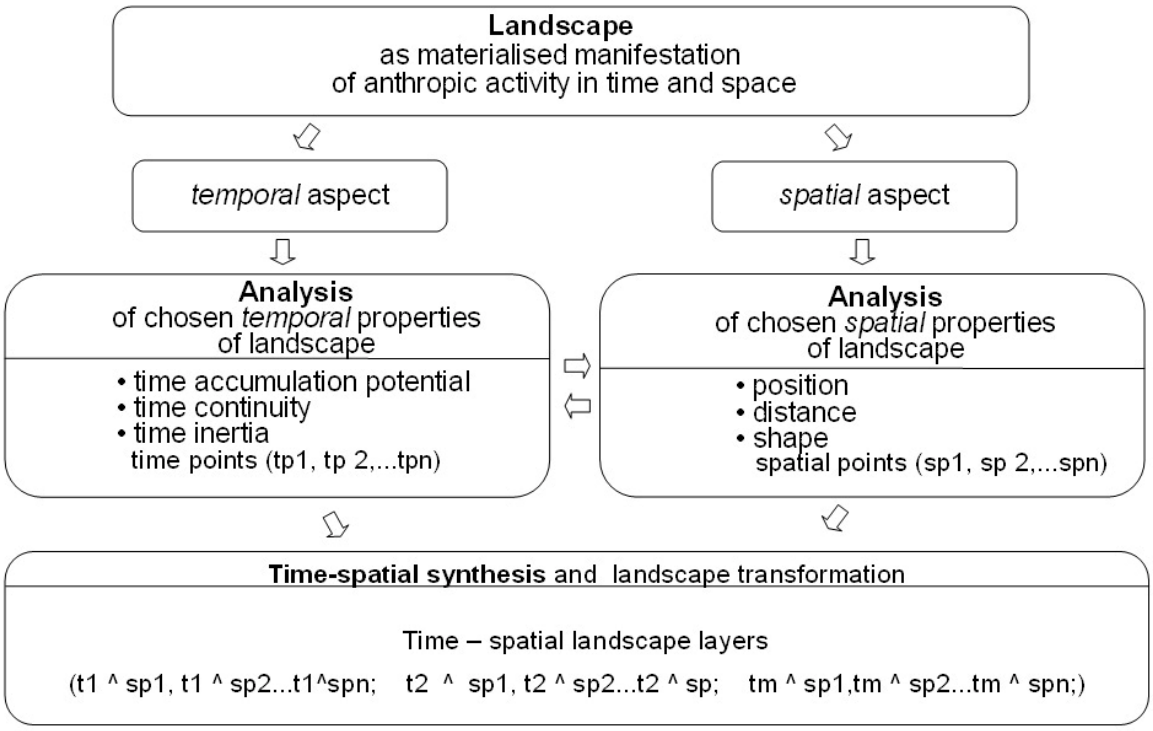


Fig. 2 Scheme of time-spatial landscape transformation (Source: F. Žigrai 2000)



Combination of temporal and spatial properties leads to clearer and deeper knowledge of the varied socio-economic and natural circumstances of such a complicated phenomenon, as transformation of landscape undoubtedly is. Time-spatial synthesis of landscape transformation are belongs among the most demanding theoretical-methodical tasks of landscape ecology and geography that still call for research (Fig. 2) (Žigrai, 2000).

Successful study and comprehension of transformation of particular landscape requires support of theoretical basis and methodological instruments of analysis, but above all of synthesis of mechanism of action of the time-spatial dimension upon the development and changes of landscape. This is the area where landscape ecology can apply their interdisciplinary holistic thinking, while emphasising their professional landscape ecological identity.

The other possible geographical approaches to study mechanism of spatial and temporal dimension of landscape for its transformation and simultaneously connecting the temporal and spatial properties in relation to transformation of landscape is the study of forms and ways of land use „as material and spiritual carriers of these elements and layers“.

Land use then can be understood as a particular manifestation of human activity and space and time, which immanently accumulates certain historic, economic, social and cultural potential and represents certain point of intersection between the natural assets of territory, technical possibilities and man's knowledge (Žigrai, 2004). The present landscape is then result of mutual action of abiotic, biotic and socio-economic spheres. Land use or landscape use creates a kind of bridge between the individual spheres, because it is the reflection and result of their actions. (Žigrai, Drgoňa 1995).

5. The multiple challenge of landscape ecology for landscape transformation research

The multiple challenge of landscape ecology for landscape transformation research depends on the inner structure of landscape transformation, it means a certain demand for identification of causes, course and consequences of the transformation process, e.g. spatial landscape transformation ,time landscape transformation, integrated approaches to the transformation processes, analysis of driving forces and transformation processes, monitoring of the transformation processes and strategies for sustainable development of landscape, as well as on landscape-ecological infrastructure or facility on the theoretic-metascientific, methodological, empiric, applied and educational level, which presents a certain scientific offer to solve this problem (Fig. 3).

The multiple challenge of landscape ecology for landscape transformation research lies on interdisciplinary, interdisciplinary and transdisciplinary or metascientific levels (Fig. 4).

5.1 The challenge of landscape ecology for landscape transformation research depending on the conception of landscape ecology

In a narrower sense, if the landscape ecology is orientated first of all on the basic research of transformation of natural processes, the flow of organism, energy and mass of landscape ecosystems and landscape structure. It is necessary to reply the question to what extent causes the changes of energy and biomass flow, biomass production and exchange of other information in the ecosystems at the landscape scale the nature of landscape transformation. This answer is important as feed back information for the landscape transformation research, because the landscape structure is affected by changed properties and stability of ecosystems.

Fig. 3 Scheme of relationship between landscape transformation and multiple challange for landscape ecology (Source: F. Žigrai 2006b)

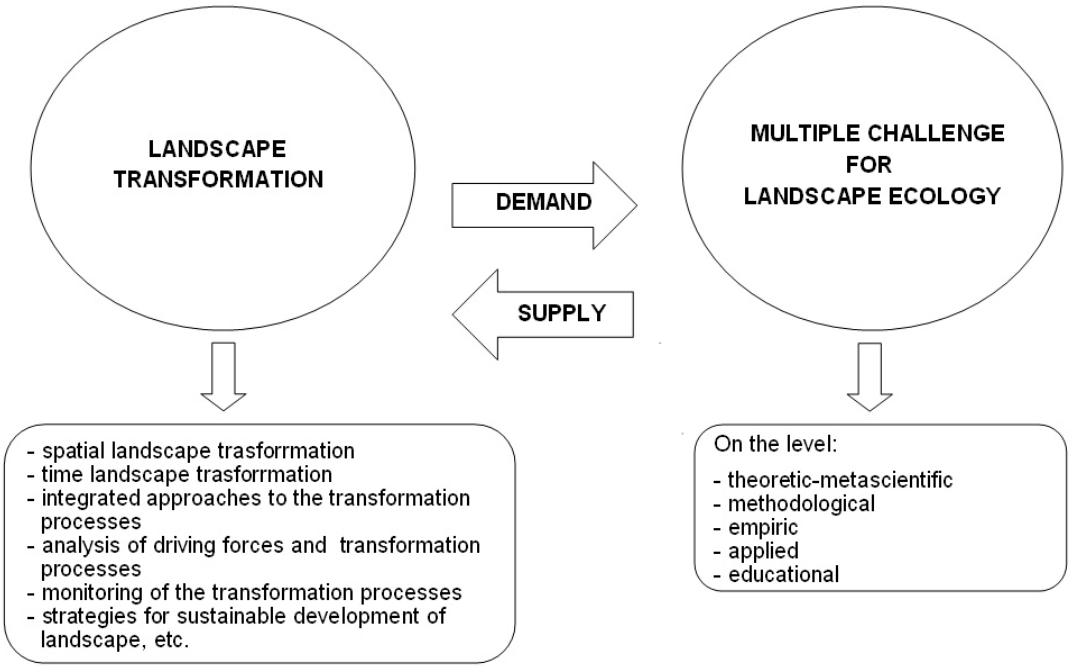
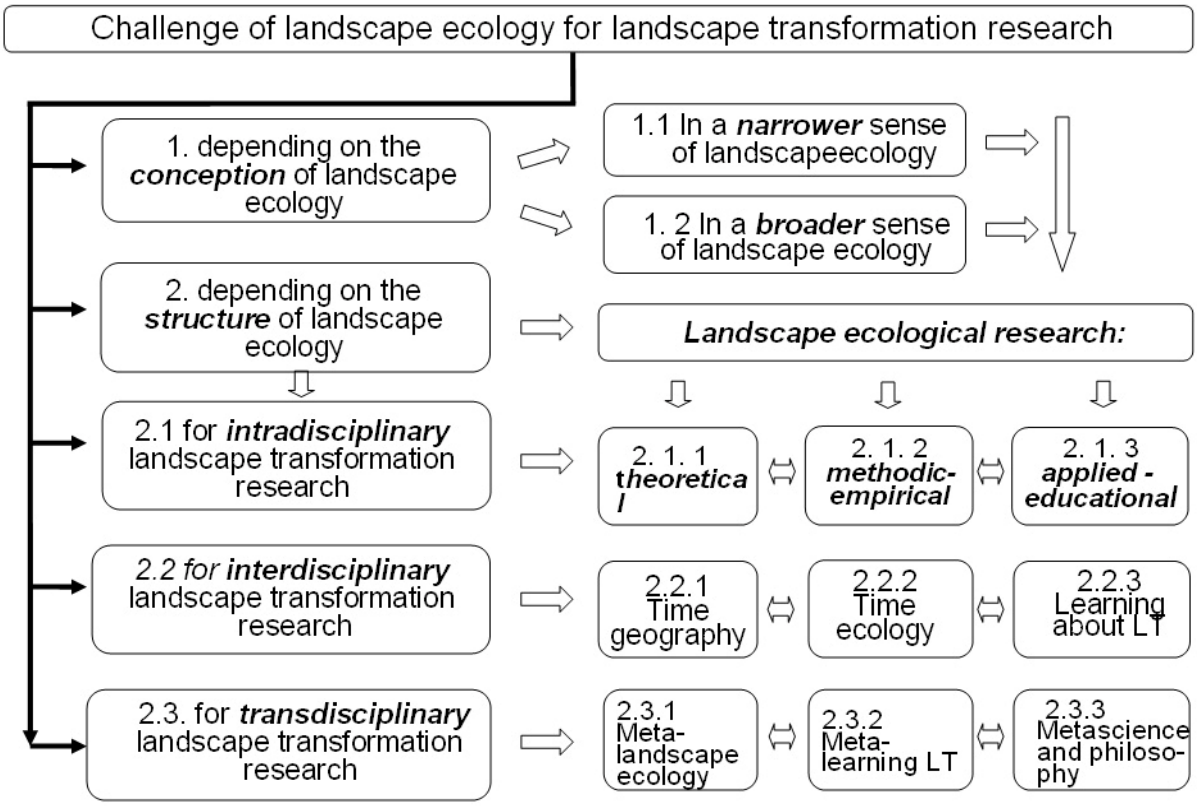


Fig. 4 Scheme of structure of landscape transformation related landscape ecological research (Source: F. Žigrai 2006b)



In the broader sense, if the landscape ecology is orientated first of all on the applied research of the relationship between nature and man in the contextual comprehension of ecological-environmental problems of landscape transformation. One of the conditions of a more effective study of landscape transformation from landscape ecology point of view is to pay more attention to the relationships between the basic and applied landscape-ecological research to support the qualitative-quantitative balance of the two-way information flow about the landscape transformation (Žigrai, 1996b). The vertical information flow of landscape-ecological data necessary to solve the landscape transformation is realized on metascientific, theoretical, methodical, empirical, applied and educational level.

5.2 The challenge of landscape ecology for landscape transformation research depending on the structure of landscape ecology

5.2.1 The challenge of landscape ecology for intradisciplinary landscape transformation research

In the framework of *theoretical* landscape ecological research it is important to generalize the results of the basic landscape ecological research of the changed landscape ecosystems and to formulate certain regularities of these changes. They should be the new part of some main theoretical principles of landscape ecology e.g. principle of landscape changes and principle of landscape stability principle of biological diversity, principle of ecological stability and principle of sustainable development.

These enriched principles can be very valuable theoretical contribution to the overall landscape transformation research. One of most important tasks of the theoretical

landscape ecology for the needs of landscape transformation research is working out of the possibility to bridge various spatial scales with various changes of ecological phenomena, properties and information. Very important is stronger collaboration and exchange of scientific information first of all among the static, dynamic and restoration landscape ecology too. More attention should be paid to working out of time aspects and especially to the study of the effect of time properties like time accumulation potential, time continuity and time inertia. In this way it is easier to understand the changes of landscape ecological processes and phenomena as part of landscape transformation (Žigrai, 2000).

In the framework *of methodical-empirical* landscape ecological research it is necessary to work out the integrated landscape ecological research of landscape transformation. It consists of integration of key landscape ecological subdisciplines like static, dynamic and restoration landscape ecology and other cross-cutting, integrating sciences such as the learning about land use, as well as integration of merologic, reduction, holistic and synthetic methodical approaches and procedures. The adequate integrated approach is desirable, because the key problem of landscape transformation research is comprehension and encompassing of its complexity (Ružička et al., 1983, Žigrai, Drgoňa, 1995, Žigrai, 2001a, 2002b).

In the framework of *applied* landscape ecological research is important to outline a more effective mechanism of transformation, implementation and argumentation of obtained results by the landscape-ecological research about changed properties of ecosystems and its processes at the landscape scale for the needs of landscape transformation, landscape planning, landscape management and for the decision makers and stakeholders. This mechanism is based on mutual influence between landscape ecological research and landscape development planning. The results of the landscape-ecological research form scientific background of landscape development planning and management and enrich its theoretical and methodological basis and vice versa the results of landscape development planning form applied background of landscape-ecological research and enrich its theoretical and methodological basis.

In the framework of *educational* landscape ecological research it is important to outline the educational bridging between subjects of landscape ecology and learning about transformation landscape at the university level, as well as their methodical approaches, which can help to develop student's ability of spatial and ecological differentiation, combination, interpretation and evaluation of analytical and synthetic landscape-ecological data necessary for the landscape transformation research. Very important is to support their ability of co-ordination and co-operation necessary for the successful landscape management of teams involved in the landscape transformation research, as well as to support their ability of argumentation and negotiation necessary for efficient implementation of the landscape-ecological data in the landscape transformation research.

5.2.2 The challenge of landscape ecology for interdisciplinary landscape transformation research

In this interdisciplinary way is necessary to intensify the collaboration of landscape ecology with other sciences dealing with such a complex research topic as the landscape transformation, e.g. geography and environmental sciences. This circumstance requires laying the foundations for the science about landscape transformation, which lies in the intersection of ecological, social and economic sciences. This learning should be the guarantee of more compact and problem orientated research of landscape transformation. In connection with this statement emerges the necessity to define the position of landscape ecology for the science involved with landscape transformation.

5.2.3 The challenge of landscape ecology for transdisciplinary landscape transformation research

On this transdisciplinary level is required to intensify the collaboration between meta-landscape ecology (the main research topic is landscape ecology as a science), philosophy and metascience. It is important for example to outline landscape ecological paradigms as a spiritual upholder for the future development of landscape ecology and especially of the dynamic and restoration landscape ecology as the closest scientific partners to the learning about landscape transformation (Žigrai, 2002a). Another important scientific task of the transdisciplinary direction of the challenge of landscape ecology is the definition of its identity and authenticity, which is done by the main landscape ecological metascientific principle based on the inseparability of the geographical spaciousness at the landscape scale and ecological processes, as well as the delimitation of its research field face to face the working field of the learning about landscape transformation (Žigrai, 2001b, 2003).

6. Conclusion

The socio-natural landscape transformation can be understood as the complex scientific research topic too. Its study presents currently a great challenge for many sciences, not excluding landscape ecology. In this context the burning question is to what extent landscape ecology is prepared as the science with its theoretical basis, methodological infrastructure and quantitative - qualitative nature of empirical knowledge, applied experiences and educational ability, successful to solve issues of the landscape transformation from the landscape ecology point of view. Landscape ecology, as the ecological scientific subdiscipline on the intersection of geographical-spatial and ecological-functional sciences has the great potential ability to apply the results of the basic landscape ecological research in practice and in our case to solve the problems of landscape transformation. (Žigrai, 2006b). Considering the great diversity of European landscapes with various natural and socio-economic reasons and the course of their transformation the obtained landscape-ecological results have simultaneously a universal nature of a considerable validity. The multiple challenge of landscape ecology for landscape transformation research depends on the inner structure of landscape transformation. It means a certain demand to for identification of causes, course and consequences of the transformation process, as well as on landscape-ecological infrastructure or facility which presents a certain scientific offer to solve this problem**.** This relationship between landscape ecology supply and landscape transformation demand will be illustrated during the oral presentation by matrices. It is important to outline a more effective mechanism of modification, implementation and argumentation of obtained results by the landscape-ecological research about changed properties of ecosystems and its processes at the landscape scale for the needs of landscape transformation, landscape planning and management, for decision makers and all stakeholders.

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Impact of urbanization on structure and function of revers

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Abstract

Urbanization increases the loading of water and nutrients while simplifying receiving stream channels, turning the urban river from a functioning ecosystem to an efficient gutter. Engineers and public works managers have historically sought to maintain channels "unchanging in shape, dimensions and pattern". While the majority of urban ecological research to date has documented that both biotic communities and biogeochemical function are impaired in urban streams, other recent studies suggest that some simple management strategies can improve these conditions. The article deals with impacts of urbanization on structure and function of rivers in a theoretical level as a basis for future assessment of the Nile River. In the article stream hydrology, stream geomorphology and stream/riparian ecology are discussed.

Key words: rivers; urbanization; landscape; management

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1. Introduction

Over the next 30 years, virtually all of the world's human population growth is expected to occur in urban areas with over 60% of the people in urban areas by 2030. Urban areas are variously defined based on population density. The UNPD (2003) predicts that urban areas will experience growth rates nearly double the worldwide population growth rate because of rural to urban migration and the transformation of rural areas to cities. Already, 75% of the people in the developed world live in or near cities, yet even in these areas, substantial growth in population size is expected (UNPD, 2003). For example, in both Europe and North America, the percent of the population living in urban areas should reach 85% by 2030 (UNPD, 2003). The increase of urban populations is expected to be even more rapid throughout the developing world (UNPD, 2003). The ecological impacts of this growth and population re-distribution are profound. The loss of forests and agricultural lands to urbanization influences local climate and air quality, alters energy and nutrient flows and leads to decreased native biodiversity. As running waters occupy the lowest-lying areas on the landscape, they integrate the effects of

land-use change and thus are very sensitive to urbanization. As land is cleared of vegetation and replaced with a large amount of impervious surface such as asphalt, concrete and rooftops, the amount of run-off entering streams increases; the hydrology and geomorphology of receiving streams are fundamentally altered; and the consequences for ecological changes can be severe and complex. Urbanization simultaneously increases the loading of water and nutrients while simplifying receiving stream channels, turning the urban river from a functioning ecosystem to an efficient gutter (Bernhardt, Palmer, 2007). In this paper we summarize the impacts of urbanization on streams.

2. Urbanization and stream hydrology

An altered hydrograph with high peak flows and reduced baseflows is the most obvious and consistent effect of catchment urbanization on stream hydrology. As a result of increasing impervious cover in developing catchments, evapotranspiration and soil infiltration are reduced. The result is higher peak discharges, flashier stream flows, and reduced groundwater–surface water exchange with potentially an overall reduction in groundwater recharge and hyporheic zone size. Since groundwater storage is reduced, many urban streams also experience reduced baseflow. In most cities, urban stormwater drainage systems exacerbate the problem of high peak flows, with piped storm drainage networks efficiently routing stormwater directly into stream channels. These stormwater/sewer networks effectively bypass the river floodplain (and sewage treatment plants), routing contaminants directly from roads and buildings into surface waters. To illustrate this point, consider the typical view of a stream network and how this view changes if one takes into account the direct links between that stream and the underground network of sewer and stormwater pipes that continue to increase in number as the area is built up. With proper sewage treatment facilities and ecologically sound stormwater designs, outflows from these pipes need not further degrade streams. However, in most cities sewer and stormwater pipes are often in disrepair. Thus, in reality, the urban stream 'network' extends beyond the stream channel into a connected series of manmade pipes and gutters.

3. Urbanization and stream geomorphology

Engineers and public works managers have historically sought to maintain channels "unchanging in shape, dimensions and pattern" (Schumm, 2005). This desire for physical channel stability has led to highly simplified urban stream channels – in the most extreme cases urban streams are confined in concrete channels or routed through underground pipes. More commonly the banks of urban streams have been 'hardened' using over-sized boulders or rip-rap to prevent lateral channel migration and bank erosion. Often, these hardened streams are far from physically stable in the traditional sense that there is no progressive adjustment in channel form (Schumm, 2005), yet urban stream channels often undergo progressive enlargement and erosion. A highly impacted urban stream channel often has little variation in depth or the particle sizes of bed material. Downcutting or channel incision is a common feature of urban stream channels as a result of high volume scouring flows and lateral constraints to channel migration.

4. Urbanization and stream/riparian ecology

In contrast to the decades of hydrogeomorphic research in urban streams ecological research has only recently begun to focus on understanding how urbanization affects ecological communities and ecosystem functions. Not surprisingly, given their flashy hydrographs, low habitat heterogeneity and high contaminant loads, this recent research has documented that urban fish and invertebrate assemblages are typically species poor (Bernhadt, Palmer, 2007). Impaired ecosystem functioning can extend out of the channel into the riparian zone, if the water table drops below the rooting zone of riparian plants because of channel incision. These

functionally disconnected riparian zones in urban catchments may have reduced efficiencies of nutrient removal. However, uptake rates in urban streams can be quite high and variable. This variability is due in part to large differences among urban sites with respect to geomorphology and water quality, as urban channels vary from concrete beds to earthen channels with some riparian vegetation and water quality varies from slightly to extremely polluted conditions.

5. Improvement of urban rivers

While the majority of urban ecological research to date has documented that both biotic communities and biogeochemical function are impaired in urban streams, other recent studies suggest that some simple management strategies can improve these conditions. Bernhardt and Palmer (2007) found that while the invertebrate diversity of headwater streams in suburban Maryland decreased with the proportion of impervious cover in the catchment, there was a positive effect of the extent of intact riparian vegetation on urban stream macroinvertebrate taxa richness. Sudduth and Meyer (2006) found in both urban and urban restored streams that macroinvertebrate richness and biomass were strongly correlated with the per cent of streambanks covered with roots or wood, indicating that biological structures could improve habitat quality. Yet, localised efforts like riparian conservation or replanting are unlikely to prove effective at improving conditions for mobile taxa such as fish. Several studies have documented lower fish diversity and abundance in catchments with high degrees of imperviousness. Improving conditions for these taxa may require adding new stormwater management structures or retrofitting existing structures to decrease peak flows and prevent contaminants from reaching the receiving streams. Improving in-stream habitat conditions may also benefit mobile taxa by providing refugia during high-flow events. There may be other ecological benefits of enhancing in-stream habitat complexity. Although channel re-configuration, re-grading banks, and manipulation of physical structures within and adjacent to stream channels is an important strategy for improving environmental conditions for stream organisms, many of the structural manipulations that are commonly performed (e.g. creation of debris dams, side pools and diversification of bed materials) can only be maintained successfully in the long run through effective stormwater management. For this reason, only in catchments where urban stormwater is retained, detained or rerouted to successfully reduce peak flows and improve surface water quality, is it appropriate to consider how to restore structural complexity through active in-channel manipulations. We suggest that the goal of such projects should be to create a variety of habitats within the stream (through alterations of channel form and addition of channel structures), raise the level of the water table in the riparian zone, and achieve inputs of leaf litter and woody debris similar to those from comparable, nonurban streams.

6. Conclusions

Urbanization of catchments leads to changes of streams along three axes: (i) geomorphic simplification in that habitat heterogeneity and floodplain connectivity are reduced; (ii) diminished societal value in that stream channels become increasingly unattractive and are avoided for recreational purposes; and (iii) ecological simplification in that stream biodiversity declines and stream ecosystem functioning is impaired, resulting, for example, in a reduced capacity of streams to reduce downstream nutrient losses. Restoration of urban stream channels is highly constrained, thus it is unlikely that an urban stream will ever be restored to its preurbanization state. Instead the goal of effective restoration should be to move the stream as far back along the three axes as is possible given existing constraints.

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Forecasting and simulation of development in urban agglomerations on the example of the city of Bratislava

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Abstract

This article deals with problem of urban development in central European region of Bratislava (Slovakia). Important role in spatial planning has forecasting of these processes. In this paper we are using spatial simulation software called DUEM to create simulations of future directions of urban development in study area. We have decided to use global cover Landsat satellite images as an input data for the model.

Result simulations for years 2020 and 2040 have been used to identify possible future, spatially defined thretments on the surrounding environment of the city. Such output can have an important role in local government decision making and spatial planning, and according to global data can have global applicability.

Key words: DUEM; urbanization; simulation; cellular automata; Landsat; computer spatial models

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1. Introduction

During the few last decades, urban sprawl has become a prominent theme in discussions and has concentrated a large research effort. Many claim that urban sprawl has a considerable negative impact on both socioeconomic and environmental processes, such as increased traffic, land use changes and fragmentation, loss of biodiversity and reduced landscape attractivity and stability.

Bratislava is the capital city of Slovakia. It is an economical, political and cultural centre. This is also a reason of big economical development and with it also big urban sprawl. Therefore Bratislava offers a good territory in research of these processes.

2. Methodology

In our research we aim to establish, using available information, future conditions of the area of Bratislava. Our first point was creation of maps of land use, in various historical periods. These maps have been then used to

calibrate and verify the forecasts generated using spatial simulation software. Then, it was possible to create simulations extending to the future, with a view to forecasting the future direction of the conditions and trends of urbanization and the possibility to develop proposals and take measures to promote the optimal use of land and to prevent negative side effects that are caused by urbanization.

To simulate the development of the area, we have used the expert systems that are working with mathematical and logical operations to forecast the development of land cover. Specifically, it was a mathematical model of "cellular automaton". A cellular automaton is a discrete model studied in computability theory, mathematics, theoretical biology and microstructure modeling. It consists of a regular grid of cells, each in one of a finite number of states. The grid can be in any finite number of dimensions. Time is also discrete, and the state of a cell at time t is a function of the states of a finite number of cells (called its neighborhood) at time $t - 1$. These neighbors are a selection of cells relative to the specified cell, and do not change (though the cell itself may be in its neighborhood, it is not usually considered a neighbor). Every cell has the same rule for updating, based on the values in this neighborhood. Each time the rules are applied to the whole grid a new generation is created (Chopard, Droz, 1998). On this mathematical principle works a program called DUEM (The Dynamic Urban Evolutionary Model) (Xie, Batty, 2003). It is an expert system that can be used to simulate changes in different types of land use, especially in urban landscape. This is useful in research about processes like urban sprawl and changes in urban systems.

As input data for the program, satellite images of the area from the NASA-Landsat program (Bauer, et al. 2003) from years 1990 and 2002 have been used. We have then interpreted satellite images and processed with respect to the abilities of program DUEM. The program works with six types of land uses: road corridors, road junctions, housing, services, industry, other. When creating the raster map, the area was divided into the previous types of land use and the result was the map of land use (1990). Data have been then imported into the simulation program. We have modeled on the basis of the spatial distribution of the area of the year 1990 to predicted spatial distribution of elements in the country in 2002. This distribution was then compared with the actual distribution of elements drawn from Landsat satellite images from year 2002. We have subsequently analyzed the simulation and the reality and compared with respect to a generalization (Baus, 2009). Our focus in particular was on biggest changes in the structure of the country, which occurred in the years 1990 - 2002.

3. Results

There have been some differences between simulation and reality, but these were mostly minor in nature. One difference was in density of elements of land use. In simulation these elements (mainly housing elements) have been denser than in reality. This difference was caused by the fact, that on satellite images we have not interpreted gardens, green areas between houses and footpaths like housing, but program did it. The biggest differences we saw in Záhorská Bystrica and Podunajské Biskupice where real constructions of houses exceed simulation. This preference was due to increasing popularity of constructioning family houses on the outskirts of Bratislava between the inhabitants. The difference also was the absence of a highway in the the real condition compared to the simulation. We have focused on areas where no change in simulated time period was, too. Mainly in area of Devin, no change in simulation appeared. It was similar to reality.

After verifying the functionality of the program DUEM we were able to create a simulation of the likely future condition of the territory of Bratislava in the years 2020 and 2040. In this period there was gradually nearly tripling of the area Záhorská Bystrica. Intensive begins to intervene in particular in the area in contact with the forests of the Small Carpathians. Large development was recorded

in Devínska Nová Ves. This part of city was virtually interfacing with Dúbravka. The large development of buildings was also in the northeastern part of town around the industrial area Istrochem a. s. There was, even if slightly, an increase of the area of the industry, but especially to the development of residential estates in the vicinity of these industry areas which fill space in those parts of the city. There is a gradual tendency to link urban areas Rača, Vajnory and developing areas in Zlaté Piesky. The high growth comes on the southern and western side of the city district Petržalka. Very strong (over kilometer) growth was recorded also in the urban part of south-eastern city called Podunajské Biskupice. At the foot of the city zone in contact with the small Carpathian Mountains buildings have grow to the existing belt of vineyards. There had also been spread of housing areas to the north beyond Slovnaft a. s. area, which is currently vacant.

We were then able to apply the simulated data in formulating recommendations for future development in Bratislava. The data have been loaded to map of nature and landscape protection. Thus, it was possible to identify possible future clashes of the nature conservation and urbanization. Among the most vulnerable areas in the future consider Malé Karpaty underhill strip crops with vines and the territory of biocentre Devínska Kobyla. Further development of estates could indeed result in greater isolation of the territory and to disturb the natural ecological relationships that are essential to maintain the current natural wealth in Devínska Kobyla. Possible local threats have been identified alongside the river Little Danube, in Záhorká Bystrica and Devínska Nová Ves. Also in the municipality of Petržalka, the gradual development of the construction to the south begins largely interfere in supraregional importance biocentre Dunajské luhy.

4. Conclusion

Results obtained in this paper are only a small part of the potential of this technology. Today, it is important to apply multidisciplinary approach. We have tried to combine knowledge from the sphere of human activity with knowledge of protection and creation of the environment, while fully realizing the potential of computer technology (Batty, et al. 2004).

Fig. 1 Real land use in Bratislava in 2002 (Baus, 2009)

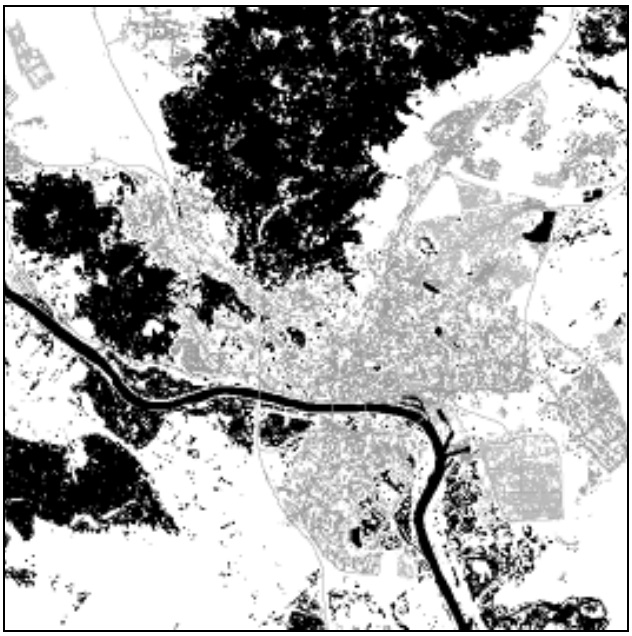


Fig. 2 Simulated land use in Bratislava in 2002 (Baus, 2009)

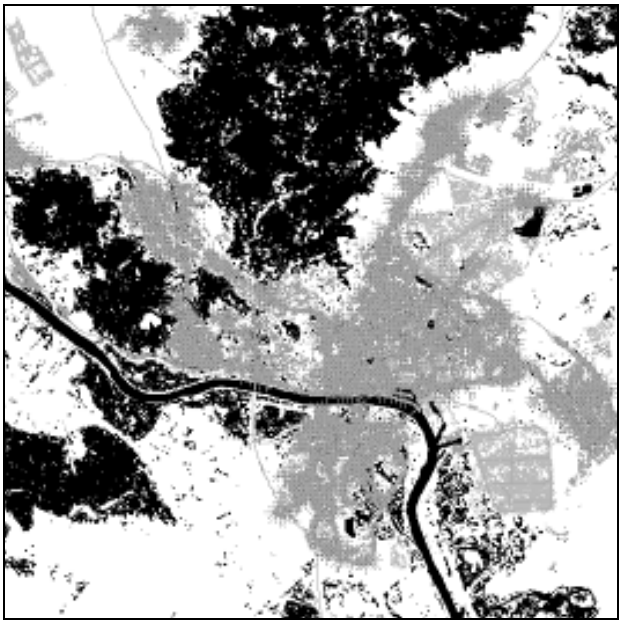
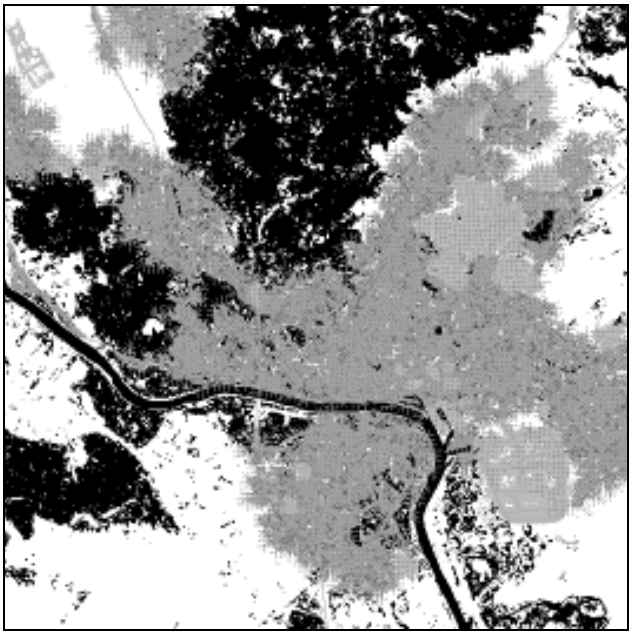


Fig. 3 Simulated land use in Bratislava in 2040 (Baus, 2009)



In our paper we use the freely available source data and their subsequent processing software. This methodology has shown relatively high accuracy, to simulate the development of the city of Bratislava. The advantage of this procedure is a worldwide coverage territory source, freely available data, which opens the possibility of a sufficiently large data base and also opens the way for international cooperation.

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The potential of development of the Tisá municipality

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Abstract

This work is based on the compilation of internal and external conditions, results of a questionnaire research and an attitude of the municipality (Berrová, 2008). The topic (and the aim of this work) is the favorable development of Tisá municipality. The first research chapter compares Tisá according to the air photographs. One clear ending result from these photographs: Tisá is expanding because of the new housing. The original housing was in a line along the main road. Nowadays, this line changed to a curve, which has the new houses in a centre. The second chapter is based on the description of the inside and outside conditions. The natural conditions, history, population, production, services and the investment and local development are described. Very important is geographical position of the Tisá municipality and its natural background. The position is advantageous because within easy reach is a boundary with Germany. Tisá has a peripheral position to the district, but the county town is relatively near. Next chapter is about the questionnaire research. The results of this showed the attitudes of the inhabitants to the county, their opinions and ideas. This questionnaire research is one of the basic suggestions for creating the resulting scheme for development. The following part of this work deals with the scenario of future (favorable development). There is a SWOT analysis and positive and negative factors for development in general and the proposal from the municipality. All is combined together. The resulting scheme is completed with a commentary about key activities. The last commentary in the work is recapitulating the chapter about scenario and is explaining how this scheme has been created.

This work helped with preparing new local plan (municipal plan). New local plan is not finished yet, but this work was one of the resources at the beginning. I would like to continue with this topic in my thesis.

Key words: potential; development; scenario; conditions; suggestion; Tisa; Tisa´s rocks

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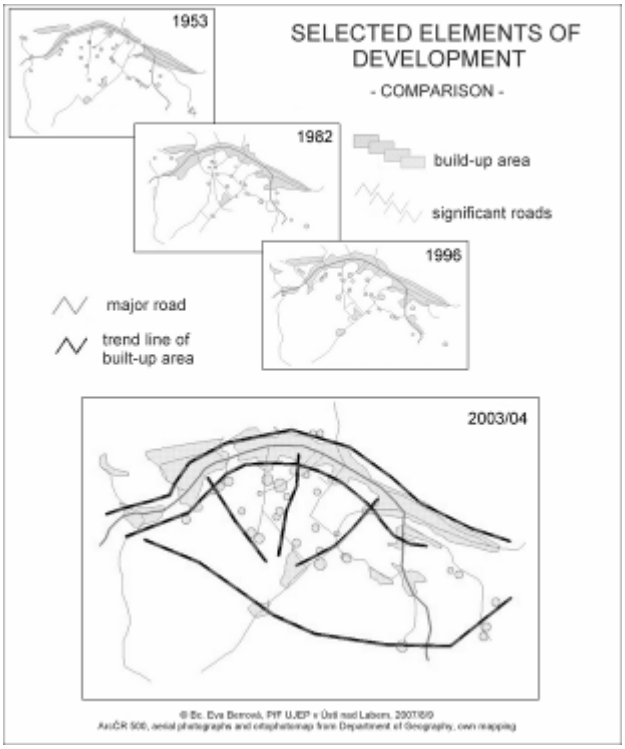
1. Introduction

This research works with internal and external conditions and with opinions of the inhabitants using the questionnaire research (questionnaires: November 2007). The result is a scheme of favorable development of the Tisá municipality. This scheme is developed from the suggestions of the municipality, questionnaires and own vision. All is combined together. This work is also underlined by some key-activities which are necessary for the development. The individuality of the Tisá municipality is caused by rich and valuable nature. Local (regional) development must respect the nature conditions, because stable ecosystem is important for the landscape (Berrová, 2008). The northern part of the village is situated in protected landscape area Labské pískovce (Elbe Sandstones PLA). This sandstone area is significant in European level. This fact in underlined by its inclusion into the Natura 2000 system. Thereto, there are many others landscape areas: nature monument Tiské stěny, natural reserve Rájecká rašeliniště and others (Bird areas, memorable trees, others). Typical for the landscape is unique rock formation and significant habitat of many animal species.

2. Methods

The structure of the work results from logical thinking. At the beginning there are analyses of input conditions. The most frequent method was data collection and processing. One of the used methods was comparing Tisá according to the air photographs from years 1953, 1982, 1996, 2004 (see fig. 1). It deals with some objects like communications (infrastructure), housing or the shape of this municipality. This method is very good to identify the former territorial development. Other method was used in a chapter about population: calculations and graphs creating. Important method was maps and schemes creating. Field survey was a part of many captures and topics. Purpose of field survey: making photographs, further knowledge, consultations with inhabitants and tourists; and own questionnaire research (I worked with 170 filled questionnaires). The resulting scheme (scenario) of favorable development is a combination of all information – input geographical conditions, questionnaires, consultations with a municipality and SWOT analyses. At the end there are recommended activities for favorable development.

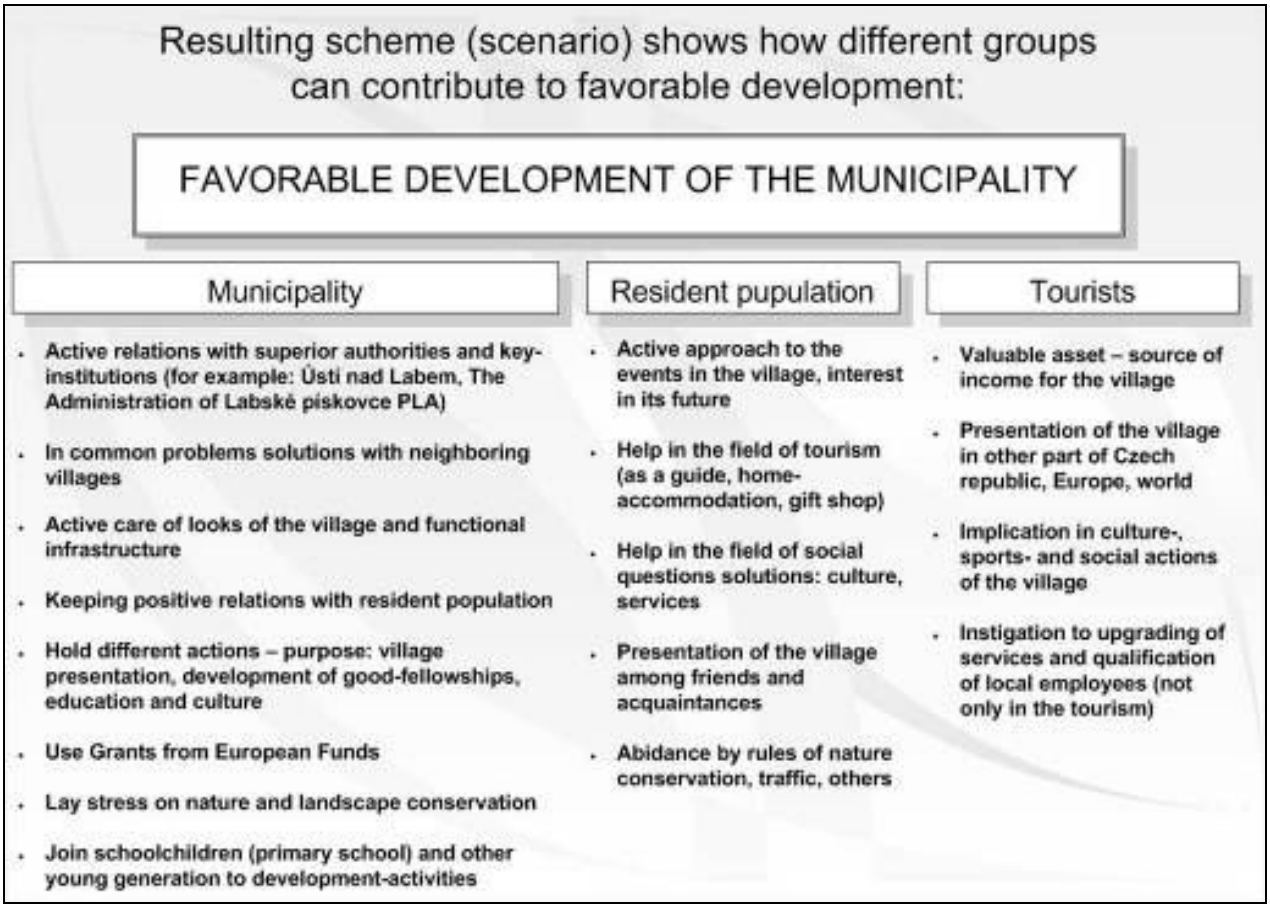
Fig. 2 Comparison according to the air photographs (selected features) (Source: Author)



3. Results

Tisá municipality is expanding because of the new housing. It has not to be at the expense of the nature. The unique nature is the point, which makes the village attractive. Resulting scheme is based on 3 different groups: the municipality, resident population and tourists and their contribution to favorable development. Each group of people has different possibilities and different interests. All activities are summarized into these main notions: Active interest of inhabitants, positive relation of surroundings, tourism development, care of the nature, good presentation of the village and monitoring (see fig. 2).

Fig. 2 Scenario for favorable development of the Tisá municipality (Source: Author)



4. Conclusion

This work combines input information like data about location, physical geography, history, social geography, questionnaires, and air photographs. These data are very heterogeneous. Many of interests are opposed. For example: nature conservation versus new housing and tourism development. Everybody must observe the rules and find the "middle-point". Tourism is very important for the income of the village. Resulting scheme should clarify the activities in the village for future. Local development must respect nature conditions, because these conditions make Tisá municipality unique.

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Dept. of geography FS UJEP Ústí nad Labem – aerial photos of Petrovice (years 1953, 1982 a 1996) and ortophotoap Petrovice 2003/2004.

Obecní úřad Tisá – expertise

Správa CHKO Labské pískovce – promotional materials, expertise.

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Designed landscapes

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Abstract

The project deals with designed landscapes. That means cultural landscapes which were affected by systematic spiritual and political influences, which gave them artistic scale. Selected designed landscapes of Czech Republic have been described on a theoretical base and concept definitions. Description of composition units and composition links has been applied on Lednice-Valtice area and Mikulov-Falkenstein area. Human identification with a site and orientation of people in space is the most important value of designed landscapes these days. Altough design landscapes are affected by urban and traffic development, it is not necessary to conserve them. Recognition of landscape composition could bring considerable impulses for working out management plan of space -landscape plan.

Key words: designed landscape; composition; visual links; management plan; Lednice-Valtice area; Mikulov-Falkenstein area

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1. Introduction

Designed landscape is a technical term created by the committee of world heritage UNESCO in 1996 and means a landscape designed and made by man. Public parks, open spaces, gardens and wide landscapes compositions are ranked within this definition.

Designed landscapes were growing on the background of landscapes formed by natural processes and cultivated by human activity. The complex includes both natural values and organically modified cultural landscape. All together they create an important scope for deliberate landscaping. Designed landscape moreover presents a very specific type of cultural landscape, the arrangements of which – or its segments - is determined by a pre-set philosophical, spiritual or artistic concept.

The basic idea of organizing space and segments in a landscape is the need to create an aesthetic value of space, present the richness of the owner or to implement clear order or spiritual scale into landscape. By a systematic

activity of humans we can see birth of sacral, civic or combined landscape compositions. This effect is more or less present in contemporary landscape and it is involved in its character or genius loci.

2. Methods

If we want to look into the concept of "designed landscapes" we need to define basic terms. Originally, the name landscape (*krajina*) was deduced from Slavonic (*kraj*), which means something at the edge. Later the landscape is known as a term for an alderman, territory unit (Vaníček 1980). Nowadays the landscape and its space determination are also felt differently in various fields. This implies that the definition of the term "designed landscape" is rather difficult.

The term of "design, designed" is based on a word root of "composition" (derived of a Latin word composition) which means composure, assemblage. But the meaning of the term "designed" is slightly modified and if it is listed in encyclopaedias, it is usually linked to fine art. That means connecting single pieces into the unit systematically, to get an artistic result. The original project is what diversifies intentionally designed landscape from a cultural landscape (sometimes called uncultivated landscape - Kučera et al. 2005). This kind of purposefully designed landscape has a character of an art piece, both in terms of making it and perceiving it, and the principles applied are the same as in painting, musical composition or sculpture. To evaluate a design landscape it is necessary to consider its individual elements (Všeobecná encyklopedie 1999). Also, in order to learn particular sign systems defining the principle idea it appears important to understand and recognize the core of the composition and the meaning of the whole work.

Based on what have been said above, a designed landscape may be perceived as a cultural landscape, which has been transformed into art piece by means of philosophical and artistic incentives of man. The same principles of contrast, rhythm, gradation, symbolism etc., are used in creation of a designed landscape as in art work. On the other hand it is very rare that a landscape, which we can identify as designed, was entirely transformed so that it can follow the original idea of the composition. The elements of composition and its links are inserted into a cultural landscape and thus providing it with an inseparable frame. The landscape composition links together current elements with those coming into being by means of numerous mutually tangled links with the features of the landscape so that they can form an integral complex. The designed landscape is then more than just a unit made of individual elements, it is rather complicated structure of relationships on various levels which help to create complexity, give value to the deal and still maintain its semanticist content.

Composition is partly made by human activity, but also by natural dominants, segments. In some kinds of landscape compositions, the parts of the concept are astrological or astronomical phenomenon or sites with stories linked to them. All the single parts of the composition, the intentional landscaping originate from, are linked to each other by lots of various relations. These may be physical, visual or symbolical. Physical relations are created by lines, alleys, tree-lines or by forest paths. Visual links create optical lines between segments of composition. Very often they are amplified in landscape by material links. Symbolical relations are created by hidden or partly hidden interactions. To recognise them we need to know the meaning of viewing the substantiality or the phenomenon.

The first designed landscapes were established in Renaissance as a manifestation of human trend of approaching landscape in 14th-16th Century. The nature in Renaissance was understood as a living space supplementing a mansion. The landscape in this period becomes a "shop window" of the best and presents prosperity and a level of an economical and cultural development of man. New farm houses, mills, fisherman houses, etc. are built in nature based on sophisticated

projects and they are becoming the centres of composition. The farm houses are connected to each other by the system of alleys, which link them to nearby towns.

The main topic of baroque (17th cen.) and classicist (18th cen.) compositions are presentation of power and religion. Early baroque is very brutal and radical in rearranging space by means of expressive axis and large dominants. On the contrary, the late baroque is gentler to nature; it respects existing status and forms it finely. The churches and mansion of aristocracy become dominants of baroque and classicist compositions. At the end of 18th cen. and at the beginning of 19th cen. we can see the beginning of inspiration by English landscaping in the rest of Europe. *Ferme orneé* (an ornamental farm house) is the main function applied, it unifies beauty and functionality. Cultural farm landscape is being supplemented with artificial segments which expresses romantic ideas about ideal landscape for humans. Artificial caves, oriental buildings, antiques and ancient ruins, artificial waterfalls etc. were built in sentimental romantic compositions. A geometrical form, which was used in baroque as the most precise form of organizing space, was replaced by organically lead lines.

Across the history we can divide landscape compositions into sacral, profane and combined. The idea of sacral landscape compositions comes from legendary places connected to life of Jesus Christ or the Saints. As the example we can use Santa Casa, Jesus tomb, stations on the Cross way, these were mostly installed to form natural dominants. But we also know landscape compositions which bring into symbols not visible from the Earth into landscape. We can understand them as sort of messages to Good. Profane landscape compositions are historically connected with top aristocracy and their needs to present their possession and social standing.

3. Results

Most of designed landscapes in the Czech Republic which survived have the character of palimpsest, many times rewritten manuscript. The oldest landscape compositions have the roots in Renaissance (*Mikulov-Falkenstein area, Novohradsko*) and were re-formed in later centuries. Phenomenal boom of designed landscapes saw Baroque, especially after *Bílá hora* (1620). This was because of the political situation and the change of ownership relations which helped to set up many widespread landscape compositions. At that time profane designed landscape is formed at *Jičínsko, Čimelicko-Rakovnicko*, *Lednice – Valtice area, Zahrádecko* and many other sacral landscape compositions – the most known is *Římovsko, Králíky, Svatý kopeček* near *Olomouc* and *Zelená hora*. Later classicist and romantic designed landscapes come into being. They are enriched by many romanticizing and "antique" buildings. As the example we can use *Hlubocko, Novozámecko*, modifications of *Lednice-Valtice area* and *Vranovsko-Bítovsko*.

3.1 Lednice - Valtice area

One of the most famous designed landscapes in the Czech Republic is Lednice-Valtice area, which is located in the south-east part of the Czech Republic. It is near the boarders of Austria and the Slovak Republic.

Designed landscape was created by the well - known noble family of Lichtenstein, who have been owners of this area from 11th cen. to the mid of 20th cen. The main composition components come from the baroque times and romantic trends of 19th Century are represented a lot too.

The core of the composition is made by Valtice town, which was the home of Liechtenstein family. From the centre of the town three main composition axes lead – first is leading to another important town of Lednice, where the summer house of Liechtenstein family was located. This axis is accented by an alley running along the dam of one of many ponds which make another important component of the composition. The second axis is connecting Valtice with the village of *Ladná* (Ladna alley). The third axis

going through a huge forest called *Boří* and going to Břeclav - Břeclav alley (Krejčiřík in Kučera et al. 2000). Deer-parks and pheasantries along with the castle gardens in Lednice and Valtice also present very important components of the composition.

The natural-landscape park in Lednice and lots of little romantic houses (*Belveder, Minaret, Hunter Chateau, Pond Chateau and Border Chateau, Janohrad, Colonnade at Raistna, Rendevous, Temple of Apollo, Colonnade of three Graces, Lány and Pohansko*) date back to the time of Romanticism. All of them were linked to a baroque composition and by means of intersected view links they unify this vast area which has connection to the surroundings and its dominants.

3.2 Mikulov - Falkenstein area

Mikulov-Falkenstein designed landscape introduces Cultural-Historical landscape of agricultural type, which is located at the borders of Austria and Czech Republic. Creating the landscape compositions is connected with famous noble-families, as was Lichtensteins, Dietrichsteins and at the Austrian side Fünfkirchens (Rigasová 2007). Designed landscape of Mikulov-Falkenstein consist the signs of late renaissance and baroque landscape. The main composition principles of it are based on visual relationships and functional relationships between single components of the composition.

The main composition axis is made by limestone capping, which run through the area from the north-west to south-east and run through important farming and aestheticsed areas. The examples are Mikulov Chateau and Sacred Hill., the pheasantry, pond *Šibeniční*, Tiergarten and Sacred hill of Falkenstein and the castle of Falkenstein. The adjacent composition axis runs through valleys of many ponds and is formed by important farm houses and designed and aesthetised areas like castle in Poysbrunn and Drasennhofen, ponds, water mills, Dietrichstein´s brick-works, pond *Nový* with an island and a pleasure house, fisher house etc. During the history all this line was fixed by alleys (Kulišťáková 2007, Kučera 2005). Another composition axis was formed by ponds going from the west to the east through the area and is connected to Lednice-Valtice designed landscape (Kučera 2005).

4. Conclusion

Designed landscapes, preserved till these days, present important cultural-historical and aesthetical values and have a big landscape-forming value. Their image affects genius loci and a landscape character of the place substantially, which closely communicates with the whole attraction of landscape and its phenomenology. Viewed psycho-geographically, these qualities of landscape have an important effect on orientation of people in space and their mental feelings. This gets highlighted especially in the globalized time of today.

Lately many of landscape compositions are attacked and destroyed by commercial development projects, which don´t respect the values preserved by centuries. In our opinion it is not possible to preserve meticulously the nature. A cultural landscape is dynamically created space, which has always been connected to the particular character of a place. Many of used compositional principles can inspire the new investment projects. They can link to phenomenology of a site; add value to the newly implemented deal while still preserving the spirit of a site.

The goal of our work is to assess some known designed landscapes in the Czech Republic and define their main values. The analysis of a landscape composition, which means identifying its components, relations and values, should make a base for working out a management plan. This should become a strategic starting point for decisions about important investment projects and major changes in the area.

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Urban development and regeneration in Poland – contemporary issues

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Abstract

Contemporary Urban development issues in case of Poland include a number of phenomena, based on rapid change of socio-economic and political system. These include development of suburbanization and regeneration processes. Among the latter ones one can distinguish both physical redevelopment of built structures and complex socio-economic revitalization of neighborhoods. In these cases key issues are associated with inclusion of cultural activities and public participation, which – in many cases – decide about the success of these projects.

Key words: urban landscape; development; regeneration; suburbanization; Poland

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1. Introduction

This article is intended to summarize current trends and problems in urban development and regeneration in Poland – a 38 million inhabitant's country, located in the central part of Europe, just in the east to Germany. In the enlarged European Community Poland represent one of the largest nations, which suffer many problems. The same relates to its cities and towns, as nowadays they have to adapt to the globalization processes. One of the major issues in this respect is urban regeneration, perceived as an opportunity to retain urbanity by many its cities and towns, as well as a serious challenge for urban management workshop in times of liberal approach to development processes.

2. Situation of Polish cities and municipalities after the political and economic transformation of 1990-s

Urban system in Poland during last twenty years was facing major changes, which were deeply rooted in both the history of the country and needs of the modernization. The so-called "socialistic city model" (adapted during the post-war communist regime) was not able to meet the requirements of the new economic order. Therefore, it had to evolve and adapt its structure to the demands of the market economy, and be transformed into the

"capitalistic city". In result, we can observe the emerging model of the "post-socialistic capitalistic city", with problems characteristic to both systems, and with the domination of market forces changing the physical structure of the urban organisms. Unlike in case of the majority of other European countries, all this is not accompanied by any major effort of the central government, and with very limited attention given by newly created regional self-governments.

In effect, many new phenomena occurred in the spatial situation of the Polish cities. Many of them can serve as the bad examples of urbanization processes, but one can regard some of the as the positive ones as well. One of the most interesting ones is associated with parallel development of the suburbanization and re-urbanization processes, and – in result – development of the urban regeneration projects. This process is not really well developed by now, but one can already note a change in thinking. This happened due to fact that municipal planners started to see the local problems, not only the general ones, common for the entire cities.

Along with the political and economic transition the Polish state decided to withdraw from most of the forms of governmental support to urban development. It was supposed to be replaced by local programs and policies, prepared and implemented by municipalities. The post-socialistic governments believed that the best decisions concerning local communities can be made only at the local level. This belief was followed by intended decentralization. But this process related only to duties, not to money distribution. Consequently many of the tasks were transferred to the local and regional governments, but the state did not provide financial basis for carrying them out. Certainly, the bigger cities with much broader economic basis and more opportunities to attract investors and capital had a better position in this situation than small urban and rural communities. But even in the case of big cities – as many tasks had to be financed – it was not possible to find enough money even for the necessary infrastructure improvements. In fact, until now the municipalities are struggling with heritage of socialistic model of urban governance. Among the main problems one can find i.e. degradation of large amount of housing stock (as they were never renovated after the war), underdevelopment of infrastructure (especially in the field of water supply and sewage collection, but the main problem is associated with underdeveloped road network and very poor quality of many of roads) and many others.

According to these two processes – decentralization of power and struggling with the socialistic heritage – neither of the possible actors (which means the central government and municipalities) had interest and money to introduce any kind of support system for urbanization (or re-urbanization) processes. Therefore, they were left for the market, as some of the liberal politicians (and also – planners) believed that free market will do its job and clear the situation. But they forgot that free market looks for the cheapest and most efficient ways of fulfilling the economic tasks, and not necessarily takes into account the social and environmental aspect of the development process.

In result, for the whole period since 1989 there was no single state program aiming in influencing the urbanization processes. The best example is so-called urban regeneration act – the parliamentary initiative to support the urban regeneration processes. Works on these documents were conducted for over ten years by now, and still no one is able to predict when they will be finished. And – at the same time – local municipalities do not intend to influence the urbanization processes, which in many cases have the over local dimension. They are usually focused on providing the legal framework for developers, as new developments mean new tax inflows and all other planning principles are usually left aside.

3. Trends in urbanization

Current urbanization practices are associated with domination – or even over-domination –

of the free market. At the same time, new products are required on this market – both in terms of housing and other types of urban program. But only in few cases they are developed in the inner-city locations. All these aspects describe the picture of the urbanization model we have to deal with in Polish cities.

Due to the policy of the Polish state and most of the local municipalities, the private sector activities are not influenced in any way by public sector. I mean, they are not influenced with financial participation that can change the program or character of the development – but of course each of the projects needs to follow the planning regulation concerning the size of the building or the complex of new dwellings, the type of land use and other building regulations. This situation is associated with the fact, that the public sector – again, thanks to the money shortage – is not able to play the active role in the real estate market. Unlike many west European municipalities, only very few local governments in Poland are able to develop and maintain a large amount of public housing stock. If they are able to do so, usually they focus on a hundred percent municipal housing, constructed to house the poorest and homeless families. At the same time, all public infrastructure like schools, roads and so on, are being built with the public money only. There is very little experience with public-private partnerships, and only in few cases private developers of the large-scale projects contribute some money for infrastructure improvement.

At the same time Poland is one of the few European countries with still huge housing needs. This relates both to the standard of existing housing and to the amount of flats available per capita. This means that both the quality and quantity of apartments need to be tremendously increased. Such a situation is the outcome of the not sufficient amount of housing constructed in the post-war times, and lack of major modernization efforts in the pre-war housing stock. Therefore, there is a market for all kinds of housing, but still the price of the square meter of new apartment plays the key role. Besides housing, there is a whole variety of new types of urban program that appeared in Polish cities after 1989. The most important parts of these are new shopping facilities as well as new leisure and office complexes.

4. Problems with degradation inner urban areas

As the effect of the urbanization processes, and of the de-industrialization of the cities (which started to take place in the mid of the 1990-ties) – the inner cities started to suffer from some degradation and urban blight. But – what is interesting – this did not mean lowering the prices for the land. The market still indicates that inner city areas are most expensive ones, even besides the fact that most of them need major clean-up process. Also, in some cases the land titles are not clear, or the plots need major infrastructure upgrade. The best example of this is the Granary Island in Gdansk – the most attractive building site in the whole agglomeration, also very expensive – but nobody will invest there unless there is a new infrastructure connection to the plots.

Besides those post-industrial sites – there is a shrinking amount of the un-built areas, which are the effect of war-time destruction. The best case is the area around the Palace of Science and Culture in Warsaw, which – once a vibrant city district – is now a huge empty site. But this is one of the few sites like this left – all around one can see popping up new office and hotel towers.

5. Growing importance and notion of urban regeneration

As the societal needs get differentiated, so does the market offer – this is the old rule of free market. And in the pure market-led urbanization in Poland it is also true – in regard to new urban program. But at the same time there is a large portion of the society not willing to change their living standard, but to maintain the existing one. They are usually housed in the buildings developed before the

Second World War, which – in general – were not maintained properly during the post-war times, and were not undergoing any major renovation. Therefore, in last decades Polish cities started to face another problem – problem of decaying housing structures, which starts to be a general problem for the society and cities. During last few years many conferences, research works and seminars were devoted to analysis of this problems and search for the best possible solutions.

In general, this problem has three dimensions. One of them is related to already in bad technical condition pre-war structures. In these cases the renovation efforts should keep as a goal technical upgrade of the material substance, and solving some of the over-population problems. Second dimension is associated with the post-war housing, which – in majority – is the prefabricated large-scale housing. Usually it still does not suffer major technical problems (but they will appear soon), but is degraded morally and socially, with many social problems. Finally it is necessary to mention still waiting for redevelopment post-industrial, post-harbor, post-railway and post-military areas, which – as mentioned in the previous chapter – usually are ready for development, but suffer from underdeveloped infrastructure.

First regeneration programs are usually perpetuated by private sector, which is interested in developing the new market products in a form of lofts and/ or "stylish" offices or restaurants. But these initiatives are supplemented by "spontaneous" regeneration – like i.e. acquiring the old factory halls for the purposes of artists' workshops. Due to such efforts the face of such the run-down districts like Praga in Warsaw and Mlode Miasto (Young City) in Gdansk started to be altered.

At the same time one has to understand the difference between complex socio-economic revitalization and just physical regeneration of the urban structures. While physical regeneration means just putting new building and refitting the old ones, the complex revitalization also includes activities associated with societal improvements and economic development. It is also worth remembering that revitalization should be understood in a slightly different way when it refers to housing areas (where improvement of physical structure is connected with social – economic revival, with special emphasis on improvement of the situation of the local community) and degraded structures connected with technical and industrial infrastructure (where creation of new physical structures is sometimes connected with restoration of historical buildings or historical technical objects, but mainly with bringing new economic activities to the areas and creation of new local communities) (see Zuziak 1998 for extended information).

6. Objectives and dimensions of revitalization

Objectives of revitalization efforts are different in each of the cases described in the literature of the subject. It is due to the different situation and problems of cities and centres taking up such activities. Very often, however, the objectives are similar, or touch on similar issues. So they can be grouped by problems and revitalization processes they refer to. The following revitalization groups of objectives can be distinguished:

Urbanistic and architectural – connected with repair and modernization (or sometimes restoration) of architectural complexes, including housing and post-industrial ones, and with conscious shaping of cultural landscape of the given area;

Technical – connected with upgrade of quality of urban structures – including technical and road infrastructure;

Social and economic – connected with economic revival and reversing negative social tendencies – including reducing development of pathologies;

Environmental – connected with improvement of condition of natural environment, reducing pollution and emissions.

The above mentioned four groups of revitalization objectives are interrelated. It results from mutual impact of e.g improvement

of the condition of urban structures and enhancement of the quality of the environment or creating conditions for social – economic revival. It means that each of the actions taken up as a part of revitalization process is connected with effects in another area, and can also have a negative or positive impact on the area. Taking up large scale urbanistic – architectural activities not combined with activities in social and economic area is a classical example here. Despite great amounts of money spent on repairs and modernizations of individual objects and their complexes – such programmes led to subsequent degradation of these. That is why it is so important to initiate activities in all areas of revitalization processes – in social and economic area in particular.

Regardless of the adopted objectives of revitalization, preparation of the process is connected with the necessity to take up actions in different areas. It means that what is needed is interdisciplinary, multi-subject and multi-dimensional activity. The initiatives can be divided into three basic groups:

- planning and designing – connected with development of relevant action plans and strategies;

- organizational and financial – connected with forming organizational structures to handle revitalization process and with provision of necessary funds;

- promotional and informational – connected with cooperation with local community on specifying objectives and directions of revitalization process.

It is necessary to integrate all the dimensions of the activities mentioned above. Avoiding taking up activities in any of them may constitute a threat to the success of the entire project. For example – not conducting social consultations in time and neglecting real participation of local community (in particular in the case of revitalization of housing structures) can lead to tensions and conflicts, quickly spreading to local politics, which can paralyse the whole process. It is similar with organizational and financial activities; very often the existing management structures are not able to prepare and implement such complex projects and programmes. Entrusting organizational and financial tasks to such incapable structures can lead to delays in implementation of the programme, its non-implementation or partial implementation. The same is true about financial issues: the operator of revitalization process must have the skill of combining various public budgets, assistance and private funds to provide for adequate level of financing individual projects. The planning and designing dimension is of some significance here as well. Only development of adequate action strategy and its transformation into programmes and operational projects can make the process a success.[1]

7. Typology of areas under revitalization processes

Revitalization processes refer to a number of urban areas and structures. As mentioned before, revitalization of the existing structures often is an alternative to development of the city outside the existing structures. Each process, referring to a particular area or structure, has its specific characteristics. Each of them poses different problems, has different physical structures and different level of degradation, and finally – differently formulated objectives. These areas can be divided into many different groups. The best criterion for such classification seems to be the one also adopted in the literature of the subject – previous function and then historical period of forming the structures. Their size and significance in the urban structure can be another criterion. Both classifications are described below.

Four basic groups of degraded areas can be distinguished with reference to the first criterion: housing areas, multifunctional

[1] The problem is often underestimated in the process of planning revitalization processes. At the same time proper development of process implementation management system is a key to the success and attainment of expected objectives. Examples of solutions in this respect are presented, *inter alia*, in: Lorens (2005).

complexes, areas connected with technical and industrial infrastructure of cities and the areas often called "urban wasteland". Each of them is divided into a number of subgroups, presented below.

Housing areas often have diversified characteristics, both as it refers to the type of structures, ownership structure, technical condition, and intensity of technical, social and economic problems. Their four main groups can be distinguished here as:

- of 18th century origin and earlier (dating back to pre-industrial period),

- of 19th century and early 20th century origin (relicts of city of early industrial epoch),

- of interwar origin,

- of post World War II origin.

Multifunctional complexes constitute a separate big group of degraded areas. Two big basic groups can be distinguished here: city centre areas, landscape complexes (including sports, recreational ones as well as cemeteries, etc.

The areas connected with technical and industrial infrastructure of cities constitute yet another group. Their distinguishing feature consists in total abandonment by the users and resignation form their active use for technical or industrial purposes, consequently meaning – total loss of significance. We can distinguish their four basic categories:

- post-industrial areas, including: a*reas of storage places and warehouses, connected with light industry (including objects and areas connected with municipal services), connected with heavy industry*,

- post-harbour areas, including: *objects of medieval origin, of 19th century and early 20th century,*

- post-military objects, including: *complexes of old city fortifications, complexes of military barracks, military training grounds,*

- post-railway areas, including: *around still functioning railway stations, areas of stand, cargo and junction stations and railway infrastructure, areas of railway lines and stations closed down or to be closed down.*

Urban wasteland of various types constitutes the last category of degraded areas. Generally speaking, the areas can be characterised as temporarily accommodated or not all accommodated areas, which can be due to a number of reasons. Their analysis indicates existence of the following groups:

- areas devastated during the war and not rebuilt,

- areas left to themselves during processes of contemporary development of cities,

The typology presented above is of universal character, which means that it may not cover various specific areas in a given urban centre.

All the area groups mentioned above can be divided by the second adopted criterion – that is scale and significance in urban structure. Three basic categories can be distinguished here:

- single buildings and the plots connected with them, constituting an element of the city tissue – that is complexes constituting an element of continuous city tissue that are not an independent element of city structure;

- distinguishing urbanistic and complexes and arrangements, consisting of many types of structures, being, however, an element of continuous city tissue, including entire city quarters;

- intricate complexes, consisting of a number of various arrangements, of various composition and original functions, constituting entire city districts.

Each of them can be interesting for various institutions of culture. Such institutions can also contribute to the success of the transformation programmes implemented there.

8. Cultural activities and projects as elements of revitalization processes

Cultural activities – including artistic ones – often become elements of revitalization programmes of degraded urban structures. In many cases, implementation of such programmes is connected with creation of new elements of city programme – including centres of culture, concert and show halls, museums, centres of artistic activity, etc. They are of great significance to the success of entire revitalization processes, as they contribute to building programme and social diversity of the areas under transformation. It is, *inter alia*, due to the fact that the objects – in particular the historical ones adapted for artistic activity, that is often degraded objects in the areas under revitalization – usually attract people involved in various types of activities – including e.g. avant-garde groups. At the same time, due to the contemporary tendencies in artistic activity, assuming active participation of the audience – local community is involved in implementation of such projects. It can refer both to the people living in those objects, and e.g. employees of industrial plants under liquidation or restructuring. Such projects can also contribute to revival of local traditions, giving the revitalized areas a special identity.

Among the projects connected with cultural and artistic activity, implemented in degraded areas, their two basic groups can be distinguished: the so called "hard" and "soft" projects. The division is based on the type of undertakings implemented under the projects. And so, "hard" projects are usually connected with building some type of new infrastructure to serve artistic activity, e.g. creation of new exhibition spaces, workshops, auditoria and performance halls. The efforts result in new spaces for activities of various persons and institutions in the areas under revitalization, which increases the attractiveness of such areas. On the contrary, "soft" projects mean implementation of various artistic activities in the degraded areas – such as festivals, performances, outdoor workshops, etc. Such activities contribute to the local community's "domestication" of the areas under revitalization, whose biggest problem usually consists in alienation from urban structure. At the same time, such activities often constitute an avant-garde of the "hard" projects described above, or of investments of commercial character.

9. Examples of linking urban structures revitalization programmes with activities in the area of culture

In Polish cities urban revitalization programmes are still at the preparation stage or have just been launched. That is why – discussing the role of culture in revitalization processes of cities – references should be made to revitalization in Western Europe (Colquhoun 1995; van der Meer and Otgaar 1999). Only with this background is it possible to describe Polish examples and the potential significance of cultural projects in implementation of revitalization processes.

In Western European cities implementation of practically speaking each revitalization project was connected with preparing activities in the area of culture. It refers both to activities of regional impact and the ones connected with renovation of single objects.

Restructuring the German industrial zone – the so called Ruhr Area is one of the best known programmes of comprehensive revitalization on a regional scale. Many projects have already been implemented under this year long programme, e.g. turning the old mine Zeche Zollverein in Essen into a design centre and museum of the history of the region, and the creation of LandschaftsPark Duisburg Nord in Duisburg. The latter project is connected with development of a culture park based on an area of an old steel mill, adapted for cultural and recreational purposes.

And as for single objects, one can mention a number of examples, of which the following can be of the greatest significance to revival of adjacent areas:

- Tate Modern Gallery in London – that is turning the old power plant into an exhibition centre, constituting at the same time an element of revival programme of the South Bank of the Thames;

- Harborlights Center concert hall in Boston – a concert and performance hall of temporary character, constituting an element of transformation process of post-harbour areas in Boston (the so called South Boston Project);

- Kaiserspeicher concert hall in Hamburg – a planned new concert hall built up on an old port granary, constituting an element of revitalization program of the HafenCity area.

There are numerous examples of this kind. They prove the significance of presence of cultural activities in the process of urban revitalization of cities. They also constitute a good base for implementation of similar projects in Poland, where revitalization undertakings are still at preparation stage. It is not often either that transformation of entire urban complexes is considered – rather single objects and their small complexes.

As for Poland, there are a few examples of pilot projects including activities in the area of culture – of both "hard" and "soft" projects. Quite of few of them are being implemented in Gdańsk. Beside Outdoor Gallery, there is also the project of transforming post shipyard areas ("Young City") and city fortifications (the so called "Hewelianum").

Gdańsk "Young City" project covers revitalization of the complex of post shipyards areas (of the total of 70 ha). It is assumed that the area will become a new centre for the entire Tri-City metropolitan area, with a wide range of function proposals, mainly of commercial character (e.g. Kochanowski and Kochanowska 2005). The interesting thing is that the project includes a number of cultural undertakings, artistic ones included. Projects and undertakings are already being prepared, before the process of commercial investing has actually started. The list of the projects to be implemented includes, *inter alia*, construction of European Solidarity Centre and extension of the already existing Road to Freedom – a public project of symbolic character, to commemorate the events connected with decline of communism and regaining freedom. And those activities, important for the entire Tri-City as they are, are accompanied by creating a new image of purely artistic dimension, including the so called "colony of artists", grouping artists of various types, and location of the Institute of Art "Island" in the building of an old vocational school. At the same time, many events of public character, such as concerts and open air events are organized in the Young City, the most famous being Jean Michel Jarre's concert organized to mark the occasion of 25th anniversary of "Solidarity". However – from the point of view of the success of the entire revitalization programme – it is also important to take up activities aimed at involvement of the local community of the areas in the direct vicinity of the shipyard areas, including artistic activities by which various social objectives crucial to the success of the whole process are attained (Sebastyański 2005).

The complex of old city fortifications, the so called Grodzisko, is another revitalization project in Gdańsk. The complex is located in the direct vicinity of the Main Railway Station. It covers the area of ca 20 ha, most of which are fortifications from the Prussian period, now under renovation (Lorens 2005). At the same time, they are being transformed (with assistance of European Union funds) into Pomeranian Centre of Science and Technology "Hewelianum", which is to become the first in the Pomeranian region *Science Park.* Presentations of "living history", connected mainly with the history of the place, are to be an integral part of the project. The fort area also hosts, *inter alia*, associations cultivating military traditions of various epochs – e.g. knights and Napoleonic. The cubature of the old fortification is being renovated as a part of the programme "Promise of the Minister of Culture", and also financed from non-central budget sources.

Similar projects and undertakings are also being implemented in other Polish cities.

One needs to mention the Warsaw "Fabryka Trzciny" [Cane factory] (centre of cultural and artistic activities located in a renovated factory in Praga district), or the Poznań "Stary Browar" [Old Brewery] (shopping centre developed in an old brewery, including a number of functions, cultural ones including) of the Łódź "Manufaktura" [Manufacture] (similar to the Poznań project, although of a bigger scale).

10. Issues in public participation

Urban regeneration has become an important part of the planning agenda for the Polish cities already two decades ago. Since a few years it has also become important for rapidly developing countries, including the post-socialist ones. This process is accompanied by growing awareness of the local communities, which intend to actively participate in the decision-making process regarding the urban development and redevelopment of numerous sites. Besides conflicts and protests regarding localization of different developments, one can also note the growing interest in urban regeneration and revitalization as well as in including cultural activities in these processes. In these cases the local communities are interested not in stopping the development, but – on the contrary – in spurring it. But still they intend to control the development and select the best solutions from their point of view. This has accelerated the transition in the approach to the participatory process – from the "accepting" mode to the "getting ahead" one. The first one is usually based on preparation of the development proposal by the investor and/or local government and submitting it to the public, usually expecting its acceptance with little or no adjustments. The other one is based on starting the public discussion on the development problem without prior preparation of the specific proposal; on the contrary, the outcomes of the public discussion serve as the basis of preparation of the specific proposals, submitted again to the public for further discussion. Present situation in Polish cities already proved the development of the latter approach and its superiority to the first one in regard to the acceptance of the local communities to the final result of the discussion on the selected sites. Also, the "getting ahead" methodology allows discussing serious development problems, defining the real conflict areas, possible solutions to it and – finally – public consensus on the final proposal. In the paper two specific cases are discussed: the Korfanty St. in Katowice and Old Town Market Square in Starogard Gdanski. In both cases two described participatory methods were used, which proved superiority of the "getting ahead" one. In both cases it allowed defining the core of the conflict and developing the possible scope of solutions. In result, it allowed achieving results more comfortable for the local community and meeting its basic requests.

11. Conclusions

Urban regeneration seems to be established as one of the key themes of urban planning in Poland nowadays. But it is deeply rooted in the market processes, which – on one hand – allows market-oriented development solutions, but – on the other side – can effect in social tensions and problems. At the same time urban regeneration processes are frequently associated with the development of the cultural activities and actions, which brings benefits to all involved actors of this game.

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Revitalisation of the entrenchments' areas of the Vistula Mouth Fortress in Gdańsk

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Abstract

The question of the rearrangement of fortifications premises and their facilities in Poland seems to become more emphasized nowadays. There are a great number of such establishments in Poland, which seem to be places of great potential. As these areas are usually neglected spaces of great historical and touristic value, it is a crucial issue to start and realize the projects for the revitalization and preservation of such sites. There are already examples in Poland of the successful revitalization of disused fortified sites and military zones and their transformation into very active tourist sites. Only when they are preserved, protected and finally made accessible to the public could the former military zones survive from absolute dereliction.

Key words: fortification; military zones; revitalisation; reclamation

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1. Introduction

The Vistula Mouth Fortress in Gdańsk which is situated in close proximity to the Port of Gdańsk, is an example of the world's largest fortified site of its kind existing today. Construction of the fortress complex was instigated during the 15th Century. Initially a defensive stone tower was developed within the fortress walls, which also adopted the function of a lighthouse, as it was situated at the very mouth of the town port. The location at the mouth of the Vistula was a vital defensive position which protected the city of Gdansk from naval attacks. The whole complex of the fortress was established during 16th and 17th Century while subsequently being rebuilt and improved after every war that reached Gdańsk. The fortification did not survive in its entirety however. In the first half of the 17th Century the Western Entrenchment was added and existed until the first half of the 19th Century when it was deliberately demolished as it no longer played an important role in the fortifying system. The last important major addition to the fortification is the (Mewy) Seagull Entrenchment which has only partly survived.

Throughout the four centuries of its existence, the shape of the fortress has changing significantly. Its builders – originating from Poland, Italy, France Germany and Netherlands were using different techniques to rebuild and reinforce the structure. These two facts enriched the history of the fortress' development and made it very complex. The history of the fortress becomes at the same time the reflection of the turbulent history of Gdańsk. It is impossible to write about the problems of the revitalization of the fortress without mentioning the most important historical facts, because only through these may one understand how serious and how large the scale of problems was.

The site remained in continuous military use until the year 1919. Yet since 1919 it was used partially as a police station and also served as a harsh political prison for a year. The creation of the Danziger Freistadt- Free City of Gdańsk demilitarized and liberated it from these functions by virtue of the Versailles Treaty. Just a year after the new terms of the agreement, Poland's first yacht club was created on the northern-west part of the fortress' entrenchments, which is surrounded by two moats (Fort Carrée's moat and the entrenchments' moat). The club remains in place to this day, but in a dilapidated condition. Since the time of World War II the site began to fall into an increasingly degraded state and finally it gradually became threatened with total destruction.

The first conservatory works started in 1956 and the fortress was put on the National Register List of Monuments.

Unfortunately these two steps towards the renovation of the site were unhelpful and for more than a decade the fortress became the fruit storage of one polish enterprise. To make the situation even more alarming – the authorities of the Port of Gdańsk decided to expand the port facilities, which eventually reached the entrenchment's moat. The port site closest to the fortress has since been occupied by the intense sulphur industry (storage, import and export of sulphur), which has a highly negative impact on the historical area. The Authorities of the Port of Gdańsk also decided to ream and deepen the Vistula Mouth in the nearest point to the entrenchments of the fortress, and finally, the very north entrenchment was severed. The two decisions of the port authorities completely degradated the fortress area and its final outcome was the creation of a void in the social sense, littoral space, hardly accessible, isolated from the urban fabric and utterly against its historical and tourist value. In 1974 the Museum of the History of Gdańsk overtook responsibility of the Fort Carrée. Following this the first serious conservatory works of the fort were conducted. Thanks to the changes initiated by the museum, the fortress gradually opened towards tourists and became more accessible. Even though, the Museum of the History of Gdańsk restored partly the Fort Carree's facilities,its entrenchments remain neglected still and nothing till the present day has been done to improve the situation. Thanks to the labours of the authorities of the Museum of the History of Gdańsk, new planning guidelines were set in 2002 for the Fortress' area and its surroundings. These guidelines have been extended to the whole Westerplatte Peninsula which can already protect the site from unexpected and undesired modes of development. Today it is just as important to restore the area of the entrenchments as to restore the Fort Carrée.

2. Methods

The idea of a well preserved, tourist-attractive site is to link the closest surroundings of the fortress and to make a passage between them, which would increase its accessibility. It is important to emphasize that the Vistula Mouth Fortress could be linked to the Mewy (Seagull) Entrenchment, situated on the north from the fortress and leading towards one of the most important monuments in the northern Poland-Westerplatte peninsula with its memorial to fallen soldiers. Simultaneously, it is necessary to remove the most bothersome (burdensome) industrial activities in the port – or at least to keep it at certain distance from the fortress, providing it a green belt for it, a sort of natural

protection and clear border between these two functions.

Obviously, there is also a great need of improvement of the existing entrenchments' site. Improvements of entrenchment mostly incorporates the arrangement of the existing greenery while underlining the historical, well preserved gunpowder works and bunkers from the 1st and 2nd half of 19th Century as well as the horse chestnut tree alley as an access to the entrenchments. Arrangements of the mentioned area should be as effortless and as economical as possible, depending on the scale of the project. Entrenchments should be maintained and improved in the form of a park with the gunpowder works serving as "park sculptures", existing, historic buildings preserved and few, most necessary premises connected with a small yacht marina development, such as small, but high quality hotel, administration of the marina, restaurant and possibly additional places of lower standard to host sailors coming to the marina. Inevitably, facilities of technical purposes, such as yacht storage, repair and conservation of small craft, need to be situated in closest surrounding of the fortress' entrenchments, possibly in north-east part beyond them. Although the fortress' future marina could welcome a large quantity of small and medium yachts (even up to 15 m of length in a few sections of the fortification's moats), because of certain fragility of the area and also a presence of bats in southern entrenchment (four species) it is important to limit the number of visitors. In addition to that, the southern entrenchment could become a protected natural reserve and in order to keep the place calm, the number of yachts (especially motor yachts) on the opposite moat side, would also be limited. It is also necessary to mention, that the car movement on the entrenchments should also be drastically limited (according to the planning regulations from the 2002 - roughly ten cars per day – only ten parking places- the minimum).The regulations for the fortress' entrenchments and its very surrounding also include the type and height of new building allowed, in order to maintain the panoramic view with the fortress' tower as a dominant feature.

3. Results

As most of the yacht ports in Gdańsk area are very small and were initially for students and scouts, they are not big enough to welcome tourists and their technical facilities are rather modest and limited, the new yacht marina in Vistula Mouth Fortress would improve the situation. It is also important to note that the localization of the port in Vistula Mouth in particular is essential, as the distance between the yacht marina in the very centre of Gdańsk, and the marina in Gdynia (even including future marina in Sopot) are too large for small craft to cover by daylight in a single day. Even though the yachting season lasts only from early May until the end of September, depending on weather conditions (which means yacht port would could become a shelter port beyond season), the new port-purposed premises on the fortress' entrenchments could still be used for small events such as sailing schools and conferences on yachting (ex. designing).

4. Conclusion

The fortress of Vistula Mouth served an important role in the history of Gdańsk and unfortunately finds itself today alienated and disconnected from the town. Not only could the fortress draw tourists, but it could be once more integrated and interwoven into the fabric of Gdańsk. No longer of military importance, the fortress could become a custodian of culture. Through carefully considered landscaping, the fortress could also become an oasis in a shuttered industrial mosaic.

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Public spaces of transport interchange

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Abstract

The first decade of twenty first century is all about travelling. Noticeable decrease in time of journeys, decreasing prices of tickets just encourage to pack a backpack and begin a voyage. And what about cities, how those changes of travel habits affect cites and their public spaces?

This short article, because of complexity of the problem, is focusing only on the public spaces surrounding railway stations, as they have instant and direct impact on inner city structure. Railway station plazas are gates to the metropolis, welcoming and encouraging visitors to enter and stay for a longer time. Furthermore because of instant access to communication services and perpetual flow of travellers, railway station area is particularly interesting location for commerce.

With proper design and management public spaces of transport interchange can become one of the most interesting and liveable public spaces of inner city.

Key words: urban travelling; city transformation; public spaces; visitors

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1. Introduction

Inner city public spaces are exceptional because they are most frequently visited and most intensively used public spaces in cities. Perpetual flow of various visitors encourages new social behaviours[1] but also stimulates the growth of commerce in adjacent areas. Unfortunately because of decreasing number of free development areas in city centres investors are forced to seek new solutions. That is why transport interchange and railway stations terrains became the focus of new development.

In terms of commercial services growth, the biggest advantage of transport interchange terrains is the pedestrian access to the city centre and uninterrupted, forced flow of travellers. That is why nowadays many modernisations and revitalisations of railway stations concern introducing shopping galleries and malls, which raises a question of the

[1] social behaviours (activities) – a group of optional activities described by Jan Gehl, as dependent on the presence of others in public space; according to Jan Gehl they are one of main determinant of the quality of public space. As social activities one understands active contact – conversations, greetings, communal activities, children playing etc., and passive contact – seeing and hearing other people (Gehl, 1996).

importance and functional role of adjacent public spaces.

2. Methods

During my research I tried to investigate as different sources as possible. Significant role in gathering information played of course reports from realized projects. The other irreplaceable sources of knowledge were publications of professor Gehl and his collaborators for particular relation to public space and social approach.

All pictures and figures I gathered during study trips or received from colleagues.

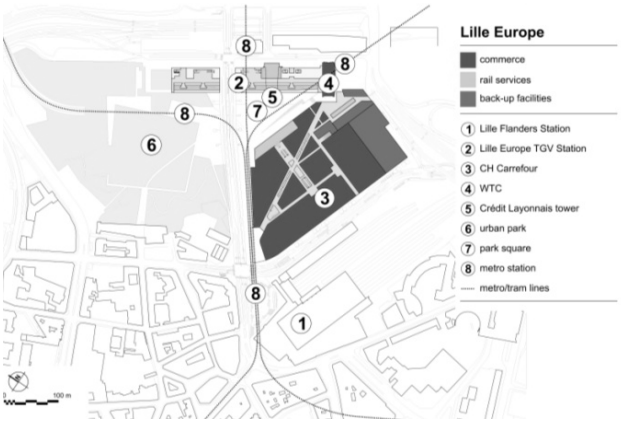
At the end, I cannot omit to mention the important role of internet in my research (seek words: public space, space syntax, pedestrian city).

3. Results

Public spaces take very important part in life of local communities, but also influence the perception of the place in eyes of tourists and travellers. In the age of globalization and constant competition, more and more attention is paid to projects of beautiful, prestigious, exceptional places, which will be globally recognized. Beauty and quality are not only aesthetic values any more. Today attractiveness of the place also stands for the price of localization (Kochanowski 2002). And when the city is memorised by its streets, squares, parks; appealing and safe public spaces become the ultimate weapon in the fight for the clients.

As mentioned above, public spaces of transport interchange are extraordinary because of the diverse visitors and intensity of pedestrian flow. They are also welcoming and therefore probably best memorised places in the metropolis. There are many examples of railway stations and their public spaces becoming visiting-card of the city. One of the most spectacular projects concerning development of TGV station is Lille-Europe. Immense project of the new interchange mode and commerce centre was completed with interesting programme of various public spaces linking new investment with historical Flanders station (Fig. 1).

Fig. 1 Diverse offer of Lille-Europe station with attractive public spaces (Source: author)



Diversity of functional programme influences the intensity and frequency of public space usage - squares and parks adjacent to railway stations are visited both by travellers and citizens (Fig. 2).

Fig. 2 Public spaces of Eurallile – designer included changing seasons in project the whole complex (photo by Zaluski D.)

Undoubtedly public spaces of transport interchange can also become very important places for local communities and therefore also for the city. Opportunity of face-to-face contact gives possibility of creating new interpersonal relations. Nonetheless, it is a difficult task for designer to obtain such effect as to encourage passer-by to stop and interact with other

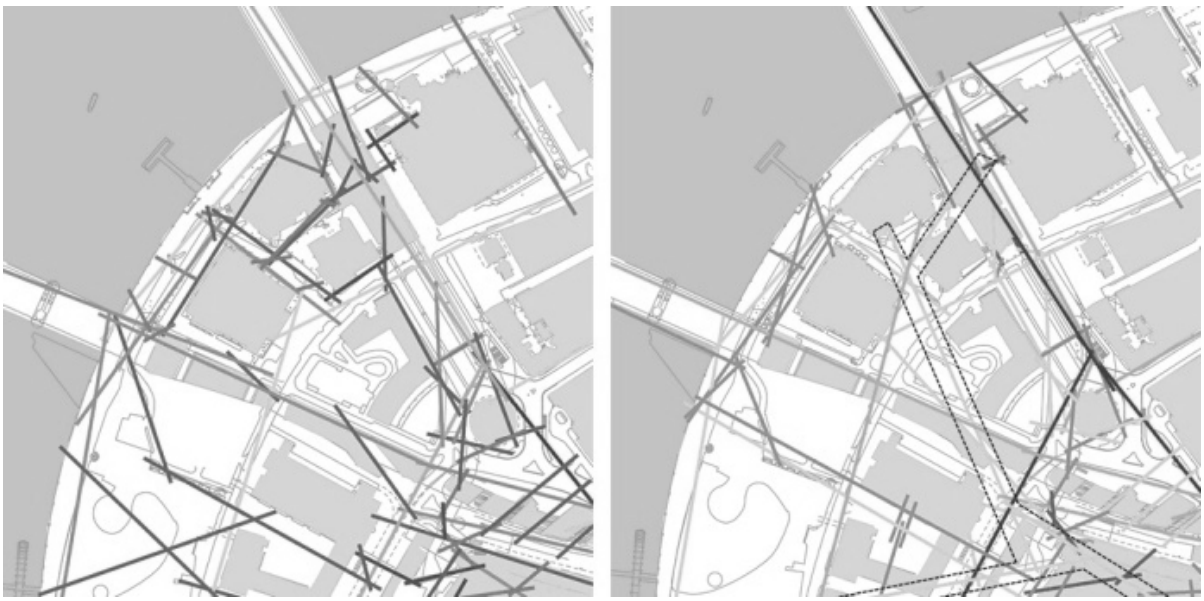
people. Public space of transport interchange is all about fast, direct connection which on one hand is an advantage of constant inflow of travellers on the other a problem to create safe and secure environment. It is a fundamental case to design spaces of potential interaction, which are not assigned just for one activity but encouraging spontaneous behaviours (Gehl 1996).

3.1 Systems and functional solutions

In the last few decades, one can observe the evolution in thinking about inner city public spaces. In order to propose a solution for a place, designer considers whole adjacent to the project system of public spaces – all the links and surrounding functions. His/her attention again focuses on pedestrians - prime users of public spaces. The accessibility, permeability and safety are crucial presumptions for system solutions (Romanowicz 1070). Inner cities again slowly become a walking dominium. Many downtown streets and squares are accessible only by foot when metropolises are introducing programs of reducing car traffic in centres. All those changes influence citizens and tourists travelling and commuting habits. More and more people travel by regional rail, buses and by metro. Of course the shift from private to public transport has the immense impact on the way how the travel interchange public spaces are used. Raising number of public transport users means bigger transfer and furthermore the need for faster and more effective "unloads" of travellers. On the other hand railway station square as the part of the inner city public spaces system still has to be a safe and attractive for pedestrians.

Extremely helpful in designing public spaces of interchange modes are mathematical analyses, which include not only whole systems of public spaces but also movement generators. Currently one of the most popular methods used in planning is space syntax analysis. The most representative example of application of that method in public space design is project for South Bank London. In spite of apparent attractiveness of the area, public spaces surrounding Waterloo Station were lifeless and regarded as dangerous. The analysis of area revealed problems in pedestrian circulation (http://www.spacesyntax. com). New links proposed in new functional model integrated the whole district and proved that place cannot be design without understanding further context (Fig. 3).

Fig. 3 Space syntax analysis for South Bank, London. Left picture illustrates existing space integration (blue – lowest, red – highest), right picture illustrates model of potential space integration after introducing new pedestrian links (Space Syntax Ltd.)



Unquestionably the main function of transport interchange public spaces is en effective distribution of travellers. Simple, easily memorisable spaces should provide safety, comfort and fast movement (Czarnecki and Siemiński 2004). Only then travellers eagerly wander around, visiting surrounding shops and bringing vitality to the area and inner city. During summer time in station plazas restaurants and cafes often put out their tables outside enriching the offer of the public space. Of course all those initiatives should be promoted and supported, as they introduce commerce to the area, but within the reason. Location of resting and entertainment spots is carefully planned not to collide with pedestrian flow and to give interesting views. The safety of travellers is the priority, which is why car traffic is carefully planned. Public and private transport are generally separated what enables better orientation in space both for drivers and pedestrians. Furthermore new travelling habits are forcing new parking solutions like Kiss&Ride, Park&Ride and Bike&Ride. One can conclude that defiantly public spaces of transport interchange are becoming pedestrian domain.

3.2 Safety and accessibility

Safety of public space is a broad definition. There are three main issues referring to the safety when designing interchange mode public spaces: victimization, terrorism and pedestrian accessibility, particularly disabled and handicap accessibility.

The biggest problem concerning safety of inner city public space users is pulsing liveability of inner city. Urban buzz in city streets and squares during day quiets down with closed shops and cafes. Public surveillance practically does not exist in downtown and public concession for go beyond the pale much bigger than in other parts of the city (Czarnecki and Siemiński 2004).

Transit spaces like railway station plazas are particular exposed to above problems. Accumulation of attractive victims heading towards trains and busses, disorientated when searching for the route attracts pick pocketing and acts of violence. Constrained closeness and limited visibility in anonymous crowd simplifies offenders the task. In such conditions police surveillance is extremely difficult and limited. Only proper design can significantly influence safety of public spaces – eliminating factors and situations exposing users to victimization; limitation possibilities, that space can give to the offenders; formal surveillance like cameras, police and informal public surveillance. Also quality reflects the safety of the place that is why all acts of vandalism are removed immediately (Fig.4). Another issue is safety of public spaces by night. All shops, restaurants and cafes opened in the evening and during night introduce activity to the place and increase informal surveillance, becoming "eyes" on the square.

Fig. 4 Gdynia. Dead, devastated public space near the entrance to the railway station (Source: author)

Unfortunately, railway stations and surrounding area because of its specification, always were and always be the aim of terrorist attacks. In this case, good design should be supported with information for travellers and employees to make them sensitive to suspicious behaviours of fellow passengers.

The last issue is pedestrian, disabled and handicap accessibility of the public spaces of transport interchange. Generally speaking underground passages and multi-level solutions

often indicate pro-car design. Attractive pedestrian public space should also provide shelter against climate conditions when needed and appealing rest places. In ageing European society the number of disabled, handicaps and elder users is dramatically rising. Good design should also consider issue of different cases of disability such as: needs of the deaf, needs of the mentally or physically handicapped, needs of the sand-blinds and blinds, needs of elders etc. (Johnni and Thuresson 2004).

4. Conclusion

Attractive public spaces of transport interchange inevitably are distinguishable from systems of inner city public spaces. By enriching offer of city centre services, they are integrating and influencing revitalization or modernization of railway station area. Although public spaces do not generate direct income, they can create proper ambience for the clients of adjacent shops and restaurants. High quality and uniqueness attracts to the railway station plazas not only travellers but also citizens. Well design public space of transport interchange can become meeting place, crucial for city inhabitants' identity and important unifying factor of city social life. To sum up, all that can result in more clients for commerce therefore ultimate victory of the metropolis in fight for tourists.

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Land-use changes in urban landscape by the example of allotment garden colonies in Brno (CZ) and Vienna (A)

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Abstract

The urbanization has been changing the landscape around us very quickly. Cities have been growing in both horizontal and vertical directions. The functional land-use of their areas - both inside and outside the cities - has been changing due to various aspects arising from needs and feasibilities of contemporary society. Allotment garden colonies are a significant part of urban landscape in many Central European cities. For the city and its inhabitants they constitute urban vegetation, public space and developing zones for other usage. The question to consider is what environmental, social and economic value they represent for the cities´ environment. There is need to draw a conclusion on how to deal with such areas in the future. Will the garden colonies be preserved, changed partially or totally? For this purpose it is necessary to analyze the historical aspects of their development and to compare this situation with the situation abroad. Changing them impetuously into fully built-up areas could lead to undesirable increase in environmental risks in landscape resulting in decrease of environment quality.

Key words: allotment garden colonies; urban green; big city environment; leisure time; soil sealing

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1. Introduction – Theoretical resources

Allotment garden colonies (further only as AGC) represent a specific way of using landscape. The multiplicity of their functions suggests describing them as “multifunctional”. They have a significant environmental, social and economic importance. It is necessary to use a wide range of scholarly literature, from landscape ecology to human geography up to urbanism, landscape and land-use planning.

Many architects (Auboeck, 1972; Vanicek, Tuzinska, 1979), geographers (Vagner, 2004), environmentalists (Rehackova, Pauditsova, 2006; Hoskova et al., 2008) and sociologists (Boudna, 1974) dealt with allotment garden colonies, with their appearance and their functions. Besides that

there is a lot of literature dealing with ACG only marginally. These are works dealing with the topic of urban vegetation, city and suburban pastime as their main topic. ACG play a part even when creating master plans. For this reason the city of Brno had a "General of gardens" (1982) and "An evaluation of allotment gardens localities on the area of the Brno city" (Kocian et al., 2006) elaborated.

ACG are an important part of (sub)urbanized landscape regarding their surface. The importance of landscape itself and every part of it is documented in European landscape convention (2000). The convention emphasizes the necessity of considerate dealing with landscape and the purpose of participative landscape planning.

Various approaches to landscape, its multiple meanings remind Antrop (2006). He claims that the landscapes often lose landscape diversity and identity, landscape character and sense of place. Traditional landscapes become fragmented and are gradually replaced by new ones. He accented demands on transdisciplinary cooperation.

If we want to perceive ACG as a part of (sub)urban landscape, we have to look for a broader theoretical framework in land-use of city landscape and its changes, in man's intervention into his/her environment and its impacts. Man uses landscape in his/her surroundings in various ways. He/she lives there, works there and relaxes there. By land-use of landscape we understand a particular manifestation of man's activity in space and time. This manifestation includes in itself certain historic, economic, social and cultural potential and represents a compromise between natural givenness of the area, technical possibilities and human knowledge (Zigrai, 1995). The contemporary landscape is then a result of mutual operation of abiotic, biotic and socioeconomic spheres. A town-dweller uses landscape for gardening or cabining to weaken the deficiency of the country way of life.

As ACG are predominantly located in urban and suburban landscape, it is necessary to start from knowledge of urban ecology when studying this subject matter (Sukopp, 1990; Marzluff et al., 2008). Even many Czech and Slovak geographers, landscape ecologists and environmentalists deal with the land-use of landscape and its changes. The theoretic basis is given for example by Zigrai (1983, 1995).

Blank un-built areas in city centres and its surroundings is rather an exceptional event. Developers and investors, naturally, seek for such places to make use of them in a most possible profitable way (shopping centres, blocks of flats etc.), i.e. sites with a strong share of built-up area. Built-up area belongs to one of serious threats for urban land. Soil sealing is a current topic, which can be documented in works of Burghardt (2006), Feller (2006), Hillel (2008), Wessolek (2008) and even in the report of the European Comission (2006). The boosting threat of soil sealing should be a warning signal against surface change of AGC into another way of land-use.

2. Allotment garden colonies in a city

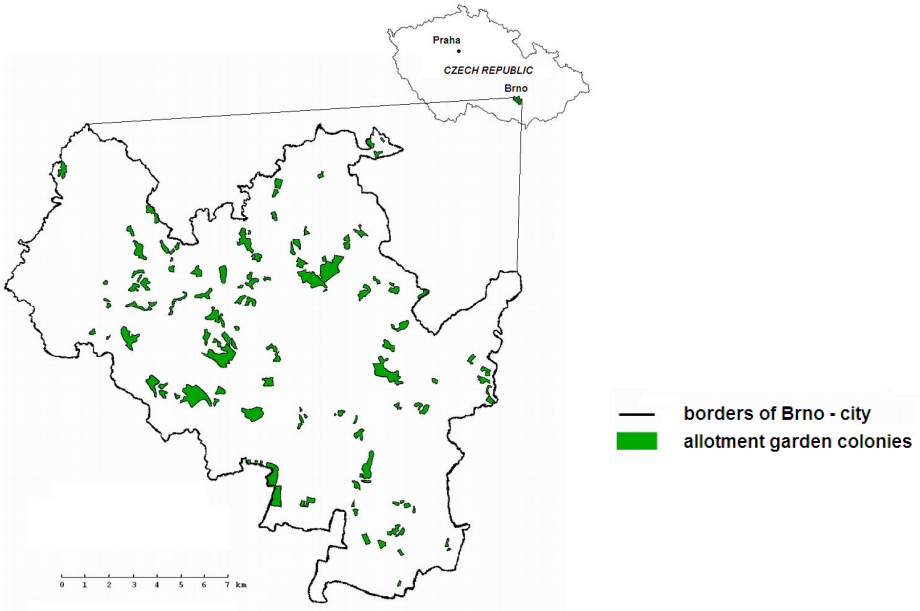
Gardening by itself became one of the Central European phenomena. People living in big cities were searching for a way how to spend their spare time. The new town-dwellers coming from country were missing direct contact to the countryside and a possibility to farm the land. Garden towns were designed in Great Britain at the turn of 19th and 20th century by Howard (Hall, 2002). Schreber gardens were created in Germany so that families could spend their free time together.

Later, especially during long communistic period people did not have many opportunities. Borders were closed, quality of housing (small flats in panel houses) was very low, cottages in countryside expensive and markets were almost empty. Allotment garden colonies served as resource of fruit and vegetable, place for self-fulfilment and recreation and as an important part of urban green areas.

Allotment garden colonies make up nowadays a vast proportion of urban landscape. For example, in Brno, with its 1 282 ha, they take up 6 % of the city's main area (Fig. 1).

The area of allotment garden colonies has undergone certain development during its almost two-hundred-year history and it has changed its appearance and functions. Even the relationships of gardeners to their allotments are completely different. The city would like to use major parts of these areas for other, more profitable reasons. Therefore, this topic is being discussed these days and it is important to deal with this subject in a matter-of-fact and comprehensive way.

Fig. 1 Allotment garden colonies in Brno – city, 2005. (Source)



3. Allotment garden colonies in Brno (CZ) and Vienna (A)

Brno-city passed the biggest expansion of AGC during the communistic isolation against the rest of the world. For these reasons are AGC seen as "relict of socialism". But where are some many AGC in the capital of Austria, in Vienna from? Following picture (Fig. 2) reflects their heavily deployment even very close to center. The only significant difference in driving forces of AGC development is already mentioned communistic period. How various driving forces did influenced the development of AGC in Vienna and in Brno documents a comparative case study.

Austria has another approach than Czech Republic. In Vienna's AGC has been allowed housing function. This fact is documented in following graph where are marked areas of AGC since 1986 and since 1994 AGC and AGC with function of yearlong housing (AGC+L). Linear trend of overall areas of AGC in Vienna supplements the fig. 3.

Fig. 2. Allotment garden colonies in Vienna in 2007. (Source: modified according to Schimon, 2007)

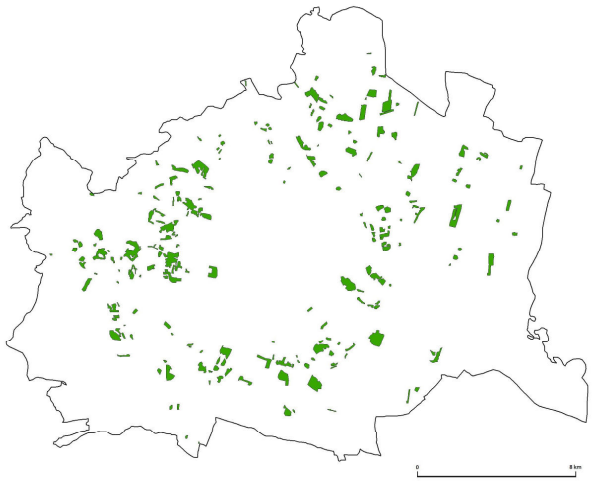
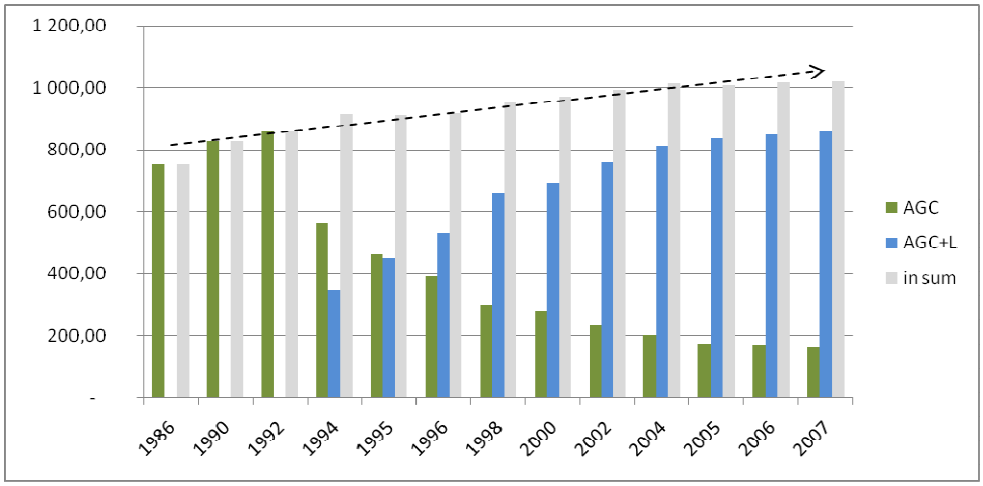


Fig. 3. Areal development of AGC [ha] in Vienna (1986 – 2007) (Source: Municipality in Vienna)



Of course there was set upper limit of areal building up that must not overpass 50 square meters. With this precaution is the land prevented from large area building up and protected urban green areas. There are growing garden cities full of decorative vegetation. By contrast in Brno is unfortunately pushed forward large housing projects. Economical profit stands against wastage of urban green areas. Soils are sealed what brings rising of environmental threats for urban landscape.

4. Allotment garden colonies, city and threats

Areas located in the vicinity of the city centre with low share of built-up area and high share of city vegetation interest many investors whose intentions with the given sites are different from their original appearance. However, for its quality environment the city necessarily needs sufficient amount of green areas. Permanently built-up areas have lots of negative aspects for its surroundings. Soil sealing comes amongst the most distinct threats for soil.

There are many different definitions of soil sealing in scholarly literature. The serious and essential thing, however, is that it comes to separation of pedosphere from atmosphere and surface biosphere (Berlekamp, Pranzas, 1992, In Burghardt, 2006). The soil is covered with layers of impermeable material, or the natural character of soil is changed in such a way that the soil itself becomes impermeable and is thus unable to perform many of its functions. Many researches concentrate on the negative aspects of soil sealing. Naturally, soil sealing has an impact upon urban climate, soil properties, water movements etc. It comes to the soil loss by excavating, to the loss of fertility, to the loss of both fauna and flora. The habitat is damaged by so called landscape cutting. The surface runoff, expenses on environmental improvement owing to broadening of thermic island, dust presence and the like, increase. Life space of low environmental quality is thus created. On the other hand, the built-up areas bring advantages regarding all human activities (Burghardt, 2006).

AGC still belong to surfaces with low level of built-up area. This fact is proved by following table (Tab. 1). AGC with their one-third share of built-up area come amongst surfaces which are classified by low level of soil sealing.

Tab. 1 Sorts of urban land-use and levels of sealed soils documented on the example of the town of Witten in Germany and classification of its levels. (Modified according to: Clever, Korndörfer 1991, Burghardt 1993; Böckner 1985, In Burghardt 2006)

Land-use type	Sealed surface (%)	Level
Public vegetation, public gardens	0-20	very low
Villa districts	20-40	low
AGC	**20-40**	**low**
Individual houses	40-60	middle
Estate housing	50-70	middle
Terraced houses	60-80	high
Industrial and commercial premises	70-100	high
Open block housing	70-90	high
Closed block housing	80-100	very high
Streets, car parks and adjacent vegetation	80-100	very high
Sports grounds	80-100	very high

Tab. 2 The extent of built-up areas in chosen AGC in Vienna in 2008. (Source: field research)

ACG	Built up-area [%]
Am Ameisbach	32,71
Garten- und Tierfreunde am Laaerberg	32,82
Gartenfreunde Ottakring	20,79
Gartenfreunde XII	30,18
Gross Jedlersdorf	13,47
Hackenberg	27,67
Ob der Als	17,87
Obstfreunde	15,45
Simmeringer Haide	23,59
Wasserwiese	25,78
Zukunft auf der Schmelz	15,19
Avarage	23,23

Even results of field research carried out in Vienna in the middle of 2008 correspond to these data. Eleven randomly selected AGC – located on the Vienna area - were evaluated. Several typical representatives from every AGC were chosen, in which calculations on the basis of MCA were carried out. Individual objects in AGC create built-up area of 15 % of total surface. Not a single chosen AGC exceeded one-third built-up area (Table 2).

Soil represents a limited natural source which cannot be renewed in the time horizon of human life (Burghardt, 2006). Every free piece of land should be protected and used only in a prudent way. AGC, either used for floricultural purposes, recreation or living, come amongst surfaces with low or very low share of built-up area.

5. Conclusion

If it comes to the dissolution of AGC, they should be replaced by at least environmentally equivalent areas. Loss of any kind of urban vegetation surely bears an increase in environmental risks. If the areas of AGC turn into something else, some other kind of vegetation should be considered first. In case of building objects serving permanent residency, ecological living should be contemplated, ideally with houses surrounded by green areas, let's say "a green island town" in a city.

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Contemporary social structures and urban forms

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Abstract

City structure mirrors the structure of the society inhabiting it. On the other hand the relationships within the society are formed in part by spatial character of the city the society inhabits. Living in times of unprecedented change, we need to map the changes in modern society to be able to build cities that reflect ever changing needs and utilizing new possibilities presented by technological evolution and the change in character of social interaction and employment. In order to test this hypothesis, it is important to examine various types of relationships between society and urbanity.

Firstly, specific examples of historic cities should be found, i.e. such that were clearly influenced by certain types of government. Then by comparing cities that were created by different governing processes rules of mutual relationships should be established, i.e. how society influences urbanity and how urbanity can influence society that inhabits a certain type of space. Secondly, by following the change of patterns in modern societies, it should be devised how these can influence further development of city structure. For this an interdisciplinary approach is needed – to get a fuller understanding of ongoing trends in informations technology, transportation, distant employment etc. It is also important to ensure optimal utilization of self organisational patterns in cities and social adaptability – in order to achieve sustainability. Then the findings should be implemented into a design method – to do this, a series of diagrams is used to illustrate the differences in space typology. First to see how plans are formed in existing cities and then how they can fulfil future needs and reflect future structure of society.

There is an opportunity but also a threat – the opportunity to resign from some of the most cumbersome of direct connections between city inhabitants. On the other hand such simplification may lead to destruction of basic connections, links and associations within society, therefore it is important to identify and retain some of the physical connections that are still essential in forming an urban society.

Key words: urban design; urban patterns; town planning; parametric design; attractors; public spaces; city structure; Gdańsk; Jarosław

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1. Introduction

One of the basic assumptions for the approach presented in this paper is that social structure and form of government are manifested in urban form. This might also work in the opposite direction, i.e. social interactions are formed and directed by the type of urban form inhabited by the specific society. Following these statements, it seems necessary to determine the type and quality of the mutual connections between social and urban structures. The society and the city become players in a an ongoing process of cause and effect.

Once we determine how these connections work, we can design cities for specific states of social development. A society should be at its most efficient when it inhabits an urban form that suits its needs. Moreover, we should also be able to diagnose what ails a specific society by analysing the city developed by it.

The issue of spatial reference between individuals is therefore very important for this topic. As Manuel Castells writes:

The development of electronic communication and information systems allow for an increasing disassociation between spatial proximity and the performance of everyday life's functions: work, shopping, entertainment, healthcare, education, public services, governance, and the like (Castells 2000).

How does this influence city structure and what opportunities lie in the future?

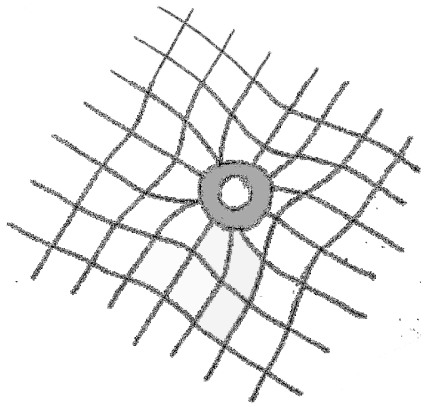
One of the tools used for this spatial analysis is attractor based. The basic idea and implementation of attractors is described further in this text. Due to interdisciplinary approach this work is a mosaic of interconnected ideas rather than a single one.

2. Definition of Attractors

2.1 Space curvature

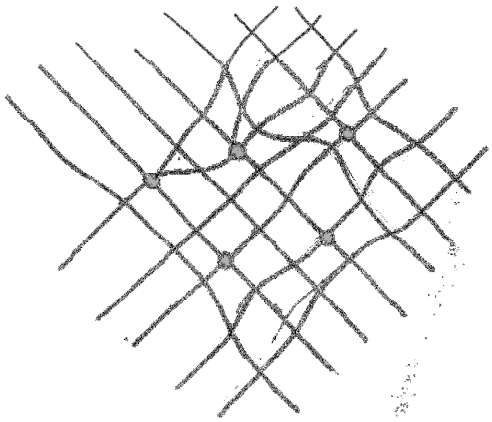
While analysing a complex structure such as urban space, it might be useful to use tools forged for description of time-space continuum in quantum physics. Without going into much detail, Albert Einstein's General Relativity theory states, that a particle in a gravitational field doesn't move along a curved path, instead it moves along the shortest path in a curved space-time.

Fig. 1 Space is bent by the central field of gravity. It can be re-interpreted in urban grid. (Source: author)



Analogically, a curved street is perhaps in essence a straight street following the social experience of the most efficient route to the nearest strong city-point. Complex social structure (global, modern, multi-cultural, inter-dependant) needs complex mathematical apparatus to simulate its space (therefore the need of advanced geometry).

Fig. 2 Urban grid deformed by scattered attractors (Source: author)



2.2 The definition

Attractor is a strong point within a city structure that influences geometry and function of the surrounding space.

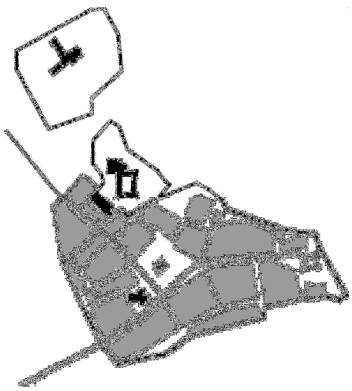
The streets leading seemingly straight to the nearby strongest attraction points, are curved. The human mind is only able to perceive right angle turns, so a winding street is treated as straight by a user of urban space.

2.3 Attractors in historic cities

A preliminary study of the attractor concept is done on the examples of historic cities in Poland: the feudal city of Jarosław and hanseatic free city Gdańsk.

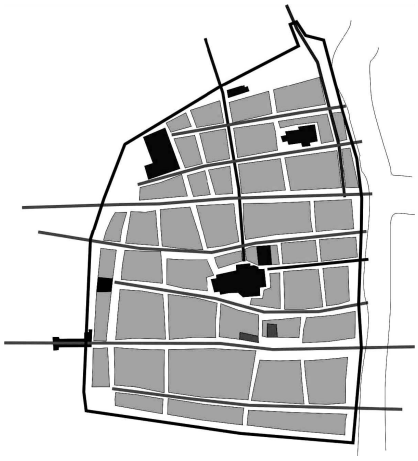
Jarosław is built around a roughly regular city square, with main directions set by connections with city gates. The strong attractor of the castle deforms the main principle by introducing a diagonal road. This enables clearly visible access to the castle.

Fig. 3 Attractor analysis of the city of Jarosław (Source: author)



The city of Gdańsk has been, for most of its history, governed by a city council independent of national and feudal rulers. The connection between the city centre and the location of the Teutonic Knights castle in the north is now all but invisible. The main rule for the city layout is the connection between land and water – with the Motława river on the east and main gates on the west. The only prominent North-South connection leads towards the st. Mary's Basilica, the largest church in the city.

Fig. 4 Attractor analysis of the city of Gdańsk (Source: author)



2.4 Distractors? Inhibitors?

It is known that plants have opposing reactions – positive and negative. Should it also be considered here by comparison? Should there be distractors opposing attractors? Or perhaps inhibitors? It could be that wastelands or steep slopes play a role of such inhibitors. Train tracks and waste disposal sites as well as cemeteries could play a role of distractors. However, a space-time continuum is only influenced by positive gravity values – and therefore it would have to be further examined – what effect would negative values of distractors/inhibitors have on the attractor based space analysis. In the process of city development a positive (constructive) approach takes place rather than a negative one. Even when destroying old structures (apart from catastrophes and disasters) it is undertaken in the name of modernity and enhanced technology – in order to ameliorate social and urban life.

2.5 Limitations

Obviously, no city is built as a result of one sole principle. In certain situations geophysical conditions may have the strongest influence on city structure. In some cities the forms of

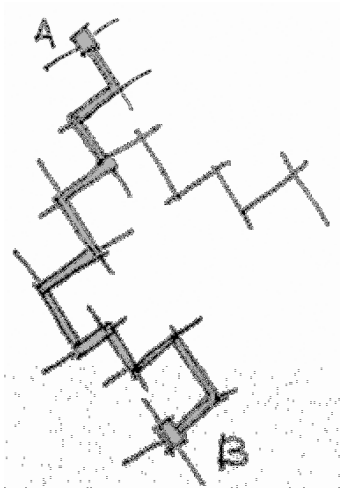
government have changed numerous times over the span of the city's history, so it would be hard to link the whole of urban development to one specific social order. However, it should still be possible to find areas and districts where the form of government and social structure have influenced the geometry of city plan and the form of the buildings.

3. The possible routes

3.1 Tree-like structures

In this type of city structure the number of connections between points A and B is very limited - often to a single possible connection. The route seems easier, but is more misleading, as there is only one right 'solution' to the problem of 'getting from point A to point B'.

Fig. 5 A tree-like city structure with limited connection options (Source: author)

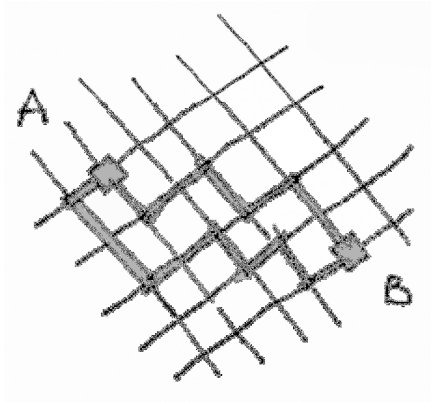


3.2 Grid-like structures

This type of urban structure enables choice of multiple different connections between points A and B. Hence the city is more adaptable, and less prone to congestion. It does create a more complex structure, but because, as stated before, the human mind is prepared for perceiving a right angle grid space - it is easy to determine the directions and choose appropriate route.

A city is a very complex system of interconnected patterns, and it is more appropriate to enable self-organisation of transportation and movement within it – so, to some extent - it can regulate itself.

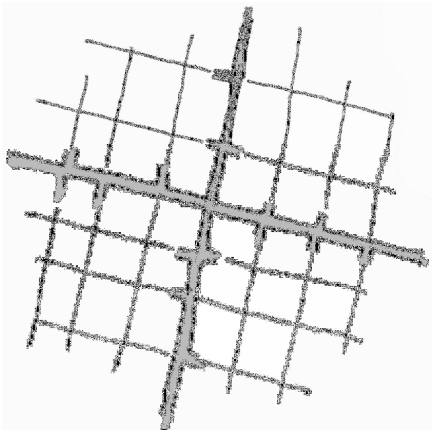
Fig. 6 A grid-like urban structure with multiple circulation options (Source: author)



3.3 Mono-itinerary

In this example a clear hierarchy of public spaces is visible, and main directions are clearly discernible. This type of space is preferred/induced by central government, army and religious administration - it underlines social hierarchy as well as the spatial one. Main roads are the domain of official public activities, while spontaneous civic activities tend to take place away from them.

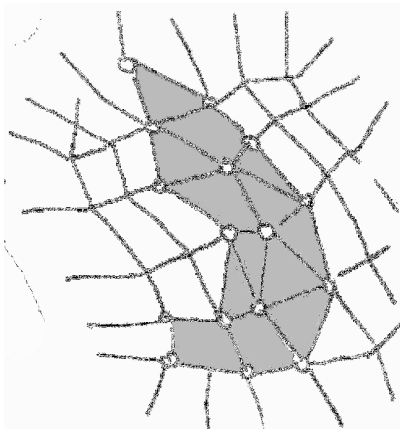
Fig. 7 Strong hierarchy of axial space (Source: author)



3.4 Poli-itinerary

These are the multiple sequences – the variable routes that lead between micro-centres. The city can be used in many different ways – according to the needs of the individual inhabitant. Industrial concept of mass production has been replaced with mass individualization and so the poli-itinerary replaces singular axis between points A and B. This system is more flexible and open for alternative ways of communication. The poli-itinerary induces development of whole areas, unlike the development of the surroundings of main axes only.

Fig. 8 Wide spread publicly used area in a non-axial space (Source: author)



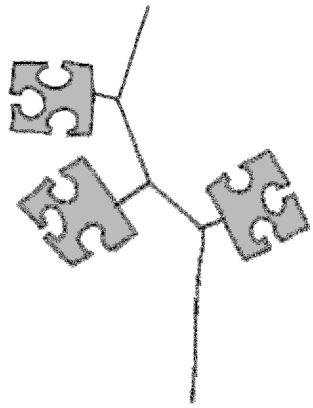
4. Continuity and discontinuity

4.1 Scattered city

Commercialization of city development has lead to discontinuity in public space. Each subsequently built area often is separated from its surroundings and relates only to itself and the main access road. There are no multiple connections unlike in traditional city blocks. This leads to severe congestion problems as well as social and spatial divisions despite the fact that the actual distance between settlements is relatively small.

In such cases inner space is public while external space is a non-place - a space without purpose. The lack of inner logic and hierarchy means that the users of space need additional guidance to be able to navigate to chosen destinations. In opposition to this, a historic city with well developed attractor structure should be easily readable for both citizens and foreigners.

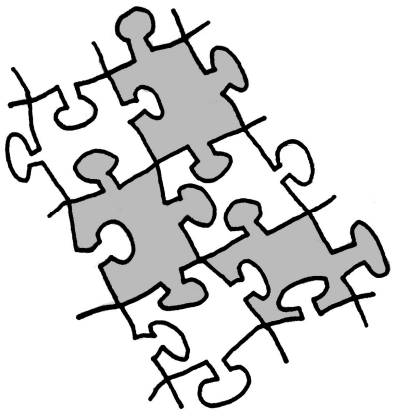
Fig. 9 Subsequently developed housing areas with singular connection with main access road (Source: author)



4.2 Puzzle city

Each city block relates to the surrounding urban space. Multiple connections are possible. What's more important private space is internal, while external space is public and belongs to the community. It enables exchange of functions and means that districts complement each other. The whole becomes more than just the sum its parts. Osmosis and homoeostasis take place.

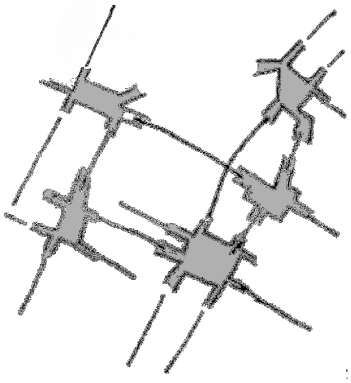
Fig. 10 A city consisting of a patchwork of inter connected areas (Source: author)



4.3 Micro-centres

A micro centre includes a commercial centre but at the same time its role is much more complex. It is about the way inhabitants use the space, about the connections between them and their social space, retaining people instead of increasing their circulation. A micro-centre fulfils its role if it gathers enough critical mass to become an attractor visible in urban grid.

Fig. 11 Public space as a sequence of micro centres (Source: author)



5. Conclusion

It seems that despite complexity of differing influences, social structure and form of government are clearly one of the most important factors determining city development. Therefore it seems useful to incorporate the separate ideas characterizing typologies of urban structures into a design method that would address needs and benefit from opportunities of modern world.

Cities are never perfectly regular, and the form of their public spaces is a result of many overlapping influences. A city is somewhere in between each of the presented oppositions: tree-like – grid-like, mono-itinerary – poli-itinerary, scattered – puzzle city. The aim is not to divide them into separate categories, and name one as 'bad' and the other as 'good'. The aim is to understand how the urban society works at present, and what can be achieved by means of analysing historic cities and modern technology, enhancing possibilities of distant communication. A question arises: which connections should become virtual and which should remain physical for a city in order to remain a living social structure.

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Fungal diseases on roses in urban space

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Abstract

In urban areas mostly ornamental plants are grown despite of their predisposition to diseases. One kind of these ornamental plants are roses. Around the world more than 30 000 forms of roses are grown. We know several fungal diseases that cause defects of these plants. The aim of this research work was to review and assess parasitic mycoflora in urban areas, to compare the frequency and harmfulness of fungal diseases depending on the type of greenery in the city of Nitra.

Key words: greenery; roses; urban space; fungal diseases; mycoflora

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1. Introduction

Cities can be entitled as urban eco-tech systems or urban ecosystems. From the ecological point of view, it is a hybrid system which includes abiotic and biotic factors, landscape components and products of human activities. The most important component of an urban ecosystem is urban vegetation. Urban vegetation is a natural part of living space which is represented as a complex of trees, bushes, lawns, areas with flowers etc. Pavements, terraces and some architectural and technical services are inseparable part of the urban greenery (Tomaško, 1997).

Urban greenery is improving the quality of living space therefore it is needed to dedicate a lot of attention all green spaces. Each suitable space should be used for creation of green spaces (e. g. parks, gardens etc.). However, urban spaces have different parasitic mycoflora which has a major influence on plants growth and development. Harmfulness of parasitic mycoflora on assimilatory organs has been reviewed from many sides. As a consequence of infection, surface film of mycelium, fructification and necrotic spots on leaves are formed. The assimilatory face on leaves is decreasing and making an early defoliation. But development of plants in cities is influenced also by soil aeration, vehicle emissions, dust, industrial air pollutants etc. The smog itself induces formation of greensick spots which have impact on the aesthetic value of plants and decrease the resistance against diseases and animal pathogens (Doruľová, 1989).

Green space may provide direct protection against physical environmental exposures. For example trees and other foliage may protect against air pollution, noise, wind, soil erosion, flooding, heat, etc. (Anonymus, 2008).

2. Methods

Within the research, health condition with the emphasis on fungal diseases of urban greenery in Nitra was reviewed and assessed. The basic research method was collecting of the parasitic mycoflora samples on the selected parts of roses, which are situated above the ground. Reviewing of presence of the pathogens was based on absence or presence of the morphological characteristic vegetative or generative parts of the host plants. On infected bushes, we were looking for changing color and size of leaves, color changes on stems and branches, presence of tumors, presence of mycelium and presence of reproductive organs of parasitic fungi. The samples of these ones were collected from each place, where we were founded some symptoms. The health condition of roses was assessed in four types of urban greenery. These localities were represented by inter block greenery, parks, private greenery and special type of greenery. Inter block greenery introduce the centre part of Nitra town, which is use for relax and the most of towns people spend free time with carrying about greenery. Parks are situating in the north-west side of town. It consists from two parts. One of them is use for relaxation and the second one is use for sport activities. Another chosen locality was private greenery, because of thinking the best protection of greenery. The last one was special type of greenery, which represents out planting around the schools and universities. Each sample was analyzed using light microscope. The results were recorded as microscopic images. Means of protection were proposed.

3. Results

On observed localities were identified only this species of pathogens: *Marssonina rosae* (Lib.) Diet., *Phragmidium mucronatum* (Pers.) Schltdl and *Sphaceloma rosarum* (Pass.) Jenkins.

Park greenery was the most attacking locality, where each of three identified pathogens were more than 50 % presented. It could be due insufficient urban greenery protection, but also type of position, soil and climactic condition to. On the other side, the less attacking locality was inter block greenery, where the presence of pathogens was under the 30 %. It is a part of greenery, where roses are protects front of industrial air pollutant and gas from motor vehicle.

Fungus *Phragmidium mucronatum* is a casual agent of rust on roses (Fig. 1). It was founded on each of spotted localities, but inter bock greenery was the locality with lowest percentage of damage with *Phragmidium mucronatum*. This fungus attacks roses in early stage of spring. First symptoms were observed already in May on backside of leaves as orange or black spots. Rusts form are an interesting group of fungi. These fungi cause diseases of many of the world's most important plants including grain crops, vegetables, and also trees (cypress, ocotillo, pines, aspen, pear) and many ornamentals plants found in urban environments (asters, carnations, chrysanthemums, dichondra, geraniums, hollyhock, iris, lily, rose, and snapdragon).

Fig. 1 Symptoms caused by *Phragmidium mucronatum* on rose's leaf from park greenery (photo: M. Majeská, 2009)

Fungus *Marssonina rosae* caused mainly black spots on leaves (Fig. 2). Small dark spots sometimes with darker margin are typically symptoms, which presented at the end of April. In common, this pathogen appears rarely. This fungus was occurred in the special type of greenery and in private greenery. In parks was the presence of this fungus spotted lower than 7 %.

Fig. 2 Symptoms caused by *Marssonina rosae* on rose's leaf from private greenery (photo: M. Majeská, 2009)

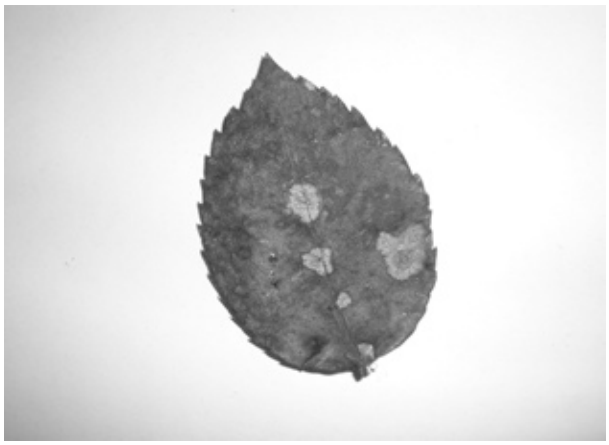

Fig. 3 Symptoms caused *Sphaceloma rosarum* on rose's leaf from special type of greenery (Source: www.sactorose.org)

Fungus *Sphaceloma rosarum* caused disease called spot anthracnose. Grey-white or brown colored round lesions are typical symptoms caused by this pathogen (Fig. 3). This pathogen was identificated on two localities, more accurately in park and in special type of urban greenery.

4. Conclusion

The result of this research is that the urban area of the city Nitra – abstractedly from the type of greenery – is in a high degree stricken by fungal diseases. The degree of damaged of urban greenery by fungus *Phragmidium mucronatum* was in range from 35 to 80 %. Species *Marssonina rosae* allocated the highest stricken in private greenery. It was more than 50 %. Whereas *Sphaceloma rosarum* is not so expanded pathogen and it occurrence is occasionally, the degree stricken of this pathogen was not allocated any essential levels. Therefore, the protection of roses should beside other floricultural measures contain also protection against fungal diseases. The protection should be focused on early destroying of growth phases of pathogenic fungus.

We are proposing several types of protection. Precautionary application of suitable fungicides prevents spread of fungal diseases. However, the using of fungicides is not always suitable especially in the public places that are used for relaxation and walking. The best possibility how to avoid spreading of plant's myco-parasites is breeding of resistant varieties of ornamental plants. Until the time such "healthy" plants will be common in our cities, the most important prevention is destroying the centres of infections.

Every green space in urban area requires maintenance. It is a living organism which evolves but also vanishes. The maintenance of urban greenery, parks, gardens and older greenery has a great meaning for enhancing the environmental quality (Juhásová, 1997).

Environments such as urban greenery that enhance physical and psychological health need to be investigated further in relation to their benefits in residential, educational, workplace, community and social settings. Urban green spaces are necessary for the healthy development of children as a means of

encouraging play and gaining access to nature (Barnett, Doherty, Beaty 2003).

Green space in cities provides direct protection from environmental exposures, promotes restoration, relaxation and reduction in stress, promotes physical activity, and promotes social interaction and cohesion. So it is very important to maintain and expand greenery in our cities. Accurate maintenance of greenery, parks and gardens in urban areas has a great meaning for enhancing the environmental quality in our cities.

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Landscape ecological stability as one of the main indicators for rural landscape quality evaluation

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Abstract

This paper deals with evaluation of rural landscape quality in Balog nad Ipľom. Ecological stability is used for evaluation of landscape quality. Coefficient of ecological stability is used in environmental practice for ecological stability rendering. It can be defined using various approaches. This paper deals with evaluating of coefficient using three approaches and their comparison.

Key words: landscape quality; landscape ecological stability; coefficients of ecological stability; Balog nad Ipľom cadastral area; Slovakia

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1. Introduction

Landscape quality is so broad term that it is not possible to be precisely define. The very flexible view on landscape quality ia a result not only from the perspective of the different approaches and outcomes, but also in terms of processing depth of this demanding and wide-ranging issues. The landscape quality, respectively indicators through which the improvement of the landscape quality can be obtain, is the main aim of most international agreements, strategies or treaties. The most comprehensive is the concept of landscape quality as defined in the National Sustainable Development Strategy of Slovak Republic, defiined as follows: "Environmental landscape quality is the state and development of the human influence on landscapes, threats and destruction of individual landscape components, respectively different landscape systems. Environmental landscape quality also depends on the human actions in the landscape, which act as a long-term "pressure" to usage of primary landscape structure, its gradual change in the secondary structure and the creation of tertiary (socioeconomic) structure, which represents, among other things, protection of economic interests in the landscape.

Evaluation of the landscape quality (or state) is based on an assessment of the physical landscape state and their integrity from the visual, functional and ecological point of view (Salašová, 2006). Also it reflects the state of

recovery of individual characters and elements that shape the character of the place.

2. Methods

The most frequented term used for characterization of landscape ecological quality is a term "ecological stability". Ecologists have proposed several incompatible definitions of ecosystems and landscape ecological stability. The most available definitions for this paper are in these works: Míchal (1982, 1992, 1994), Mičian, Zatkalík (1986), Miklós (1992), Forman a Godron (1993), Vološčuk (2001), Reháčková, Pauditšová (2007) etc. According to Míchal (1982) stability of any kind of system is not in its unchanging state, but in its ability to retain its own dynamic equilibrium. Ecological stability is the ability of the ecological system to persist even under the disruptive influence and reproduce their essential features as well as in terms of outside distortions. This ability is expresed by a minimal change in case of destructive impact or spontaneous return to its initial state, respectively development of the original trajectory after eventual change. Landscape ecological stability preservation is the most general and comprehensive condition for preservation of gene pool, biological heterogeneousness, equilibrium, flexibility, natural ecosystem behavior and natural productive ability of landscape (Izakovičová et al., 2008).

To evaluate the ecological landscape stability, as the most frequent indicator in assessing of the environmental landscape quality, several methodological approaches were developed, which are mostly based on defining the coefficient of ecological stability, which basic definition and mathematical expression were introduced by Míchal (1982) in his work. The equation for calculation of this coefficient of ecological stability has undergone several revisions and modifications for different types of work.

Coefficient of ecological stability (Míchal, 1982):

$$CES = \frac{S}{L} KES = \frac{S}{L}$$

where:

S – extent of relatively stabile areas (forest, meadow, pasture land, non wood vegetation)

L – extent of relatively unstable areas (arable land, built-up areas)

Attributes of the coefficient are interpreted:

CES < 0,10 areas with maximum of natural structures

CES 0,10 – 0,30 above-average exploited areas

CES 0,30–1,00 areas intensely exploited mainly by agricultural manufacture

CES > 1,00 nearly balanced landscape

Coefficient of ecological stability (Löw a kol., 1984):

$$CES = \frac{1,5A + B + 0,5C}{0,2D + 0,8E}$$

where:

A – areas with ecological stability (ES) degree 5 (forest, water areas)

B – areas with ES degree 4 (bank overgrow, greenways)

C – areas with ecological stability degree 3 (meadow, pasture land)

D – areas with ecological stability degree 2 (arable land)

E – areas with ecological stability degree 1 (built-up areas)

Attributes of the coefficient are interpreted:

CES < 0,1 degraded landscape

CES < 1 disrupted landscape

CES = 1 balanced landscape

CES 1 – 10 landscape with dominating natural elements

CES > 10 natural or almost natural landscape

Coefficient of ES (Reháčková, Pauditšová, 2007):

$$CES = \sum_{i=1}^{n} \frac{p_i . S_i}{p}$$

where:

CES – coefficient of ecological stability

P_i – area of secondary landscape structure (SLS) elements

S_i – ecological stability degree of landuse elements

p – total area

n – number of SLS elements in territory

Attributes of the coefficient are interpreted:

1,00 – 1,49 landscape with very low ecological stability

1,50 – 2,49 landscape with low ecological stability

2,50 – 3,49 landscape with medium ecological stability

3,50 – 4,49 landscape with high ecological stability

4,50 – 5,00 landscape with very high ecological stability

3. Study area

Balog nad Ipl'om is a village and cadastral area in the Veľký Krtíš district of the Banská Bystrica region of southern Slovakia. It belongs to Hontiansko-Ipeľský micro region and river basin Ipeľ. Area of Balog nad Ipľom is 834,94 ha and it lies in elevation range from 131 to 178 m.

Cadastral area Balog nad Ipľom is mainly created by arable land (77,33 %), meadows (6,18 %) and inherent part of the cadastral area is also built surface – municipality (5,96 %). There are mentioned all the attributes of secondary landscape structure for the complete overview: built surface – municipality (49,8 ha), agricultural area (1,8 ha), arable land (645,7 ha), unpaved road (5,3 ha), cemented road and transport area (7,8 ha), recreational area (2,7 ha), mosaic of gardens and vineyards (11,2 ha), graveyard (0,7 ha), meadow (51,6 ha), herb-grass crop (17,6 ha), non-used areas with wood species vegetation (4,1 ha), non wood vegetation (24,2 ha), lined vegetation (0,9 ha), forest plantation (1,5 ha), watercourse with bank vegetation (8,9 ha), water surface (0,2 ha) and landfill (0,94 ha) (Ružičková et al., 2005) (see fig. 1A and B).

Fig. 1A and B Cadastral area Balog nad Ipľom
(Source: Miklošovičová, 2009)

4. Results

In the cadastral territory Balog nad Ipľom, the first coefficient of ecological stability reaches amount 0,168, which means that cadastral territory is above-average exploited and there are evidently disturbed natural structures. This coefficient does not deliberate the ecological stability degree of different secondary landscape structure elements. According to second equation for calculation, which regards for total area of secondary landscape structure elements and also their ecological stability degree is this amount 0,063, which means that cadastral territory is degraded landscape type. When specific structure is deliberate, coefficient of ecological stability reaches amount 1,106, which means that cadastral

territory is classified as landscape with very low ecological stability.

Increase of ecological stability is possible to achieve by creating biological corridors, which are from 6 to 12 metres wide (Ministry of the Environment of the Czech Republic, 2007). They should be situated on arable land border or within fields (they should be 50 metres far from each other and following the tillage orientation within fields). Biological corridors should be with any derogation (mechanization, chemicals, etc.).

5. Conclusion

Agricultural production has a negative effect not only on landscape stability, but also of water resources, gene pool and forest resources, biodiversity or landscape scenery and finally intensive agriculture has a negative effect on human health. Increasement of ecological stability in case of intensive used monotonic agricultural landscape, can be achieved through appropriate measures such as vegetation strips for erosion control, suitable agro technic procedures, maintenance of eco stabilizing elements in the landscape and etc.

The quality of the cadastral territory Balog nad Ipľom is very low, as a result of the monotony and intense management of agricultural landscape, which is considerably signed to ecological landscape stability, that classify the land as degraded type with very low ecological stability. The landscape quality is constantly changing and evolving and we should be seeking to influence it, if possible, in a positive way so that we preserve it in the best condition for future generations in the context of sustainable development. This can be achieved through the protection of nature and landscape, and its proper planning and management.

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Tourism development vs. land cover changes

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Abstract

The word tourism was according to Kulczycki (1977) used for the first time in 1838 in Stendhal's book *Mémoires d´un touriste.* Since then it has got into most world's languages under the meaning of *"activities of people who travel to and stay in places outside their usual environment for more than twenty-four hours and not more than one consecutive year for leisure, business and other purposes not related to the exercise of an activity remunerated from within the place visited"* as defined by the UNWTO. Tourism is an economic and social phenomenon which – just like any other phenomena – is subjected to constant change. This change occurs not only within the travel industry itself, but also in the environment which tourism uses to develop in and to function.

Key words: tourism; tourism development; land cover changes; Corine Land Cover; Demänovská dolina

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1. Introduction

The relationship between tourism and the environment has been universally recognized and the importance of the conservation of the host area and its special feature has been widely accepted (Kavallinis, Pizam, 1994). Tourism plays a prominent role in rural development because of its ability to create job opportunities and prevent undesirable migration of population even in the economically stagnant regions. Among these we can also count the high-mountain areas where no other form of industry finds suitable conditions for its development. To be able to produce economical values, tourism needs to consume natural potential and environmental resources. Then it comes to the loss of biodiversity and destruction of natural areas, since the most visited and most valuable areas are often at the same time the most vulnerable ones, in particular, it is the case of natural parks and other protected areas. Still, tourism is a phenomenon, which diversifies the rural economy and it can serve as a development

tool if handled responsibly within the boundaries of sustainable development (Gajdoš, 2006).

2. Land cover and identification of changes

Land cover can be defined as a material manifestation of natural and social-economic processes, in other words - of land use, on the Earth's surface. Identification and analyzing of land cover is a prerequisite for analyzing causes and consequences, assessing human impact on landscape and for solving the problem of sustainability and ecological stability in various decision making processes (Feranec, Oťahel', 1999). One of the most important factors effecting high-mountain areas is human and human activities, which occur mainly in tourist attractive areas.

There are three basic groups of methods, by means of which it is possible to obtain information about landscape changes using images form one or more time horizons (Feranec, et al., 2007):

1. visual interpretation (also computer supported),

2. digital methods of changes identification,

3. combination of both.

Visual interpretation of changes is the oldest and the most spread method. Nowadays it's almost exclusively done by digitalization on a computer screen. As a basis one takes either the oldest or the newest aerial photograph from the time horizon which is then interpreted and the final layer of land cover is compared to older or newer images, whereby changes are identified. This procedure enables the interpreter to have control over the size and the character of changes and one can also eliminate illogical or too small changes. The final layer of changes does not include sliver polygons, which occur at each overlay of two layers generated independently from each other.

In contrast to the visual interpretation digital detection of changes is very sensitive to the exact position registration of input images, as well as to the radiometric differences between the images. Therefore it is much more used to identify changes using satellite data rather than aerial photographs. Lately a new method of object oriented classification is gaining ground, since it offers high quality results when mapping high mountain landscapes on the basis of aerial photographs and when certain conditions are at disposal, it could also serve for changes identification (Stanková, 2008).

3. Methods

In this research digital orthophotomaps/aerial photographs from the years 1986 and 2006 were used and analyzed by visual interpretation. They are a great data source for landscape monitoring, since they record the land cover state in a certain time. A legend for high-mountain areas land cover mapping was proposed on the bases of digital orthophotomaps. It stems from the Corine Land Cover legend and extends it by adding new level, details of which match the cartographic outcomes in scales 1: 10 000 to 1: 5000. New categories of the degree of destruction of ski tracks were added, by means of which it will be possible to monitor tourism impacts on the land cover and the landscape. The proposed legend was applied when mapping land cover in the model area of Demänovská dolina valley, particularly in Chopok – Jasná, which is located in its southern part.

4. Results

4.1 Study area

Demänovská dolina valley represents a typical high-mountain area and is a sought-after, well-known and fast developing ski resort situated in the National Park Low Tatras, which provides a certain degree of protection. The highest peak is Chopok with 2 024m.

There are 17 transporting sport devices in general in the Chopok-Jasná Ski Centre (11 ski lifts and 6 cablecars) with the capacity of

16 430 persons per hour. The overall length of the ski tracks is 24 244 m and half of them use artificial snow (http://www.jasna.sk/). The length and the density of the ski tracks together with roads and forest roads result in the fact that the width of continuous forest stands in between the clear cuts reaches only 400 to 50 m. The whole area of the ski resort above the forest boundary is endangered by potential erosion with soil transport of 5-15 mm/year. Measurements on the eroded surface of the FIS ski track showed 150 times higher volume of soil losses than in an adjacent spruce forest. Yet the intensity of pedogenic processes on the northern part of mount Chopok is only several hundredths of mm per year (Midriak, 1993).

4.2 Land cover changes detected by visual interpretation

Deforestation represents the biggest share in the areas of land cover changes (Tab. 1). It occurs mainly for the purpose of timber production, in some cases the purpose is also building of new ski tracks or widening of the existing ones. Deforestation is then followed by various destructions of green areas on the ski slopes and ski tracks, where it comes to water and anthropogenic erosion (Fig. 1).

Changes also occur in reforestation and growing of natural young stands and between artificial surfaces (building of accommodation facilities and various buffets and restaurants). Basically, however, there are minimum changes above the forest boundary (Fig. 2).

The impact of summer tourism demonstrates itself e.g. by trampling and destroying vegetation alongside the tourist paths, which subsequently leads to worsening of the state of air- and water regime in the soil and to accelerating of erosion or to devastation of the land cover.

Fig. 1 Erosion on a ski track below the forest boundary (photo: Ľubica Papajová Majeská, 2008)

Fig. 2 Ski track above the forest boundary (photo: Ľubica Papajová Majeská, 2008)

Tab. 1 Area changes of selected land cover categories

CODE 5	Area in 1986 (m^2)	Area in 2006 (m^2)
11232 Accomodation facilities	15 277	23 445
14216 Green areas of skiing areas	394 607	182 883
14217 Partially destructed green areas of skiing areas	157 159	268 432
14218 Destructed green areas of skiing areas	106 602	234 070
31210 Coniferous forests with continuous canopy	7 316 388	6 817 459
32111 Alpine meadows	1 044 878	1 017 095

5. Conclusion

Today's knowledge of social and ecological systems has greatly improved since the days of the Brundtland Report in 1987, which was suggesting that sustainable development can be achieved and maintained by simply following a set of rules. However, our knowledge does not keep pace with our ability to alter systems like tourism development (Miller, Twinning-Ward, 2005). We need to recognize the limits of our knowledge and seek deeper understanding of the tourism issue complexity.

Tourism development is desirable, but there is also a need to constantly monitor landscape changes in their progress and negative tourism impacts to be able to prevent irreversible changes which could end up in ceasing the development process.

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Vienna - The strange case of a local integrated public waste management system in the current context of globalization and neo-liberalism

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Abstract

Stimulated by the case of the "waste emergency" occurred at the beginning of the year 2008 in Naples (Italy), the article aims at giving to policy-makers a new vision on the topic of waste management in urban areas. The case of Naples has aroused in fact several reflections: first of all about the double nature of the waste both as problem and as resource; then on the possible existing relation among the waste management system, the public policies, the quality of life and the urban form in the European cities. In order to better investigate these dimensions, the article steps out from Naples and focuses on a more stable case study, Vienna, a city that is worldwide considered as a model of efficiency in the waste management domain. Through an analysis based on different methods it is shown how the current urban waste management system in Vienna is the result of a historical process: born as a sectorial political choice taken in a moment of crisis and isolation, it has afterwards developed as an integrated urban policy. After having outlined the past process and the current situation, the article opens up questions about the future and especially about the effectiveness on the regional level (Vienna-Bratislava city region) of such a successful model on the urban scale.

Key words: waste management; urban planning; public policies; sustainability; form of the city

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1. Origin of the research

It is not easy to explain why such a specific and technical topic as waste management has become interesting for an urban planner.

The answer - or at least the starting point of the research - can be probably found in a particular event happened in Italy at the beginning of the year 2008 and developed during the following months: the state of emergency was declared in the Campania region because of the huge amount of waste that could not be disposed and a special commissioner for the waste management was appointed by the former Prime Minister Romano Prodi, in order to solve the problem in the next four months. Following the daily news and focusing on the development of the process

more than on finding responsibilities and solutions to the problem had been a great opportunity to start to consider the topic of waste management in a new light and in a wider sense. Although the news has mainly focused on the negative effects of a "bad waste management" (risk for the environment, for the health, for the law and order), alongside to the relevance of the local dimension, some other aspects have also emerged, such as the global dimension of the problem - a large amount of the waste stored in the Campania region comes actually from other countries or Italian regions - and the economic value of the waste, recognized not only by the criminal organizations that are illegally dumping the waste coming from other regions or countries but also by other private actors. Also in Naples, in fact – as it has been happening already for ten years around Europe – some big multinational companies, the so-called "multiutilities", are starting to make room for their business and to compete trying to replace the Public Administration in the management of part or of the whole waste management cycle (collection, plant construction, treatment..).

The above mentioned elements already show the complexity of the issue and the strong interrelation between the waste management and the economic, territorial, social and political dimensions. Unveiling such complexity and reflecting on it in order to promote the mutual learning of cities represents an interesting challenge for a form of urban planning intended as urban policy analysis and design.

2. Research question and method

Stimulated by the case of Naples, the research reflects on the role of waste management in urban areas and questions the inevitability of the current European trend towards privatization through the analysis of another case: Vienna, a European metropolis in transformation and in search of a new identity that has elected sustainability and quality of life as core elements of its future development strategy. After some experiences on the field, the research question was finally articulated as following: *is Vienna affected by the phenomenon of the privatization of the public services that is undergoing in most of the European countries and has been proposed as the only solution in Naples? And above all: does any relation exist among the waste management system, the public policies and the quality of life?*

The research has been carried out as a case study to reflect on in order to connect the specific context and its high degree of innovation with a more general theory. This approach has allowed to list a set of actions that could suit other contexts and to avoid the automatic application of the Viennese model merely as a "best practice" (Yin 1984).

Given the complexity of the topic and the particularity of the approach, it has been difficult to find an already existing method that could be followed as a theoretical basis for the research. Therefore it has been chosen to combine two different methods stemming from very far traditions that apparently do not share any elements: the Material Flow Analysis (MFA), consolidated in the Seventies in the chemistry field and the Public Policy Analysis that was introduced during the Sixties in the political science domain.

The method of the Material Flow Analysis, a quite recent discipline based on the ancient physical law of the conservation of the matter, considers the territory (region, city, single housing unit) as an organism with an own metabolism (Brunner 2004; Wolman 1965): the resources enter this organism (or system) in form of inputs (goods, air, water etc), are transformed by several human activities (housing, transport, communication, eating, cleaning etc.) and are finally partly expelled in form of outputs and partly conserved in form of stock within the system (solid and liquid waste, air pollution etc.). The approach of the MFA to waste management is very progressive and not so common for most of the public administrations around Europe: the management of waste is seen in fact as a way to control the flows of resources through the territory reducing their impact on the

human health and on the environment, to save materials, energy and space and to limit the threat for the future generations through an appropriate treatment of the waste before the final disposal.

The MFA represents an appropriate way to analyse the effectiveness of a waste management system and also leads to consider the territory as a system in which different processes happen, interact and have consequences, as the Public Policy Analysis with a focus on different topics does. The Public Policy Analysis is in fact a way to study the effectiveness of the actions of the public administration. It defines a public policy as a group of actions and of interactions aimed at coping with a problem, a demand, a need or an opportunity of public intervention and therefore particularly focuses on the actors involved in the process – individual or collective both expressing unitary and recognizable objectives -, the available resources – economic, political, cognitive -, the way the actors interact – confrontation, bargaining, problem solving - and the stake of the process. Starting with the chronological reconstruction of the process, the analysis continues with the identification of the different actors, of their roles, of their objectives and of their patterns of interaction and is concluded by the evaluation of the success of the policy in relation with the different actors and their objectives (zero sum or a positive sum game) and not as an efficient objective solution to the problem. The Public Policy Analysis is not only a strong basis to analyze the complexity of the processes happening in the urban space, but also introduces an interesting point of view on the issue of the conflict that is not considered as an obstacle but as an event that often can start the process, lead to a redefinition of the preferences of the actors, change the terms of the problem or create new alliances among the actors.

The use of the two methods has allowed to recognize the uniqueness of the case of Vienna in the European context and to identify the elements of innovation that will be described in the following pages.

3. The European context: waste management between globalization and neoliberalism

Although the technology has rapidly developed in the decades and the debate about sustainability has contributed to the rise of a more environmental friendly consciousness in many countries, still the waste production is usually considered as an unavoidable side-effect of the economic activities and has therefore been treated as a quantitative problem to get rid of through waste management. In this sense it is possible to better understand the rising trend towards the shipment of hazardous or simply exceeding waste from wealthier to poorer countries or regions – as it is happening in the case of Naples - that can be considered a form of *globalization*, intended in general as *"an enormous variety of micro-processes"* (Sassen, 2006) that consist in the reduction and removal of barriers between national borders in order to facilitate the flow of goods, capital, services etc.

Alongside with the process of globalization, the waste management is also invested by another trend that is considered to be common in many contexts: *neo-liberalism*, intended as a political choice towards privatization in several fields formerly managed by the Public Administration. In fact, the European market of the waste management seems to be a rising sector where more than 5000 private companies operate. The dimensions of the business are the following (2005): 30 billion euros for the municipal waste market, 62 billion euros for the non hazardous industrial waste market and 8 billion euros for the hazardous waste market; for the future ten years it is foreseen an increasing rate also related to the access of Eastern European countries in the EU space that represent an interesting and wide market for the private companies. These data reflect a tendency towards a progressive privatization of the public services that started ten years ago in Europe as a result of different reasons such as the liberalization of the markets promoted by

some EU laws and the outsourcing of the services promoted by various local authorities.

In particular the EU Directive on Services (2006), according to the policies for the creation of a European market without internal barriers to the circulation of goods, people, services and capital, aims at increasing the competition among the private service providers and to promote their free movement on the European territory. While the supporters of the EU Directive have justified it as the only way to provide efficient services in a context of scarce public resources, the representatives of some local governments – mainly from Germany - have opposed to it: to outsource the services of a public administration entrusting specialized companies would threat the traditional territorial model and the capacity of the government to manage and coordinate different policy areas.

4. The strange case of Vienna

Already from the first analysis it has been evident the main anomaly of the case of Vienna in the European context: almost the whole cycle of waste management is still in the hands of the Public Administration, which is very competitive with respect to the private companies that try – in vain - to enter the local market.

Another (apparent) strangeness of Vienna, defined and well known on the international level as a sustainable city, is that the total amount of waste to be recycled does not exceed by large the minimum imposed by the EU (30 %). This datum actually shows the peculiarity of a choice taken some decades ago by the Viennese politicians and updated but basically confirmed nowadays: in the Fifties, while large part of the cities of Western Europe were experiencing a considerable growth and sustainability was still an unknown concept, the city of Vienna, which on the contrary was undergoing a severe crisis, due to the isolation from its traditional partners (Eastern Europe) decided to exploit the waste as a source of energy. From the first incineration plant built in 1959 to the present (now Vienna has the wider district heating network in Europe) a lot has changed, but not the commitment of the Public Administration to invest in this sector.

Among the main changes we can list the attention towards ecology and the integration between waste management – traditionally considered as a sectorial policy - and other urban policies. The main engine of this strong change of perspective has been an event: the accident occurred at the beginning of the Eighties in the incineration plant of Spittelau, famous for its central location that is unusual in many other European cities: the inhabitants of the neighbourhood (*starter* of the process) rioted for the immediate closure of the plant of Spittelau and the eventual creation of a new plant outside the city, while the sector of the municipality of Vienna in charge of the Waste Management (MA 48) confirmed the necessity of maintaining the plant in the same position because of economic and technical reasons. The two different positions lead to a conflict during which the MA 48 tried to assume the role of *director* of the on-going process, sure of its political power: as a compensation of the public decision that could not be changed (to maintain the position of the plant) it proposed to renew the building, entrusting the famous Viennese architect F. Hundertwasser of the renovation of the façade. The decision taken by the MA 48 not only did not satisfy the inhabitants, but provoked the violent reaction of many other citizens and especially of the environmentalists (*allies* of the inhabitants and *opposers* to the MA 48): if Hundertwasser, member of the Green Party, had accepted to conduct this work, he would have betrayed the green principles. To renew the façade, in fact, would have not solved the problem that in the perception of the environmentalists was the shift to a zero waste society where the only possible way of waste management was recycling. Unexpectedly after some months of reflection, the architect decided to accept the work commissioned by the municipality and to use his fame to act as a *mediator* between the environmentalists, who were supporting the local inhabitants, and the decision maker (the MA 48). As a result the MA 48 proposed not only to renew the

architecture of the building but to take into account the demand for a more sustainable society, for a reduction of the threats to the environment and the human health and therefore invested a consistent amount of resources in the scientific research, in order to find new solutions in the mid and in the long term.

The research, promoted and supported by the Municipality of Vienna, mainly focused on new technologies for the incineration and district heating (reduction of emissions, introduction of filters, safety of the plants) and on alternative forms of waste management to be adopted in the long run. Therefore the Institute for Water Quality, Resources and Waste Management of the Technical University of Vienna was strengthened and the method of the Material Flow Analysis was consolidated, while a new Institute for Composting and Use of Compost in Agriculture was created within the University of Natural Resources and Applied Life Sciences of Vienna (BOKU).

The waste management therefore started to be considered a fundamental public service in the agenda of the city, a service that should have been offered in an undifferentiated way in every neighbourhood and that should have contributed to the quality of life, defined both as quality of the environment (reduction of emissions etc.) and of quality of the public space (cleanliness, accessibility). A deep knowledge not only of the topic, but especially of the context (existing resources, main features of the territory, needs of the citizens etc.) developed in the Public Administration and lead to a stronger collaboration between the MA 48, other sectors of the municipality (Environmental Protection, Water Management, Urban Agriculture, Urban Planning etc.) and experts; even the inhabitants of the neighbourhood, the citizens in general and the representatives of environmental associations changed their role from *opposers* of the MA 48 to *allies*. This collaboration was mainly aimed at evaluating the current situation and to draw future strategies, to be translated afterwards into selective investments made by the Public Administration. The cooperation continues still today and is formalized with the tool of the Strategic Environmental Assessment (SUP) that involves all the above mentioned actors and is aimed at the production of a new waste management concept (Wiener Abfallwirtschaft Konzept) every two years.

Looking at the material results of the process, on one hand the extension of the district heating network has been promoted to reach the present 1000km (21,9 % heating demand of the city), while on the other hand the process of composting has been introduced as a form of recycling. The improvement of the performances of the incineration plants and the consequent substitution of polluting resources with clean resources (heating obtained from the waste and not from oil; use of compost instead of chemical fertilisers) have contributed to a strong reduction of CO_2 emissions and to the enhancement of the environment: nowadays Vienna is listed among the best cities in the world concerning the quality of life and the main distinctive factors expressed by the citizens are the air quality, the way the public resources are managed and the usability of the public spaces.

The choice for the district heating and for the composting shows also a strong connection between waste management and urban planning: Vienna in fact stands out in Europe for its extremely compact form and for the strong presence of agricultural and forest areas around the city. Therefore, on one hand the creation of a capillary network of district heating has been possible and less expensive than everywhere else and on the other hand the idea of introducing the composting process has been suggested by the traditional presence in the city of the urban agriculture that was declining lately. Hence the production of natural manure became part of a more general revitalisation policy of the urban agricultural areas through the introduction of biological agriculture and the commercialisation of the products in the city, which was made possible only after various campaigns of the Public Administration to make the citizens more

aware of new forms of consumption. Also in the last Masterplan (STEP 05) the future image of the city is shaped upon the existing: Vienna is still presented as a compact city where the development focuses on internal abandoned areas adjacent to the already urbanised areas and aimed at better defining the borders of the agricultural belt.

Nowadays the waste management policy in Vienna seems to be stable but is the result of the long and complex process outlined in its fundamental characters in the previous lines. Looking back on it, some elements of the process are worth underlining in order to better understand its importance. First of all it has developed in three different phases: the definition of the problem during which the interaction among the main actors was conflictual; secondly the confrontation and redefinition of the problem characterized by the bargaining among the actors and thirdly the implementation of the solution, where the main actors have started to cooperate.

While at the beginning the problem risen by the local inhabitants seemed to be the location of the incineration plant, it was afterwards redefined by the environmentalists as the shift to a zero waste society; the nature of the problem has still changed thanks to the intervention of the technical experts (IWA-TU Wien), who introduced the point of view of the Material Flow Analysis. In the end the problem was defined by the MA 48 as the protection of human health and of the environment and the saving of resources (economic, material, spatial). It is fundamental to stress that the final redefinition of the problem is the result of the *scientific knowledge* produced by the technical experts and of the *interactive knowledge* produced by the MA 48 as an interpretation of the opinion of the other actors involved in the process.

The capacity of the MA 48 to consider and interpret the point of view of the other actors can be considered *strategic*, since they used it to anticipate the behaviour of the other actors and to advantage themselves.

Regarding the success of the process, at the beginning it seemed to be a *zero sum game* for the inhabitants, since they were perceiving themselves losers against the powerful public administration, while in the end it turned out to be a *positive sum game*, since the main actors involved obtained advantages.

5. Regional cooperation: dream or reality?

After the fall of the Iron Curtain in 1989 a new era has started for Vienna, since it has opened again the possibility of the cooperation between the city and the Eastern European countries, which represented its traditional partners. Since the entrance of Austria in the EU in 1995, Vienna has started to become the door to the East for several international companies. After the entrance of several Eastern European countries in the EU the cooperation has further strengthened and has lead to the creation of a transnational region composed of Vienna (A), Bratislava (SK) and Brno (CZ). The new region, called CENTROPE, aims not only at strengthening the economic, infrastructural and knowledge relations, but also at preserving the rich natural heritage (Danube, Viennese Forest, Little Carpathians) existing between the different centres, in order to be attractive for potential international investors as a high environmental quality centre.

In spite of the declared cooperation within the region, very little has been achieved in the ten years after its constitution and the reality seems to be very far from the plans: while Vienna is strongly investing in the Danube Park and in environmentally friendly infrastructures that cross the city and two other Austrian regions, Bratislava is now experiencing the boom, as many Eastern European cities that have just entered the EU: the investments, mainly private and foreigner, are concentrated on the building sector, the creation of hard infrastructures and on dumping facilities far from the city centre. Although the city is surrounded by an extremely rich environment (Danube, Carpathian Mountains, forests) the resources for its preservation are steadily decreasing.

Although CENTROPE has been defined as a learning region, the exchange between the cities is marginal. As it was stated

by the chief of the Urban Planning in Vienna, Dr. K. Puchinger, the political and economic context of the two cities is too different and an effective implementation of the CENTROPE project would be possible at the beginning only through small pilot projects.

Waste management could be therefore a suitable cooperation project since the city of Vienna has consolidated not only an effective but also a very flexible approach that many Austrian private companies have learned and are now exporting in Eastern European countries. A "controlled cooperation" and a continual confrontation between the two cites could promote fertile learning, balancing the environmental threats that are following the boom, and probably reduce some of the structural weaknesses in facing western private companies typical of the Eastern European countries. Such weaknesses can be mainly described as: governance problems (scarce internal coordination among different sectors of the public administration; insufficient systems of consultation of the local stakeholders), capacity problems (scarce experience, reduced exchange of good practices) and economic problems.

The exchange with the Viennese experience can also show how waste management could be profitable and could become therefore an investment for private companies.

6. Final remarks and possible reflections

The case of Vienna awakens several reflections that could be interesting also for different contexts that should be considered as unique and with specific features, in order to avoid to automatically apply the experience of the Austrian city. Incineration, district heating, recycling, composting, dumping are just different options to reach the real objectives of the waste management as they are defined by the theoreticians of the Material Flow Analysis, that is to say to protect the health of man and of the environment and to save resources (materials, energy, space). Therefore in every context the choice of one or more methods of waste management is closely related to the socio-economic situation and to the urban form: for example in a context of sprawl the application of a district heating network based on the Viennese model would be a non-sense.

First of all in the case of Vienna it is interesting the change of perspective about the waste, no longer considered as problem, but as a resource. However this is not the main peculiarity of the waste management in Vienna since others are the most innovative elements of this case, such as the shift from a sectorial policy to an integrated one with various other urban policies, as it has already happened for other policies (transports, urban renewal). Moreover while in many Italian cases – Naples is the most evident but not the only one – waste management is considered as the answer to emergency, in the case of Vienna this has developed as a structured policy that has been articulated over time and has become structuring for the whole city.

The Viennese experience also shows as the commitment and the responsibility of the Public Administration in the waste management can generate knowledge within the public actor and power against possible private competitors that rarely have found space in the Viennese market, but have instead treasured that diffused know-how and have started to successfully operate in other contexts, such as Eastern Europe. Finally also regarding the topic of the participation the case of Vienna gives interesting cues and shows how it cannot be decided *a priori*, in order to legitimate choices that have already been taken: the accident of Spittelau represented a critical and unexpected event that on one hand lead the citizens to doubt about the Public Administration and to self-organise and on the other hand pushed the Public Administration to invest in transparency, in order to give place to a dialogue.

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Parallels between Territorial Systems of Ecological Stability and Spatial Communication Networks in Cities. Another Approach to Public Spaces

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Abstract

Public spaces are inevitable parts of urban structures. There are many strategies how to handle with them. Sustainability, good ecological or socio-ecological and communication qualities should be the main attributes of well-tended public spaces. One of the ways how to manage it is to create networks of public spaces. My intention is to offer another view on organising public spaces in cities. As it is written in the title the key approach lies in comparing and finding parallels between Territorial System of Ecological Stability and Spatial Communication Networks in Cities.

Key words: communication; public spaces; territorial system of ecological stability (TSES)

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1. Introduction

"Every ecosystem on Earth includes humans or is impacted by human actions; in turn humans and our institutions are influenced by the ecological systems within which we function. Often research has focused on social problems or environmental problems separately." (Newman et al., 2008, p. 94)

"Cities can become more sustainable by modelling urban processes on ecological principles of form and function, by which natural ecosystems operate." (Newman et al., 2008, p. 92) The same principle can be applied when speaking about public spaces. My intention is to offer another more complex view on organising public spaces in cities. As it is written in the title the key approach of my work lies in comparing and finding parallels between Territorial System of Ecological Stability and Spatial Communication Networks in Cities.

I consider these three terms as the most important key words for this topic: Communication or Spatial Communication Network (see paragraph 4), Public Spaces and Territorial System of Ecological Stability. Here are their definitions relevant to the topic of my research.

Communication: According to the Encyclopaedia Britannica communication is „the exchange of meanings between individuals through a common system of symbols“ (Encyclopædia Britannica Online, 2009). There are different kinds of communication: nonverbal, verbal, mass and public communication. But it is not only about exchanging of information, communication is also an interaction between people, between people and landscape, people and city or other spatial structures. Using ecosystem metaphor everything is a part of socio-ecological system and there are interactions and relations between its elements inside it. “The social interactions between people from different sectors are the glue of a city.” (Newman et al., 2008, p. 170)

Public Spaces: “Public spaces are open to all (...). When properly designed and cared for, they bring communities together, provide meeting places and foster social ties of a kind that have been disappearing in many urban areas. These spaces shape the cultural identity of an area, are part of its unique character and provide a sense of place for local communities.” (Woolley et al., 2004, p.12)

Territorial System of Ecological Stability (TSES): “The Territorial System of Ecological Stability (...) is a mutually interconnected complex of both natural and near-natural, altered ecosystems that maintain natural balance. Its main purpose is to reinforce ecological stability of the landscape by conservation or restoration of ecosystems and their mutual interconnection.” (ANCLP, 2009) TSES consists of biocentres, biological corridors and interaction elements. TSES serves for protection of ecological-worth parts of landscape and it is also a tool of sustainable development. Within its structures there are permanent processes and exchange of information, interactions among all parts of ecosystems.

2. Methodology - Working Process

As it is a concept of my Masters diploma work for next academic year, only a basic research and review of the topic have been done until now (*written in italic*). I will continue working on this topic according following plan. This all should be completed until May 2010.

(1) general review of the topic, defining goals and key terms/words

(2) selection of the model place where to apply the findings, to observe and work on – case study: Prešov, Slovakia

(3) gathering documents and relevant materials: TSES, Land-Use Plan, demographic analysis, etc.

(4) observations and work on the site, collecting information (photo documentation, interviews)

(5) survey / public opinion and suggestions (different views of different groups of inhabitants)

(6) analysis: defining of problems & potentials

(7) creating of a working map – selection of places – areas, lines and nodes (basic skeleton of network)

(8) consultations / cooperation with Slovak Environmental Agency (branch Prešov), municipality of Prešov and other steakholders

(9) evaluation: categories of spaces according importance and other aspects

(10) suggestions: examples of possible solutions and further usage

(11) final material: consisting of maps, final report, photo documentation, etc.

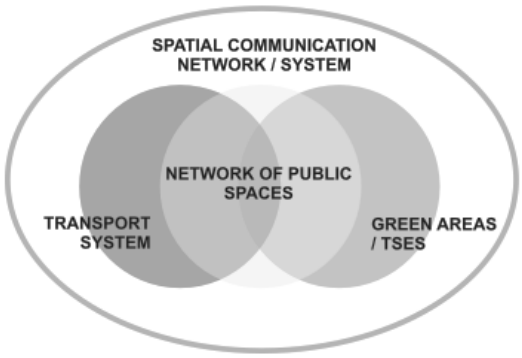
3. Territorial Systems of Ecological Stability and Spatial Communication Networks. Parallels on Local Level in Cities

“Cities are places where humans live, interacting with each other and with other living organisms as well as abiotic elements. Cities can be regarded as ecosystems like any other, as they are made up of interacting abiotic (nonliving) and biotic (living) components. There are new components such as buildings, transport, and sewerage

infrastructure, formal parks and sporting grounds, and introduced plants and animals, but these components still fall within the biotic and abiotic categories that interact in a system." (Newman et al., 2008, p. 93)

As I have mentioned before I am focusing on the parallels between Spatial Communication Networks and Territorial Systems of Ecological Stability in local conditions of the cities. Spatial Communication Network can be understood in different ways – as a transport system, system of visual communication in cities, communication through historical sites, architecture, landmarks and other physical structures of the city, as a green network and also as a system of public spaces. The meaning of TSES was explained in paragraph 2.

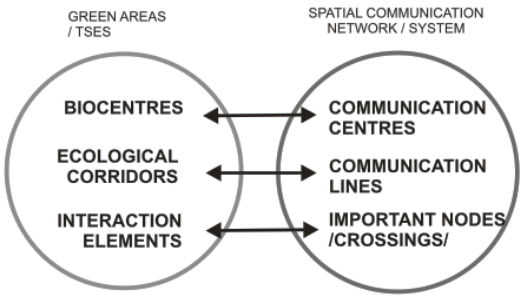
Fig. 1 The Spatial Communication Network (Source: author)



I assume that when speaking about public spaces we should take these two main aspects into consideration – communication quality and ecological / socio-ecological quality. Network of public spaces consists of spaces like parks, squares, traffic nodes, amenity green spaces, civic spaces, etc. connected with communication corridors or green corridors. Why is it so vital to create networks of public spaces? "At all levels of life—from the metabolic networks inside cells to the food webs of ecosystems and the networks of communications in human societies—the components of living systems are interlinked in network fashion." (Newman et al., 2008, p. 169)

Networks of public spaces could enhance efficiency, help to organize the space more effectively and that is how they reinforce the quality of environment and ensure sustainability. People would probably not realise their existence, but it would offer barrier-free and user-friendly life in the city.

Fig. 2 Comparison of Composition Elements of TSES and SCN (Source: author)



When speaking about Spatial Communication Networks some elements are common for more systems – e.g. parks are part of TSES and also belong to the network of public spaces. So these systems (networks) are overlapping here. But also there are some other elements that can only belong to one of the systems (e.g. strictly protected areas cannot be used as places of intensive social contacts and on the other hand some of communication lines like busy roads cannot be a part of network of public spaces or even TSES).

Like TSES consists of biocentres, ecological corridors and interaction elements, communication network is formed by similar structures. If subject of TSES is biocenosis, then by SCN it should be sociocenosis and when TSES is being established to enhance ecological stability, by SCN (and so by networks of public spaces) it is socio-ecological stability. Main components of the Spatial Communication Network are areas / communication centres (parks, pedestrian areas, etc.), communication lines (boulevards, avenues), important nodes (crossings of traces, etc.). "One of the benefits of high-quality public space is its potential as a venue for social events. Well managed festivals and other

events can have a very positive effect on the urban environment drawing the community together and bringing financial, social and environmental benefits." (CABE, 2007, p.13)

4. Case Study

My intention is also to implement the idea of spatial communication networks to real conditions. I decided to take Prešov because of its suitable scale for this case study. It is the 3rd largest city/town in Slovakia with population of 91 498 inhabitants (population density is 1302 per km^2). It is a metropolis of the Prešov Self-Governing Region and historical region of Šariš. Municipality is now running several projects on public spaces - revitalisation of green areas, creating new cycling paths, solving problems with traffic, etc. But there are still not enough interesting spaces to focus on them. My intention is to offer complex view on the city and its public spaces. As a base for my work I am going to use existing Land-Use Plan , Mapping of Public Greenery, TSES and other relevant documentation. As it was written above, the final material (result of my diploma work) would be mapping of public spaces in the city, evaluation of current state and suggestions how to enhance their quality.

5. Conclusion

"Every public space has different uses and means different things to different people. A well-designed public space meets the needs of all the people using it without favouring one particular group of people. It is flexible enough to meet different needs now and in the future." (CABE, 2007, p.16) Like TSES or green networks are planned to ensure eco-stability of ecosystems (or biotops), network of public spaces (spatial communication network) would enhance stability of social communication sites. Only parks and open spaces are not enough. It is necessary to create appropriate spaces for people to meet and communicate.

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Contribution of the Urban Green Structure to quality of life

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Abstract

Urban areas are in constant evolution, being inhabited a vast population and occupying large areas. These are places of opportunities, but also large needs, and must have high levels of quality of life, in order to provide a good environment and livability.
Urban green areas play different roles in the urban fabric, being an essential element in the enhancement of quality of life. Its aggregation in a coherent and organized network, such as the Urban Green Structure, will increase its role in the city and contribute to quality of life and sustainability.
This research aims to evaluate the contribution of the Urban Green Structure to quality of life and sustainability, with the development of a methodology, using endogenous and exogenous indicators to calculate its influence in the quality of life parameters.

Key words: urban green structure; urban areas; green areas; quality of life; sustainability indicators

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1. Introduction

Cities are increasing at a high rate, both in size and population. Today, about one half of the world population dwells in cities and is expected that, in 20 years, this number will increase to the double (UNFPA, 2007).

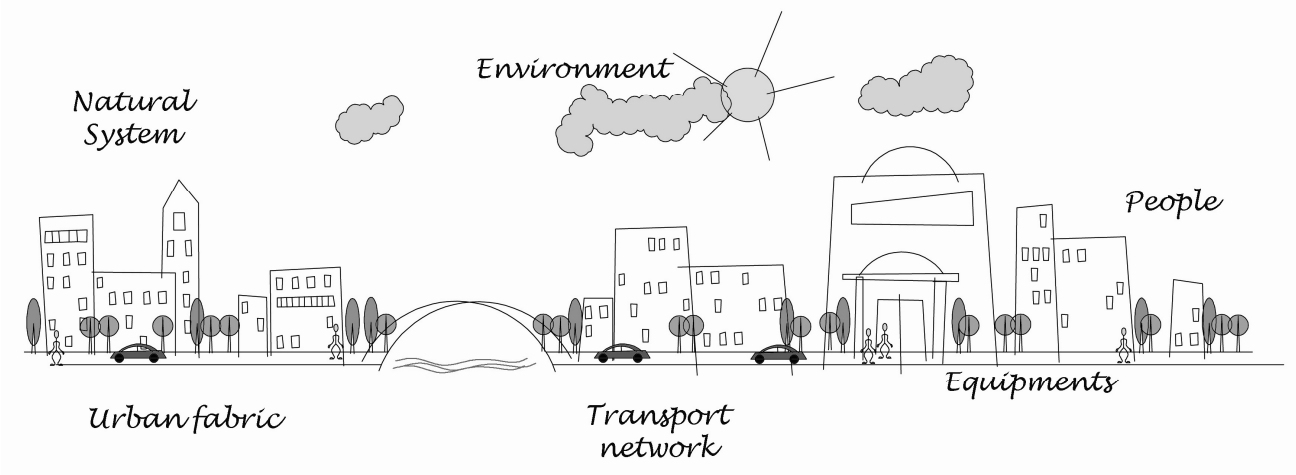
These are very attractive places, with multiple opportunities, where it can be found work, housing, services and recreation, among a sort of factors that can supply people's needs and make life easier. However, is in urban areas that the problems concentrate, existing social and environmental difficulties.

It is essential to provide a good quality of life in urban areas and this is an issue which must be considered *in spatial and urban planning policies. According to the EEA (2009: 13), "well-designed buildings and public spaces in a well-planned urban environment can provide attractive, secure, quiet, clean, energy-efficient and durable surroundings, in which prosperous and healthy communities can thrive in the long term".*

Public places and urban green areas, because of the various functions they perform, are quality of life promoters, and its integration in a coherent network, such as the Urban Green Structure, can enhance this capacity.

The Urban Green Structure (UGS) is one of the components of the urban space, such as the urban mesh, transport network, hydrographic network, natural system, infrastructures and equipments, among others (fig. 1). It is a multifunctional entity in the urban context, fulfilling environmental, social and economic roles, the three domains of sustainability. By analyzing its structure, function and relation with other urban elements, it is intended to assess the contribution of the Urban Green Structure to quality of life and evaluate how can this relation be improved and potentiated (both functional and structural), proposing strategies that can enhance quality of life and sustainability.

Fig. 1 Urban systems (Source: authors)



2. Methods

In order to evaluate the role of Urban Green Structure (UGS) and Urban Green Structure Areas (individual areas that integrate the UGS) in the enhancement of quality of life, were compared the functions that these areas fulfill with the parameters of quality of life, finding some similarities, concluding that the Urban Green Structure, for its inherent characteristics, components and functionality, is a quality of life promoter.

This research is being developed in a three steps methodology:

(1) Evaluation of the contribute of individual Urban Green Structure Areas (UGSA) to the parameters of quality of life;

(2) Evaluation of the contribution of the Urban Green Structure (UGS) to quality of life, analyzing the advantages in integrating urban green areas in coherent and organized structures.

(3) Proposal of strategies to enhance the role of the Urban Green Structure to promote quality of life and sustainability.

The individual Urban Green Structure Areas (UGSA) were evaluated in respect to a set of 215 indicators, integrating both objective and subjective factors. The objective indicators refer to quantifiable and visible characteristics of the spaces, while the subjective indicators will be evaluated based in the people opinion, with interviews to the population. The indicators were divided in three categories: general (related to the city characteristics), exogenous (focusing the relation of these areas with their surroundings) and endogenous

(relating the inherent characteristics of each space).

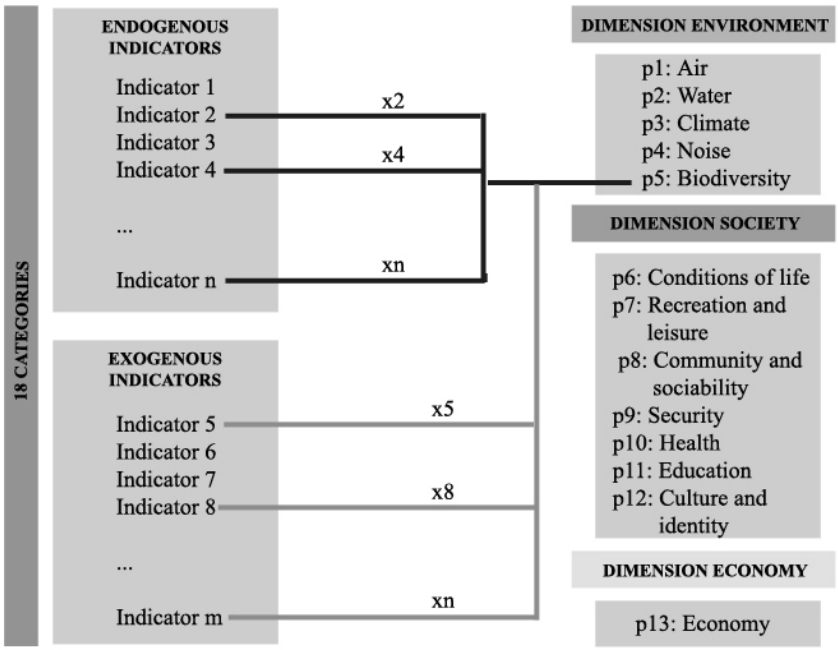
To evaluate the contribution of each area to quality of life, the following quality of life parameters were evaluated: air, water, climate, noise, biodiversity (in the environmental dimension), conditions of life, recreation and leisure, community and sociability, security, health, education, culture and identity (in the social dimension) and the economic dimension. The evaluation of each parameter was calculated thought the sum of the value of the indicators, related to each parameter (fig. 2).

3. Case study: Urban Green Structure of the city of Porto

The first case study is the city of Porto, which is located in the north region of Portugal. With an area of 4 150 hectares, is inhabited by about 230 000 persons, being the central core of the Metropolitan Area of Porto, which is the second most important urban center of Portugal.

Porto is a city with very ancient roots and a long cultural history, and its green areas were always linked to this evolution. According to the Porto Master Plan (2006), the Urban Green Structure comprises about 20% of Porto territorial area and fulfills the following functions "*urban structure, recreation, pedagogy, promotion of the image of the city, promotion of the environmental quality, physical, visual and sound protection and aesthetics*".

Fig. 2 Evaluation method. Relation between the indicators and quality of life parameters (p) (Source: author)



4. First results

The Urban Green Structure Areas of the city of Porto were divided in 12 typologies: Private Gardens, Semi-public Gardens, Public Gardens, Public Parks, Urban Parks, Mixed Use Private Areas, Agricultural Production Areas, Equipment Areas, Framing Areas, Crossing Areas, Urban Voids and Others. In this paper, it was evaluated one example area by typology (fig. 3). The category "Others" is composed by spaces that have been transformed (for example, constructed), having already lost their original role in the city and Urban Green Structure. For that reason, these areas are not being evaluated.

Fig. 3 UGS of the city of Porto (light grey) and the analyzed areas (dark grey) (Source: author)

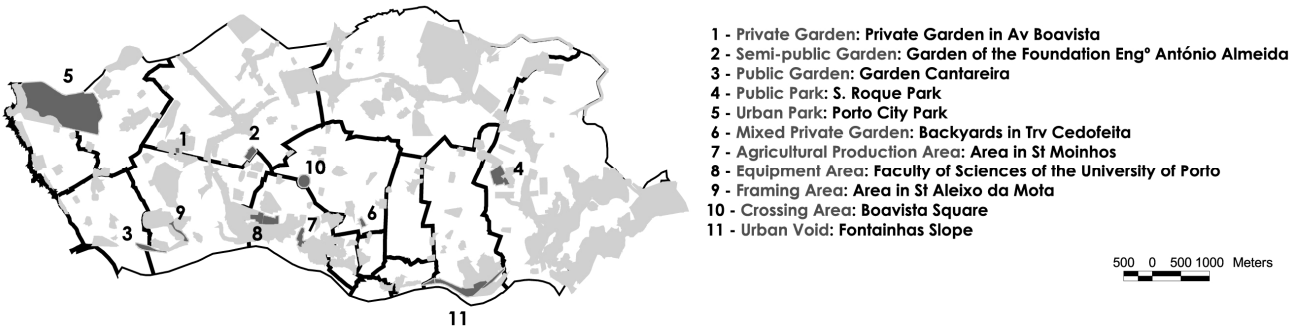
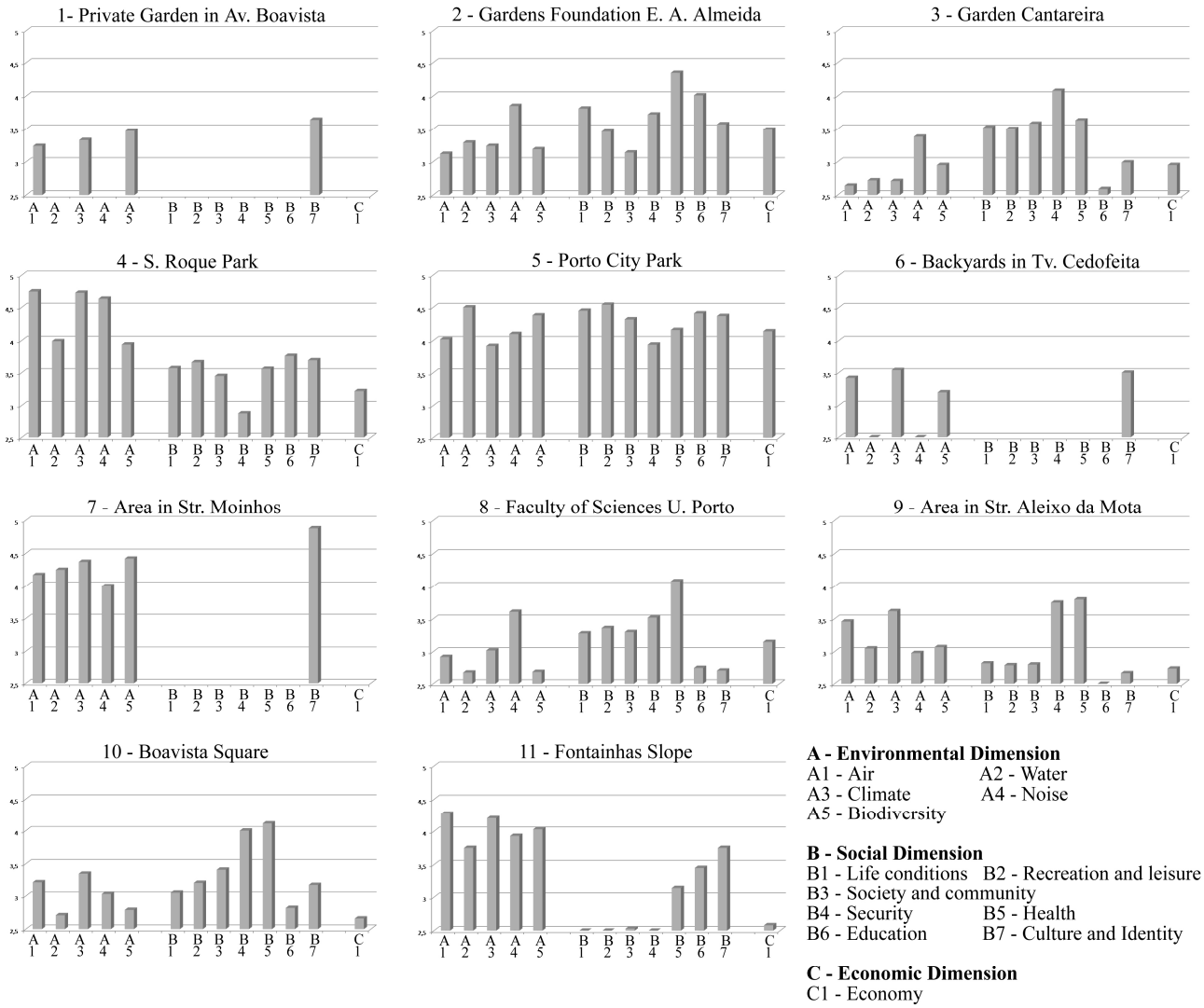


Fig. 4 Evaluation of the contribution of the analyzed areas to quality of life (endogenous indicators) (Source: author)



The analysis of the exogenous indicators shows which parts of the city have better conditions and more needs, and where is more important to find strategies to increase quality of life. Factors such as accessibilities, housing conditions, environmental conditions and the equipments and services are elements with high potential to enhance quality of life and sustainability. According to the research, Porto City Park (5), Area in Street Moinhos (7) and Boavista Square (10) are located in areas with higher quality of life potential.

The UGS Areas with the highest contribute to quality of life were identified evaluating the endogenous factors (fig. 4). In the environmental domain, the areas with the highest contributes to quality of life are S Roque Park (4), Porto City Park (5) (due the woods and habitats that integrate), Area in Street Moinhos (7) (an agricultural area) and Fontainhas Slope (11) (an urban void with a great biodiversity potential). In the social domain, the areas that contribute most to quality of life are the Garden of the Foundation Eng. António Almeida (2) (a private garden which can be visited, having various activities and events), Porto City Park (5), Cantareira Garden and Boavista Square (three public spaces with high visitation rates). Also Area in Street Moinhos (7) has a high value in the parameter culture and identity of the city, because it constitutes one remaining rural area, derived from the city past. In the economic domain, the Garden of the Foundation Eng. António Almeida (2) and Porto City Park (5) have the highest values, due to the activities and services they provide and incomes they get.

According to the evaluation, Porto City Park is the space with the highest contribution to quality of life in all the domains observed. This is due to its structure, location, area, composition and functions it has in the city of Porto. In the evaluation is important always having in mind that different areas and typologies have distinct functions, and contribute in a distinctive way to quality of life and sustainability.

In the case of the private spaces, because these areas have no public access, not all the indicators were measured. These evaluations were made according to some parameters, mainly though cartographic data.

5. Conclusion and Future Prospects

The urban green areas and Urban Green Structure are important elements in the city, which, due to its characteristics and functions, are promoters of quality of life and sustainability. Different categories of spaces perform distinct functions, being all essential to the urban equilibrium and sustainability of the city. It is important to compare the contribution of the various areas and typologies to quality of life, according to factors such as: structure, function, area or composition, in order to find the ones that best fit in the strategies for the city development.

In the next phase, the Urban Green Structure will be analyzed, as a whole, evaluating its contribution to quality of life. Comparing the results of the individual areas with the UGS, it will be possible to determinate the surplus value that exist in the organization of the urban green areas in a system and its influence in the enhancement of urban quality of life.

In the last phase, will be outlined strategies, mechanisms and guidelines to promote and enhance the value of the Urban Green Structure in the promotion of urban quality of life.

It is essential to promote these areas and structures informing and make the population and policy makers aware of its importance, as well its fragility, in order to develop articulated and conjugated solutions to promote quality of live and sustainability in the cities.

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Interdisciplinary suitability analysis of prospective areas for low-rise housing in Tyumen suburbs (Tyumen region, Russia)

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Abstract

Post-perestroika Russia experienced the effects of suburbanization. The initial boom in country house building involved all regions of Russia. This paper is devoted to developing housing in Tyumen suburbs which means that the considered activity is housing construction. Interdisciplinary suitability analysis of prospective areas for low-rise housing is used as a tool to compare prospective areas and to define the most proper area for housing construction.

Key words: suburbanization; low-rise housing; suitability assessment; Russia

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1. Introduction

Tyumen city is one of the biggest modern cities in Siberia, and suburbanization is one of the typical processes in developing Russian cities. Tyumen's general layout was passed in Tyumen in May, 30, 2006, after being generated by "Russian research institute Urbanistika" (St. Petersburg). This document is a basic document that assigns fundamental points of special and infrastructural development of the city. In response to the growing demand for out-of-town housing, the city administration made a decision to assign relevant areas for low-rise housing.

Low-rise individual housing will be built there; indeed, in some areas the construction is already in process. Nevertheless, what follows is an integrated study of the prospective areas according to their suitability for this kind of construction. In this case, it is more reasonable to compare all the areas. Accordingly, based on the General Tyumen layout five prospective areas have been selected for low-rise housing (fig. 1).

2. Interdisciplinary suitability analysis

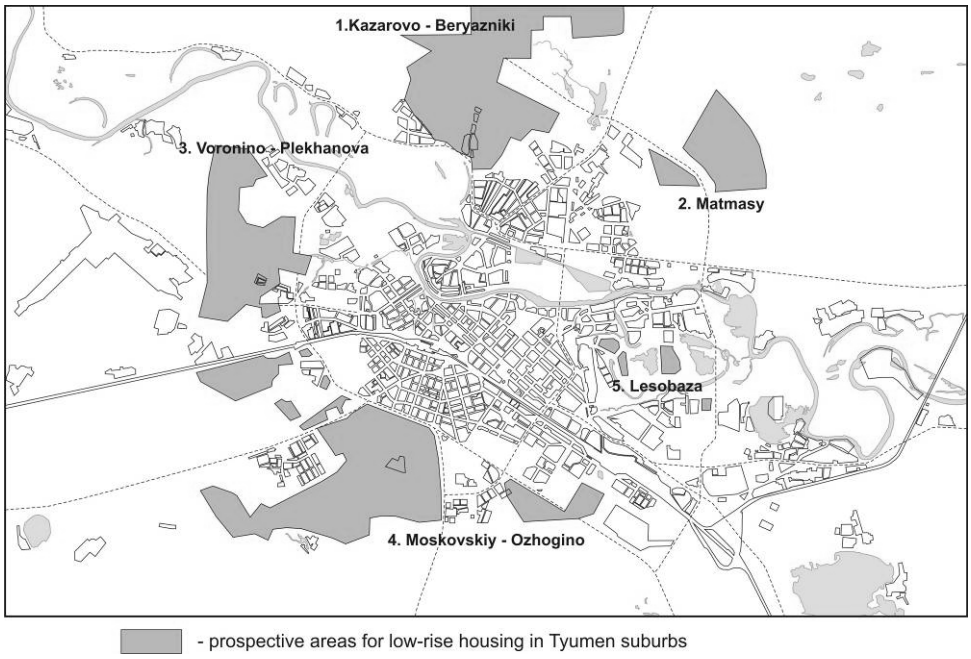
The primary consideration for any development should be its fitness for purpose, i.e. how comfortable, convenient and aesthetically pleasing it is for the people who will live there. The suitability analysis process provides a systematic method of assessing a wide range of site conditions and land uses.

The housing construction in Tyumen suburbs is an object of research. Therefore, it is necessary to combine relevant factors that need to be considered for this kind of activity which could play a key role in the area's development. There are two areas for consideration: compliance with the requirements of construction and the comfort of prospective living. Based on these and existing information four basic directions for assessment can be defined: landscape-ecological assessment (presented landscape-ecological assessment is based on such definition of landscape: it is natural geneticly homogeneous territorial complex with unified geological structure, certain class of relief, climate and biotic cover (Kozin 1996), aesthetic qualities assessment, ecological state assessment, transport accessibility assessment. Taking into account all these factors, the assessment should be sufficiently complete even it is a subjective expert's assessment.

2.1 Landscape-ecological assessment

In Russia, the main challenge of planning procedure is to estimate present natural conditions in terms of stability and the value of landscapes. Stability is the ability of the landscape (landscape complex) to maintain its rate of functioning and spatial structure under changing external influences (Kurbatova 2004); and value is the aggregate of aesthetic attractiveness, uniqueness, comfort and recreational resources of the landscape (Drozdov 2006).

Fig. 1 Localization of areas of low-rise suburban housing (based on General Tyumen layout)
(Source: author)



Tab. 1 Matrix of integral coefficient for the attraction of the developing landscape(κi) (Source: author)

Stability \ Value	Highly valuable	Valuable	Not valuable
Highly stable	7,5	6,5	5,5
Stable	6	5	4
Unstable	4,5	3,5	2,5

A matrix of value and stability parameters (Table 1) can be constructed and an integral coefficient for the attraction (κi) of the developing landscape identified in order to offer a more opportune comparative assessment for further application of this data in suburban planning. For that priority has been given to stability factors using an additional coefficient 1,5.

Having defined the integral coefficient for the attraction of each developing landscape for individual suburban housing, this formula may be used to assess the attraction of some areas comparatively taking into account the area ratio of landscape with different measures of integral coefficients for the attraction of the developing landscape:

$$K_m = \frac{\sum_1^i S_i \times \kappa_i}{S_c},$$

where K_m – average coefficient of attraction for area, κ_i – integral coefficient of attraction of particular landscape, S_i – square area of landscapes with the same value of κ_i, S_c – total square area of land under assessment.

When the average integral coefficient for each area has been determined it is easy to define the most prospective one from a landscape-ecological point of view. Areas 3 (Voronino-Plehanova) and 4 (Moskovskii-Ozhogino) are more attractive for development from the landscape-ecological point of view. It is because these areas are located on an lacustrine-alluvial plain that is more favourable for housing. The rest of areas are located in less stable natural complexes, where the groundwater line can reach 0,2–0,5 meters from a surface that is very unfavorably for construction. In order to develop the necessary conditions in these areas it is indispensable to undertake regenerative actions that could entail additional costs from a developer.

2.2 Aesthetic qualities assessment

Natural aesthetic resources are the whole environment surrounding people that excite them with aesthetic satisfaction. The method is based on a complex assessment of basic elements of landscape (Ėringis 2000). Any elements of scenery are indicators of aesthetic quality.

The relief is flat everywhere, and there are not many ponds except area 5 (Lesobaza). Here some artificial ponds and some former riverbeds of the Tura River can be found. The abundance of green areas and forests is also different. Areas located in the north of the city do not have a lot of picturesque vegetation; on the contrary, swampy territory is spread there. There are no historical and natural monuments either. Next to areas 1, 2, 3 and 4 there are some comparatively small local natural sights and natural monuments. All areas are located next to industrial zones in the city which are a negative factor for aesthetic quality. Area 3 (Voronino-Plehanova) has the best aesthetic qualities.

2.3 Ecological state assessment

Five key categories of ecological conditions were selected: air, noise, radiation, electromagnetic pollution, and the presence of city dumps. In order to define the level of pollution, data from Tyumen ecological committee, materials from General Tyumen layout, and library material were used.

Area 1 (Kazarovo - Bereznyaki) is the most ecologically unfavorable territory and it is not just because of air pollution. There is also quite a high level of noise and radiation pollution. Area 5 (Lesobaza) is the most polluted with air emissions because there are industrial pollution sources and storage rooms, highways for freight transportation. Also there are ash dumps from an old thermal power plant that had been burning peat. Areas 2 and 4 have the most favorable ecological state.

2.4 Transport accessibility assessment

Transport accessibility is very important for prospective owners of houses in the suburbs. The linear structure of Tyumen, the underdevelopment of transverse direction, the unsystematic solutions to transport problems

and the artificial and natural barriers lead to a situation where the main traffic artery under existing conditions of high level of automobilization does not suit the modern needs of the population. The average speed of cars in rush hour does not exceed 14 km per hour (Guseinov 2001).

In order to make a transport accessibility assessment, the methodology used was developed by the construction company "Terra-Nedvizhimost" while building a suburb of Moscow. The time to reach the city centre from the suburbs in rush hour is defined as a criterion. Only the time required for driving through the main highways was measured. The General Post Office was selected as the city centre. There are three zones of different transport accessibility according to expended time:

- comfort zone – under 30 min
- acceptable zone – from 30 min to 1 hour
- unacceptable zone – more than 1 hour

As the average speed of cars in rush hour is about 14 km per hour, the average driving time for the main highways leading to the city centre that are defined in the General Tyumen layout as highways of uninterrupted driving has been calculated.

Therefore, according to the results of the calculation, it is easy to see that part of area 4 is in the comfort zone. Consequently, this area is admitted as a comfort zone. Areas 3 and 5 are in the acceptable zone, but 1 and 2 are unacceptable because it takes more than 1 hour to get to the city centre from these areas. Moreover, in these areas many of the roads are under construction now which could create difficulties when getting to any region of the city.

2.5 Total comparative assessment of areas for prospective low-rise housing in Tyumen's suburbs

The total comparative assessment of areas for prospective low-rise housing is the resulting total of all undertaken assessments where favorable factors have a positive value of points and where unfavorable factors, such as ecological pollution, have a negative value. All results are in the tab. 2.

Tab. 2 Results of total comparative assessment of areas for prospective low-rise housing (Source: author)

Undertaken assessments	**Areas, points**				
	1	**2**	**3**	**4**	**5**
Landscape-ecological assessment	4,4	4,6	5,7	6,1	4,3
Aesthetic qualities assessment	2	0	3	2	2
Ecological state assessment	-7	-4	-6	-4	-5
Transport accessibility assessment	0	0	1	2	1
Total	**-0,6**	**0,6**	**3,7**	**6,1**	**1,3**

The results demonstrate that area 4 has the best features for low-rise housing. This has the most stable natural complexes (landscapes), the ecological state is acceptable and it is within the comfort zone of transport accessibility.

Area 3 is also quite favorable territory for low-rise housing. This also has stable landscapes, and, moreover, it has the most attractive view, but the ecological state is unfavorable. Although area 5 has acceptable transport accessibility and high aesthetic qualities (there are some ponds and forests), it is located on a flood plain of the Tura river which means that landscapes here are not really stable for construction over the long term. Areas 1 and 2 according to this assessment are unfavorable for low-rise housing.

3. Conclusion

A complex comparative suitability assessment of areas for prospective low-rise housing has been undertaken taking into account different factors. There is no doubt that it is necessary to undertake some improvements in areas that were defined as unfavorable that could entail additional costs for a developer. Prospective developers should cultivate the landscape and maintain it in an acceptable condition for housing. It is necessary to minimize ecological degradation from different sources and not allow its growth in the future. Green areas are also an important factor for ecological and aesthetic conditions. Currently, the number of parks is unacceptable so prospective developers should pay more attention to the development and maintenance of green areas. The transportation system needs to be re-thought, as the existing transport arteries can not accept the predicted transport load.

In conclusion, different level plans with suitability analysis approaches like this can form one of the axes of a sustainable development strategy, both for individual districts as well as for the country as a whole over the long-term period. This research is just one of the attempts to apply the suitability analysis to a real Russian city where there are challenges about developing low-rise housing in order to create a sustainable interconnected natural and man-made system for comfortable living.

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Multilayered canopy structures in young urban woodlands – aspects on recreation and biodiversity

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Abstract

Structurally rich woodland plantations have the ability to form a forest interior space and provide a genuine sensation of nature on a considerably smaller surface than other newly established woodlands. Species rich plantations are also more resilient to external disturbances such as climate change or new pathogens. In this paper, some preliminary results are presented from a structural analysis of 11 "naturalistic" woodlands established approximately 25-30 years ago in southern Sweden and Denmark. Several different woodland types were identified, and the implications of structural complexity for recreation and biodiversity in an urban context are being discussed.

Key words: urban forestry; canopy stratification; woodland structure; recreation; biodiversity

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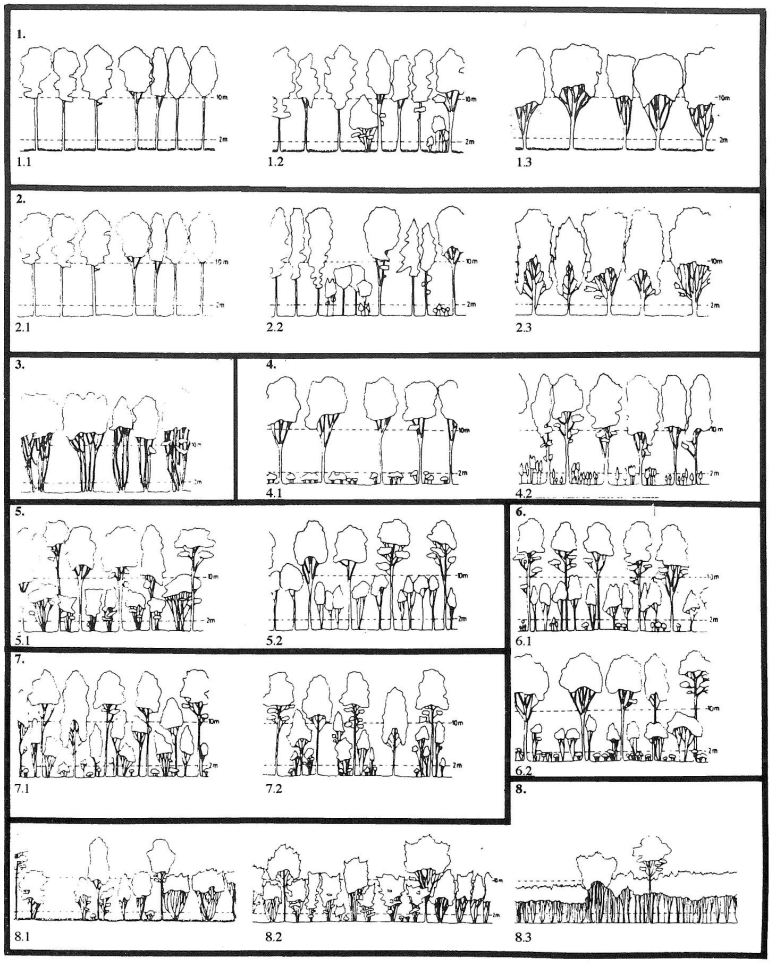
1. Introduction

Most urban forests in northern Europe are younger than 50 years old (Gundersen et al 2005). This percentage is likely to increase in the future because new plantations are constantly being established. Unfortunately, urban vegetation in parks, gardens and other green space is usually managed only with the mature state in mind (Gustavsson 2004). Mature forests do not evolve rapidly but demand time for development. In an urban context, it is however necessary to take advantage of woodland plantations already during the young stages of development. Urban green space is being increasingly recognised as a resource for providing recreation opportunities for people and wildlife habitats for fauna and flora. One of the emerging trends in woodland creation in recent years has been the "naturalistic" approach (Kingsbury 2004). The essential idea behind this approach is to identify an appropriate plant species mixture to be established based on ecological processes and functions. This is in agreement with the modern paradigm of habitat restoration, which strives at restoring whole functioning ecosystems, not simply species assemblages or communities (Gray 2002). As a reaction against the oversimplified mainstream silvicultural practices during the 1970's, various researchers and practitioners have begun to explore and implement conceptual

ideas on forest management focusing on the structural character of vegetation types as an approach for long-term design and management of woodlands. In Sweden and Great Britain, near natural or "naturalistic" plantings emerged as a concept drawing inspiration from existing natural and cultural landscapes (Gustavsson 2004). One example is Gustavsson's description of different structural vegetation types, which describes various one-layered, two-layered and multi-layered stand types (fig. 1). By using a variety of different trees and shrubs in new plantations, attempts were made to construct the fully stratified character of the temperate mixed broadleaf forest. In the autumn 2008 we returned to the a number of these relatively natural plantations established during the early 80's to evaluate their structural development in relation to species diversity and past management.

Fig. 1 Overview of different structural vegetation types with one, two and multilayered canopy structures (according to Gustavsson 2004)



2. Methods

The study areas consisted of 11 oak dominated urban woodlands located in southern Sweden and Denmark. To balance for natural variations within the forest stands, and also due to the relatively small size of several of the woodlands, we used subjectively located study plots as to be sure that all structural variation were covered by data collection. The study plots measured 15 x 15 meters and the number of plots varied from 2-4 per stand. In each plot, all tree and shrub individuals above 1 m height were recorded in a coordinate system. The height and green crown depth of all individuals was measured. Based on this data, the number of canopy layers were identified by using the

Landscape Management System (LMS) stratification algorithm developed by Baker and Wilson (2000). Crown projections were used to identify the cover percentage of all canopy layers identified by the mathematical model. Since the algorithm had a tendency to overestimate the number of layers in the lower strata, canopy layers covering less than 10 % were aggregated until this requirement was met. Depending on the forest structure identified, each stand was assigned to correspond to one of the structural vegetation types described by Gustavsson (2004). To exemplify this, illustrations of the horizontal forest complexity were made by drawing one profile diagram in each stand.

3. Results

Based on the LMS stratification model and the structural comparison of Gustavsson vegetation types, we identified canopy structures corresponding to six different kinds of multi-layered structural stand types. These included two types of three layered stands, two types of two-three layered stands and two types of two layered stands (Table 1).

Tab. 1 Present woodland structural vegetation types identified at the study sites.

Canopy Layer Complexity	Structural Stand Type
Three layers	Three layered stand with understory of saplings
	Three layered stand with a dominant shrub layer
Two-three layers	Middle layered dominated stand with emerging canopy trees
	Two layered stand with a tendency to full stratification
Two layers	Two layered stand with a complex canopy layer
	Two layered stand with a middle or a shrub layer

4. Discussion

The preliminary results indicate that the "naturalistic" plantations established between during the late 70's and early 80's have evolved in different ways and developed into different structural woodland types. This is perhaps not surprising as different variables (e.g. soil conditions, original species mixtures, management) have varied significantly between the various stands. What is more interesting is perhaps that three layered canopy structures can be developed within this short time frame, as illustrated by a profile diagram from one of the study sites (fig. 2).

In this example, the canopy layer is dominated mainly by oak whose foliage allows relatively high levels of light transmittance, enabling the hazels in the middle layer to develop large crowns whilst low growing shrubs and saplings can be found in the lower shrub layer. In natural forest ecosystems, these multi-layered characters do not usually appear until the later stages of stand development (Oliver and Larson 1996).

The structural character will inevitably affect the way the specific woodland is perceived by the general public, as well as the various species inhabiting the forest.

Fig. 2 Profile diagram of a stand with a three layered canopy structure (Illustration: Anders Busse Nielsen)

4.1 Recreational aspects of forest structure

Depending on the species composition and structural complexity of the woodland, people will perceive a forest stand in different ways. Unfortunately, the forest interior structure has sometimes been neglected in the past, as more focus has been put on the appearance from the outside (Gustavsson 2004). Complexity has been identified as a key concept of visual landscape quality (Tveit et al. 2006). The pruning of branches or creation of glades within the forest are examples that can contribute to an attractive and increased forest interior complexity (Gustavsson 2004). This heterogeneity also is important both at the stand and the landscape level, and multi-layered woodlands should be considered in relation to the surrounding landscape. Young stands are generally perceived as less attractive than older stands containing large trees although people often prefer of mixture of both type for recreational purposes (Gundersen and Frivold 2008). The same authors conclude that other factors such as openness, visibility, stratification or what kinds of forest people are used to, are also important factors. By working with a structural approach, it is possible to create a more complex and heterogeneous stand environment. Multi-layered stands also give a better impression of maturity and are often perceived as older than they actually are. Moreover, understory shrubs can suppress the recruitment of tree sapling (Beckage et al. 2008) and thus have a stabilising effect on the visual quality and sight line within the forest.

4.2 Aspects of forest structure on biodiversity

It is evident that a structurally more complex woodland automatically implies the presence of a higher diversity of tree and shrub species. Since different organisms are associated with different species, both species composition and species richness will be affected by a more diverse tree species composition (e.g. Berger and Puettmann 2000). The effect of the structural components on different species groups has also been widely studied. Many species groups are favoured by an increasingly complex forest structure, e.g. insects (e.g. Vance et al. 2007) or birds (e.g. Willson and Comet 1996). In contrast the species richness of vascular plants can be negatively affected as less light is transmitted to the forest floor

(Gilliam 2007). Another benefit of a varied tree species mixture is increased resilience towards pest outbreaks whose frequency has increased during recent years (Alvey 2006). Overall, urban parks and woodlands have the potential to provide habitats containing a high species diversity. They must therefore be considered as biodiversity hotspots in an urban context (Cornelis and Hermy, 2004) even though the importance of the urban landscape for conservation of biodiversity is relatively limited in importance compared with the traditional view on nature conservation (Kendle and Forbes 1997). Kendle and Forbes (1997) however point out that from a nature conservation point of view, urban environments may have a major role to play in raising public interest and awareness. They may also improve the understanding of ecological processes, which will facilitate the conservation of natural ecosystems in the long term. Therefore, matters concerning biodiversity must also be integrated in the design, construction and management of young woodlands and other urban green spaces.

5. Conclusions

This study shows that multi-layered woodlands may be created within a short time frame in an urban context. The possibility of utilisation of forest plantations for recreational activities already during their young stages is particularly desirable. In addition, richer woodland structures are likely to have a positive effect on forest biodiversity. The identification of such experienced-based concepts for the development of multilayered structures in young forest plantations is an exciting prospect for urban forestry and one that will become increasingly important as the debate on sustainable urban development intensifies.

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Comparison of historical landscape structures occurrence in context of landscape appearance

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Abstract

The landscape structure and landscape character are deeply embedded into historical development of land use. The horizontal landscape structure reflects areal and species diversity transformation depending on land use. Landscape appearance, as a combination of landscape structure and geomorphologic relief, reflects those changes as well. The article deals with analysis of landscape structure and the relationship between inherence of historical landscape structures in two areas with similar natural condition and similar land use history. The goal was to inquiry information about landscape appearance from combination of land cover and geomorphologic relief and accordingly to results to explore the relationship between historical landscape structures and landscape appearance.

Key words: landscape appearance; historical landscape structures; land use

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1. Introduction

Landscape character represents all features of landscape image and of historical and environmental importance. The character means a complex of features or characteristics, a something what distinguishes one landscape from the other as the each characteristic - the cultural or natural, are enmeshed together. According to landscape Convention each country of European Union shall protect their specific landscapes. As the historical area of Slovak Republic was until 20th century predominantly rural country the relicts of earlier agricultural land use. The specific features of landscape are the historical landscape structures (HLS) or in English spoken countries cultural landscapes, or cultural heritage (Swanwick, et al., 2002). Historical from this point of view means older than 50 years (Huba, 1988). This description is very general and Jančura (1998) differentiates into distinct categories: HLS originated linked to relief structures, such as mining relicts, HLS linked to secondary landscape structure such as urban or village settlements or different types of vernacular architecture in settlements or linked to land use forms.

The first complex characteristic shows similarities between both area. Cadastre of the Horné Plachtince is situated in a narrow valley of orographical part Krupinská Planina, which belongs to volcanic mountains of Inner Western Carpathian bow with a mild climate. The land use is predominantly agricultural (67%), the settlements has compact character in hollow basin part and scattered character in the plateau (Michal, 1980). Horné Plachtince is a small village with continuously decreasing population of 200 inhabitants mostly in post-productive age (71 %).

Cadastre of Detva is also situated partly in the hollow basin and partly on the slopes of orographical part Poľana and Javorie, with a mild climate and volcanic sub-soils. The settlement comprise Detva administrative centre of Detva district with population 14 973 and progressive population growth. The landuse is also predominatly agricultural (61 %) and settlement partly compact (Detva) and scattered over the whole cadastre (Jančura, 2000). Horné Plachtince are more alike the scattered settlement over the Detva cadastre than Detva itself.. The most important difference amid the basic characteristic is the difference between population count and its age structure.

2. Methods

The research use a process used by identification of landscape image and character by using differential method of identification (Jančura, 2003). The information from landscape structure was excerpt from topographic maps scale 1:10000 and ortophoto. All analyses were performed in GIS software ArcGIS 9.2 to provide a basic database of the area. The examined area was divided virtually into net of squares 1x1km. Landscape structure by defining landscape image was distinguished into three steps: 1. analysis of relief (comprise hypsometry analysis, geomorphologic characteristics) 2. Analysis of secondary landscape structure (comprise definition of landscape type, spatial placement of particular features and its count in each square). 3. Combination of particular characteristic in every square such as landscape type with relief forms and specifying often occurring combination of types. These most often occurred types were considered as typical squares which contains a most recognisable landscape pattern. The relief analyses were processed according Lacika (1997). He defines types of relief from the difference between lowest and the highest place in the square 1x1 km. It means for heights 31-100 m, lower higlands 101 -180 m, highlands 181- 310 m. The landscape type was defined according inherence of forests, arable land or permanent grassland and inherency of urbanised area or dense scattered settlement. The types in each square were assessed empiricaly.

Identification of historical landscape structures according to form and origin affinity. In our case we identify HLS linked to secondary landscape structure specifically to agrarian landforms. It means that HLS were selected using as criterion: shape (linear or squarish), and inherence of concomitant vegetation. Identified and selected HLS were compared to its inherence in typical squares.

The identification of landscape image was performed by panoramic photographs from distinct stands, where all characteristic landscape features can be seen. In these photographs were thereafter HLS and the characteristic features identified.

3. Results

3.1 Landscape structure and landscape image

From the analysis of each square in the area we obtain the most occured combination of landscape type to type of relief and count of features to type of relief. For the area of Detva cadastre was used 153 squares from which most occurred combination is woodland-agricultural type with settlement on the lower highlands with 20 squares, second most occurred is agricultural type with settlement on the lower highlands with 17 squares and woodland-agricultural type with settlement on the heights. For the area of cadastre Horné Plachtince the most occurred combination was woodland-agricultural on heights with second

most occurred is woodland-agricultural type with settlement on the lower highlands and woodland-agricultural type on with settlement on the heights (fig. 1).

In the landscape image of Horné Plachtince dominates forests on the heights and agricultural land on lower highlands. In Detva dominates agricultural land in every most frequent combination.

Fig. 1 Percentage ratio of land use categories in most frequent squares (Source: Sedláček 2008)

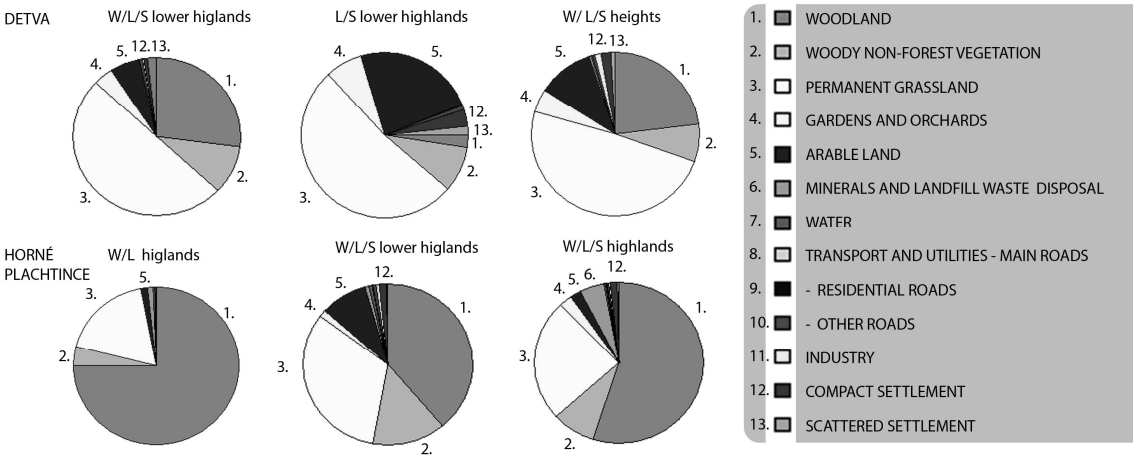
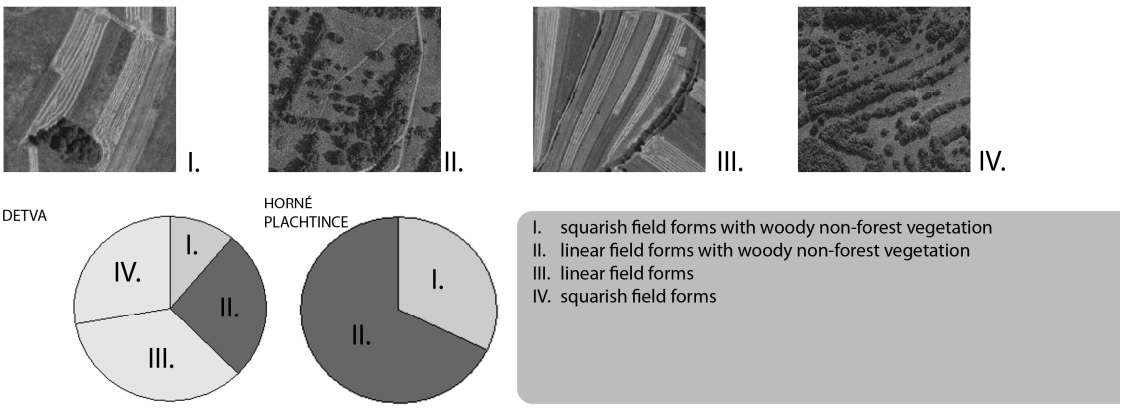


Fig. 2 Percentage ratio of selected historical landscape structures in examined areas (Source: Sedláček 2008)



3.2 Historical landscape structures

By the assessment was compared a change in land use statistics in both cadastres. As the source were used maps of second military mapping from (1854) for Detva and cadastre map of Horné Plachtince (1878). Due to difficult identification and imprecision in old maps was comparison simplified to landscape index, which comprise only woodlands, agricultural land and settlement. The changes in former and present land use showed decrease of agricultural land in both cadastres (Table 1).

Tab. 1 Changes in land use (Sedláček, 2008)

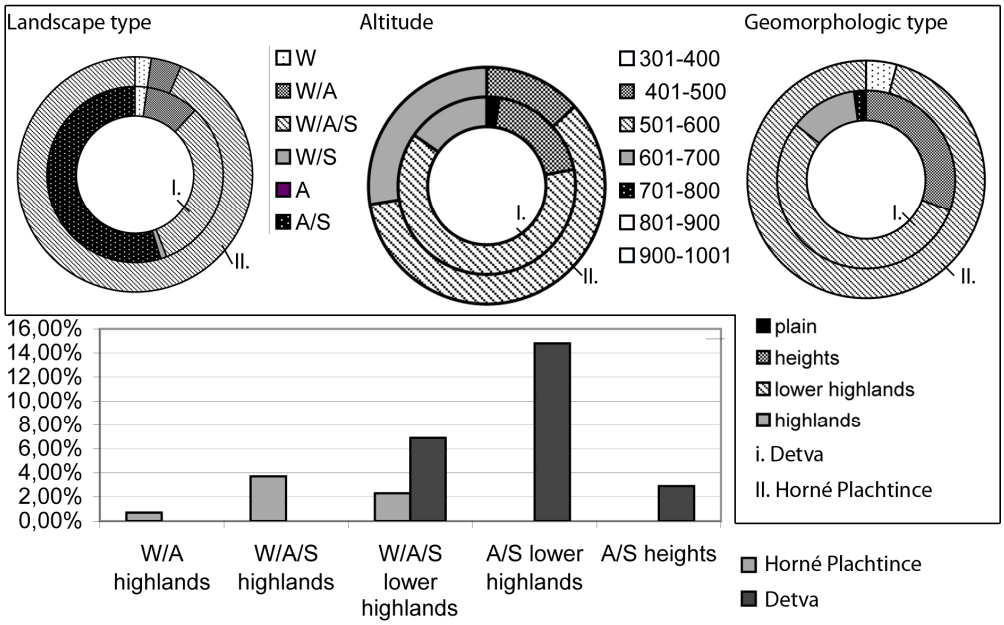
Land use	Detva		Horné Plachtince	
Year	1854	2003	1876	2003
Woodland (%)	37,80	26,55	65,11	41,06
Agricultural land (%)	50,98	72,96	31,75	58,41
Settlement (%)	16,15	0,73	3,13	0,53
Landscape index	4:5:2	3:7:0	7:3:0	4:6:0

In both areas were identified historical landscape structures linked to agricultural landuse presented in Detva with linear and scutal forms field forms with and without vegetation, in Horné Plachtince linear and without vegetation only (fig. 2). These structures are subjected to traditional agricultural methods predominantly provided by small farmers and of major value as a landscape character value. In both areas were the structures compared to geomorphologic characteristics and landuse type (fig. 3).

Highest abundance of selected historical landscape structures in both examined areas is situated in altitude of 501 – 600 (Detva 55, 23 and Horné Plachtince 95, 02 %) and on the low highlands geomorphologic type of relief.

In the cadastre of Detva were found linear and squarish field forms, which are sign of active agricultural landuse. On the other hand in Horné Plachtince cadastre were found historical landscape structures linear and square but twined with vegetation on permanent grassland. The arable vegetation wasn't found there.

Fig. 3 Relationship between historical landscape structures and altitude, landscape type and geomorphologic relief. Graph below compares percentage ratio of inheritance in typical squares in both cadastres (Source: Sedláček 2008)



4. Conclusion

The article introduces an easy method to describe and evaluate statistically types of landscape in examined area. To select a landscape and to divide it into a net of squares of equal area represent one of the possibilities how to describe a land acording to distinct set of criterion. Geomorphologic characteristics and areal inheritance of landscape components represent in our experiment distinct characteristic for every square, assuming, that image of landscape is characterised by combination of land cover and geomorphologic relief. The most occured combination of landscape help to concieve which part of landscape is most common or which one is specific. As the spatial inheritance characteristics were compared, arised the difference between both areas. Three most occured combination of landcover and relief (typical squares) contained in general more woodland that typical squares of Detva cadastre which, on the other hand showed more arable areas. In Plachtince cadastre can be seen woodland type with small inheritance of scattered settlement, with permanent grassland instead of arable land and on the other side Detva cadastre in agricultural type of landscape with „living“ farm fields, and scattered settlement.

The hypothesis that landscape image comprise landcover and geomorphological relief was used also by comparision of inheritence historical landscape structures in examinated areas and the subsidiria criterion was the absolute altitude. It was found that HLS showed affiliaton to similar types of geomorphological relief (lower highland) and landscape type (woodland/agricultural with settlement). Could be assumed that specific areas in similar landscape types have similar historical development and tends to remained untouched by tremendous replotting in socialistic planning period.

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Biodiversity protection and sustainable tourism with the concept of socio-ecological resilience

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Abstract

The number of environmental problems related to human activities, and the creation of conservation areas is one of the solutions being adopted for the preservation of nature and endangered species, or other aspects of human heritage. Tourism is one way to use global biodiversity and cultural diversity to economic advantage, but it may have impacts on biodiversity and cultural diversity itself.

The development and commercialisation of ecotourism is also a step in the direction of bringing some discipline to international externalities.

Management at each local level depends upon developing human awareness, not only among the visiting tourists, but also the local residents and the various authorities. Poor management caused by a lack of information or education, or actual neglect would create further problems. So the authorities must continuously assess the human impacts upon their sites.

Key words: biodiversity; residence; sustainable tourism

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1. Introduction and main research focus

The governance of natural resources is emerging to confront with new challenges. Currently, an increase can be observed in the different level of connections between different environmental issues and decisions of local, regional, national and international relevance. There is a need for a stronger and more intensive coordination and exchange. Biodiversity loss and resilience have already become an urgent topic for future generations and need to be looked at from different aspects.

It is presumed that the Slovak economy will keep developing rapidly. However, if the economics only focus on industrial development, it would result in damage to the Slovakian environment and the natural resources of the country. (As it happened in Japan in the 1950s-70s. There is large number of people who became ill by environmental pollution by intensive industrialization).

It is clear that the Slovak economy will keep developing rapidly. However, if the

economics only focus on industrial development, it would result in damage to the Slovakian environment and the natural resources of the country. (As it happened in Japan in the 1950s-70s. There is large number of people who became ill by environmental pollution by intensive industrialization).

Tourism is one way to use global biodiversity and cultural diversity to economic advantage, but it may have impacts on biodiversity and cultural diversity itself (German Federal Agency for Nature Conservation, 1997), although this damage can arguably be limited if it is managed properly.

Tourists provide a significant potential source of income that might contribute towards the cost of conservation programmes, and the tourist demand for recreation and holidays is growing with increases in real incomes and leisure time. This potential for growth is often considered to be more than just short-term (Williams and Shaw 1991, Tisdell 2001).

In the developing world, economic planners are putting emphasis on how to create and stimulate incomes in rural areas where many of the poorest people are to be found. Where tourism can develop using natural infrastructure and climatic advantage, it is often seen as a cost-effective way of meeting these national and regional development objectives (Jenkins and Lickorish, 1997).

However, tourism has a difficult relationship with conservation management. This economic market is fragile and affected by externalities. A region of outstanding natural beauty or some other scarcity value (e.g. rare species) may attract too many visitors, leading to the destruction of the asset that made the area attractive (Deegan and Dineen, 1993).

The development and commercialisation of ecotourism is also a step in the direction of bringing some discipline to international externalities. By commercializing the environmental services implicit in ecotourism, there is, principle, a vehicle through which environmental preferences of consumers can be translated into monetary payment t service providers. Purely private property rights, however, are unlikely to foster desirable promotion of ecotourism, and local government involvement is likely (Pearson, 2000).

Resilience concept has increasingly been used in the analysis of human-environment interactions. Holling (1973) states that "Resilience determines the persistence of relationships within a system and is measure of the ability of these systems to absorb changes of state variables, driving variables, and parameters and still persists." (M.A.Janssen, E.Ostrom,2006).

2. Aims and objectives

The aim of the study is to identify problems associated with the management of conservation sites in a number of countries, to identify their causes, and ultimately suggest possible management strategies that can improve the present situation.

The specific aims and objectives of the study are to:

Undertake research about the management of National Parks and equivalent conservation areas.

To clarify and compare the problems of management of National Parks in several contrasting countries on different continents - including Slovakia, Japan and Ireland.

To assess the reactions and impressions of some visitors to these sites with a view to identify potential problems/conflicts of interest.

To build on the theory of socio-ecological resilience and evaluate and suggest mechanisms for managing the potential conflicts between wildlife (biodiversity) and tourism, giving appropriate consideration to both environmental and economic aspects.

3. Methodology

The study will be based on a combination of secondary and primary data.

The primary sources used in this research will be interviews with tourist, local residents, rangers, other involved people and authorities on the site (possibly the Ministry of Environment, Ministry of Tourism and some politicians). Questions will be analysed and assessed based on their environmental impact (nature conservation), and economic influences (sustainable development) on interdisciplinary study.

Practical research will be done on comparative study of national parks including Slovakia (experiencing new paradigm shift by institutional change. Having huge potential for the new market, especially tourism as there is lots undiscovered place by tourists), Japan (highly economic developed country. Problems in natural tourism management), Ireland (succeeded in tourism, but still there are negative effect to nature by human impact) and other countries in Europe, Asia and America when it is required.

The secondary sources will be theoretical literature regarding through natural and social sciences in socio-ecological management policy and process, especially on resilience theory.

A lot of work on resilience has focused on the capacity to absorb shocks and still maintain function. Applying this theory to tourism management practice could give a better solution to environmental problems caused by human impact.

4. Study Areas- Japan, Ireland and Slovakia

Japan has the image of the oriental country and it has succeeded in the cultural tourism (e.g. Kyoto, Nara) but not in the natural tourism. Japan Tourism Agency has just established in October 2008 under ministry of land, infrastructure, transport and tourism. However, even just judging from their webpage, promotion is still weak. The only latest update on the English webpage is on October 2008 to tell the Agency has opened. There is more effort needed to provide information for the foreign tourists.

The problems of Natural tourism in Japan is mainly caused by intensive number of tourists. It can be often seen that soil erosion, over-crowded in natural sites in Mt.Fuji and Oze-Nikkou National Parks.

Ireland has succeeded in tourism industry. It contributes the high percentage of the economical resources also with the promotion of cultural festivals (e.g. St. Patrick's day) and the unique landscape (e.g. Cliffs of Moher). Also the cooperation between Republic of Ireland and Northern Ireland can be seen in the tourism agency organisation. However, there are still problems in natural tourism management, which are soil erosion in Wicklow Mountain NPs, water contamination in Killarney National Park areas, and pressure from tourism and farmland in many other places.

Slovak tourism agency is offering attractive information to incoming tourists on their website with 8 languages of contents (Slovak, English, French, Hungarian, Russian, German, Polish, Dutch), and various photos, videos, weather forecasts, currency calculator, and articles are available. But how many people came up with the idea to have holiday in Slovakia and use this webpage? - What is the image of this country? - Tatra Mountains, caves or forest?

The image of the country is still weak compare to other European countries. There is necessity to promote the tourism and create the image of the country by advertising (by web, TV, posters etc.). So the number of potential tourists would have interest to visit this country for recreation or holiday then it shall contribute to the sustainable economic development.

5. Conclusion

There are motley environmental problems related to human activities, and the creation of National Parks and World Heritage Sites is one of the solutions being adopted for the conservation of nature and endangered species, or other aspects of human heritage.

Many of these sites have links to tourism, as this is often seen as a mechanism to offset the costs of administering a site, as well as providing education. However, as has been indicated by the survey respondents, any human interaction could bring some negative effects to the park/site, and these need to be effectively managed. Every site is unique and the challenges involved in management differ from country to country, and even site to site.

Conservation is now an issue of international concern. This is partly due to the development of a worldwide 'global commons' ethic, and partly because conservation is increasingly linked to international trade - either due to the growth in world-wide tourism or because rare biological and cultural commodities have an international market.

There are many environmental problems related to human activities, and the creation of National Parks and World Heritage Sites is one of the solutions being adopted for the conservation of nature and endangered species, or other aspects of human heritage. Many of these sites have links to tourism, as this is often seen as a mechanism to offset the costs of administering a site, as well as providing education.

However, as has been indicated by the survey respondents, any human interaction could bring some negative effects to the park/site, and these need to be effectively managed. Every site is unique and the challenges involved in management differ from country to country, and even region to region or site to site.

Management at each local level depends upon developing human awareness, not only among the visiting tourists, but also the local residents and the various authorities. Poor management caused by a lack of information or education, or actual neglect would create further problems. So the park authorities must continuously assess the human impacts upon their site(s) - including those that come directly from the visiting tourists.

Following this, they need to inform and educate both tourists and locals in order to encourage people to protect the natural or cultural heritage resource concerned. Where the pressure comes from illegal activities they need to actively enforce the legislation.

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Trees adapted for urban paved sites – ongoing research concerning selection of site-adapted species use, learning from nature

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Abstract

Trees can be exposed to severe stresses in the urban environment, such as lack of soil volume or insufficient supply of water and nutrients. As a consequence, numerous city trees are in bad condition or even dying, which reduces their aesthetic and recreational values, as well as their ecological functions to moderate climate, capture air pollutants or serve as a habitat for wildlife.

Two approaches to address the problems are: (1) to improve the growing conditions mainly under ground, and (2) to search for plant-material better adapted to the harsh environmental conditions of urban areas. Recent research has concentrated on improvement of site conditions, while selection of suitable tree species has received less attention. The choice of species used in urban areas is often quite narrow with an uncertain adaptation for urban environment among many of the species. This narrow catalogue of urban species can also jeopardize the future for urban greening depending on the risk for new serious tree-killing pests. Therefore, identification and testing of new species is required, better adapted to the urban environment.

In this paper, an approach for plant selection is presented to find and select suitable trees for paved city environments from habitats where trees have naturally evolved under conditions that resemble the urban environment. This approach will be applied to identify prospective tree and shrub species from one region in Romania and in one region in northern China.

Key words: urban trees; selection; site adapted species use; dendroecology

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1. Introduction

Trees fulfil important aesthetic, social and environmental functions in urban areas. However, urban tree life is increasingly under stress, leading to poor vitality, tree decline and recurring outbreaks of diseases, particularly in urban streets (Pauleit 2003). The average lifespan of street trees as well as of other trees living in paved city environments exposed to high stress is rather short (Sæbø et al. 2005). Historically, when introducing trees and other plants into cultivation in our cities little attention has been given to the species' tolerance for different site situations. Instead aesthetic qualities where prioritized (Spongberg 1990).

Since 2007 the City Tree Centre has been developed at the Swedish University of Agriculture Science (SLU) Alnarp in order to coordinate and initiate research and education concerning design, construction and management of urban trees. This include the development of a research approach with the aim to test a methodology where the selection of trees for urban paved environment starts with habitat studies.

1.1 Urban paved environment

Today the problem for urban tree planners lies not in finding a great variety of species which are well adapted for the favourable growth conditions that often exist in urban woodlands and parklands (Sæbø et al., 2005). Rather it lies in finding species that can withstand the harsh conditions in urban paved sites. Streets and other urban paved site with sealed surfaces are complex stressed environments for tree growth (Richard 1983). Trees in these environments are to a great extent exposed to heat, drought, high lime content and Ph of soils, soil compaction, pest and diseases, emissions and de-icing salt (Pauleit 2003) (Table1). Species that are poorly adapted to these harsh growing conditions are particularly susceptible, even to less aggressive pathogens (Richards, 1983; Sæbø et al., 2005; Tello et al. 2005). Additionally, it is predicted that the climate changes will adverse the conditions for tree growth through increased average temperatures combined with more frequent heat waves and periods of drought during summer (SOU 2007, IPCC 2007).

1.2 Unvaried choice of species for urban paved sites in Scandinavia

In addition to the extreme site conditions in urban paved environment, a limited number of species and genera dominate the urban tree stock both in European and North American cities (Pauleit et al. 2002, Raupp et al., 2006, Bühler et al., 2007) and is particularly apparent in Northern Europe (Pauleit et al., 2002). In Oslo (Norway), one clone of lime tree (*Tilia x vulgaris* 'Pallida') represents 70% of all newly planted street trees, while in Reykjavik (Iceland), 90% of all newly planted street trees are from one species of poplar (*Populus trichocarpa*) (Pauleit et al., 2002). In Copenhagen (Denmark), London plane (*Platanus x acerifolia*) and lime tree (*Tilia ssp.)* represent 61% of all street trees planted between 1990 and 2000 (Bühler et al., 2007). Yet, recurring outbreaks of diseases on the most commonly used species and the threat of future diseases and infestations of vermin have lead to considerable and persistent argumentation for the necessity of using a wider range of species (e.g. Tello et al. 2005; Raupp et al. 2006).

From discussions with urban tree planners in Scandinavia, it is clear that the unvaried choice of species for paved sites is a reflection of local experiences/traditions and unwillingness to take the risks associated with using 'unproven' plant material in intensively used and prestigious streets and public spaces.

Today, we clearly stand in front of two important challenges in the planning and management of urban trees:

- increase knowledge and experience about site-adapted use of species

- introduce a larger variation of species and genus.

Tab. 1 The table compile information from scientific literature concerning stress relative aspects which urban paved environment represent and is orginised into climate, soil conditions and water supply and air and soil pollution

Climate	- Air temperature generally higher than in surrounding rural landscape, especially during night-time both during the vegetation period and in winter, caused by losses from heating systems, combustion of fossil fuel and radiation from sun-heated hard materials (urban heat island effect) (Landsberg 1981; Sieghardt et al., 2005)
	- Rapid temperature increase in areas exposed to sun during the morning hours (Flint 1985)
	- Generally reduced wind speed giving higher temperatures compared with the countryside, but also streets and places with strong cooling and drying winds in 'city canyons' lowering the air humidity (Landsberg 1981)
Soil conditions and water supply	- Hard materials covering the ground giving rise to rather high ground temperatures in sun-exposed places (Graves 1998)
	- Limited rooting volumes and poor soil oxygen due to ground compaction (Flint 1985; Rolf 1994).
	- Low biological activity often combined with lack of key nutrients, partly caused by very limited accumulation of litter and mould (Craul 1999)
	- Alkaline soil due to use of road salt in the winter and weathering from rather chalk-rich building materials (Craul 1999)
	- High evaporation rates combined with low water infiltration due to hard materials covering the ground and effective drainage systems (Flint 1985)
	- Sudden fluctuations between dry and wet as a result of compacted soils with problematic structure (Nowak et al., 1990; Craul 1999; Sieghardt et al., 2005)
Air and soil pollution	- Increased levels of air pollutants such as sulphur, nitrogen oxides and carbon dioxide (SO_2, NO_x and CO_2) (Sieghardt et al., 2005)
	- De-icing salt, reducing the soil porosity as well as the availability of oxygen and soil water for the roots (Hvass 1985; Pedersen et al., 2000; Saebø et al., 2003; Pauleit 2003; Sieghardt at al., 2005). De-icing salt is probably the most problematic soil pollutant in northern Europe.

1.3 Ecologic direction in selection of trees for urban paved sites

In nature trees have been stress-tested and selected for millenniums. Some species have specialised toward certain habitat types (habitat specialists), while others have developed a more broad habitat specificity (Gurevitch et. al., 2002). Trees that have specialised in habitats with rather dry shallow and limited soil volumes and rapid changes between low and high air temperatures may be particularly well adapted for the conditions in urban paved sites. Such habitats are mostly found in steep, south facing rocky and craggy mountain-, canyon- and iron-bound environments as well as in continental steppe woodland environments (Gurevitch et. al., 2002; Grime 2002)

From the perspective of the northern parts of Central Europe and in adjacent, mild parts of Northern Europe it is unlikely that the species poor native dendroflora can contribute to a larger variation of tree species with extended tolerance of the environmental stresses characterizing urban paved sites of the region (Duhme and Pauleit, 2000). In comparison, other regions with a comparable climate yet having a rich dendroflora may hold the potential to contribute new tree species and genera well adapted to the growing conditions in urban paved sites across Central Europe and in adjacent, mild parts of North Europe (Takhtajan 1986; Breckle 2002).

The main research question in this project is how knowledge concerning untraditionally tree species and their site

tolerance can develop. A central hypothesis of this project is that there are still more species, subspecies, varieties and ecotypes to be collected and brought to use in street- and paved city environments as former plant collecting expeditions in potential regions around the world have not selected species specifically for these environments, habitats and use functions. This project presents an approach to the selection and introduction of tree species for paved city environments in the northern parts of Central Europe and in adjacent, mild parts of North Europe.

The main objectives in this project are:

- Identify flora region with site situations and climate similar to inner city environment across Central Europe and in adjacent mild parts of North Europe.

- Classify the tree species performance in these habitats

- Present/discuss a list of promising tree species for further research/selection regarding use in urban paved sites

2. Methods and materials

The research will be conducted at the north part of the Qinling Mountain, China and in northeast Romania (Moldavia) where climate and site conditions matching with urban paved sites in Central Europe and in adjacent mild parts of North Europe can be found (Takhtajan 1986; Breckle 2002).

In order to evaluate the potential water stress in the research plots evaporation and water runoff will be calculated. For the calculation of potential evapotranspiration the regression by Thornthwaite (1948) will be used. Here the monthly potential evapotranspiration is a function of monthly values on temperature, number of sunshine hours per day and cloudiness.

In the location of research plots an overall understanding of the species composition, structure and dynamics of the forest systems, and how these are affected by the altitude and variation in the local site conditions have to be carried out. Special attention will be given to identify the exact location of e.g. steep, south facing slopes with shallow soils and rock outcrop, where identification of the range of tree species growing on these slopes will be carried out. After this overall understanding of the study area is obtained, study plots will be strategically placed on the recognized slopes. The main criterion for locating a plot is its location on the steepest and/or most rocky parts of a given south facing slope. Within these parts of a given slope, achieving homogeneous site conditions while include the widest possible range of species determined the exact location and size of each plot. Plot size will vary between 10x10 and 30x30 m.

For each research plot, slope direction and steepness will be measured and rock outcrop and field layer cover estimated (FAO 2006). Soil samples will be collected in the plots in three different depths (0-20, 20-30, 30-50 cm) from 10 pits randomly distributed in each plot (Klute ed. 1986; FAO 2006).

All trees in a plot will be measured for diameter at breast height (DBH), total height and age. To establish the age, all trees will be subjected to drilling as close to the ground as possible (Grissino-Mayer 2003). Additionally, the position of each tree will be recorded distinguishing between canopy and understory, and tree habitus will be recorded as single steamed respectively multi steamed trees.

Profile diagrams will be drawn in order to demonstrate vegetation structures, species compositions and species performance.

3. Expected results

The result in the study will be presented as follow:

(1) Based on the overall understanding of the vegetation, including species composition and species distribution in combination with calculation of evapotranspiration and water runoff, the plots and their matching with urban paved sites can

be obtained. Further, due to the soil texture and organic matter of the soil in the plots it is possible to calculate the potential water stress in the plots.

(2) In the chosen plots an evaluation of the existing tree species and their performance in the stands will contribute to the understanding of the tree species development and eventually the ecological strategy to deal with with this type of habitats.

(3) Finally, a species list with tree species which are performing well in natural habitats with similar growing conditions as urban paved sites in Central Europe and in adjacent mild parts of North Europe will be compiled. This list will include species that have their main distribution in this type of habitat and have a fairly fast growth and also develop old trees in these sites.

4. Discussion and Conclusion

When the plot data are combined with the general observations of the tree species' occurrence across the woodland systems, it becomes clear that some of the species observed have developed an extensive plasticity and tolerance for a range of environmental conditions (habitat generalists), while others have specialised toward the distinct habitat type of south facing slopes (habitat specialists) (Gurevitch et. al., 2002). When searching for species with high tolerance for urban paved sites, specialists towards warm and dry habitats are of greatest interest. However, these results have to be considered as a starting point in a possible selection process aiming to increase the urban tree stock with more species and genera of trees that are site adapted for urban paved sites. This stage of identification has to be followed by further evaluation where tests in urban plantations have to be carried out before any clear recommendation can be made. Nevertheless, in the selection process towards new trees for urban paved environment, it is less time consuming if the selection process from the beginning focus on promising species based on habitat registration rather than testing randomly among tree species.

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Ecological stress accounting: case study from Tisá and Petrovice (1970-2005)

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Abstract

The research is studying progress of the ecological stress inter 1970 – 2005. Neighbourhood of the study area with the unique natural basement and the chemical industry in Ústí nad Labem gives an expectation of interesting result, which was confirmed. The research is mainly based on the own field research and gives general confrontation with look at the history and to the present. The research gives a list of all natural elements, cultural relics and historical monuments that makes the individuality of the study area. Follows detailed describing of stressors and calculating of the ecological stability. At the end are added estimations to the future and some recommendations for the development of the study area.

Key words: ecological stress; accounting; case study; progression; field research; Tisá; Petrovice

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1. Introduction

The research deals with an ecological stress accounting in study area Tisá and Petrovice municipalities inter years 1970 - 2005. It is an interconnection of some different parts - nature protection and cultural-historical monuments against the ecological stress. The landscape in the study area is influented by nature element and stressors together. The individuality of the Tisá and Petrovice is rightly given by the valuable nature basement (e.g. protected landscape area Elbe Sandstones, Natura 2000 protected areas, nature monument Tiské stěny) that must function in closeness to the hard industry centre Ústí nad Labem. The main aim of the research is the ecological stress accounting in the opposition of the valuable natural basement. Respecting its aims this thesis is divided into the two main parts. First describes nature protection, cultural relics and historical monuments. This part points out on the cultural and historical heritage of the study area.

2. Methods

The structure of the research respects the logical structure of the thesis. There are two

main parts, first describes nature protection, cultural relics and historical monuments. This part points out on the cultural and historical heritage of the study area. Second, the main part of the thesis analyses, calculates and interprets an ecological stress as the opposition of the nature and cultural element. This part also gives estimation for the future and some recommendation for the development of the municipalities. Both parts are mainly based on the own field research and knowledge of the study area. The most frequent method was data collection and its interpretation, also contact with the involved and useful institutions and studying subject literature. With data interpretation were analyzed the aerial photographs. Maps were created with GIS application. The ecological stress is made by 10 indicators (e.g. ecological stability coefficient, air pollution, traffic). Each of them was analysed every 5 years and the table with the final scores was made.

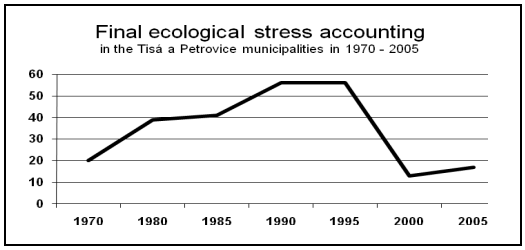
3. Results

One of partial aim was made a list of all natural elements, cultural relics and historical monuments. The main result of the research is the Final ecological stress accounting graph (Fig. 1), that shows an ecological stress progression between years 1970 - 2005. The ecological stress is an indicator made by 10 stressors (e.g. coefficient of the ecological stability, emissions and noise from traffic, old ecological stresses, immisions, level of the relief anthropization). All of them were in detail described and analyzed. The indicator reaches values between 13 in 2005 and 56 in 1990 and 1995.

Regression between 1995 and 2005 is evoked by the land-use changes (less arable land, more pernament grass vegetation) and also by the environmental changes connected with the industry structure change after political changes in Czechoslovakia in 1989.

An estimation is that an inertia causes that today´s stresses will be influented the environment for next some years and the ecological stress will be slightly raise. After that today´s environmental acquisition will take an effect and the level of the ecological stress will be stable on the low level.

Fig. 1 Ecological stress in studied municipalities
(Source: author)



4. Conclusion

The research combines field own research and literature studying with the personal knowledge of the study area, which makes the results more valuable. Respecting fundamentals of nature protection will cause preservation of the stable level of the ecological stress and also the nature individuality of the study area that makes it unique. Used methods are applicable also for the other areas.

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Evaluation of vegetation and their limits for sustainable development

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Abstract

Non-forest habitats are important landscape elements, which build network of the territorial system of ecological stability. Results of habitat mapping can be used for planning activities in the landscape, which are based on assessment of natural environment, as landscape planning, integrated management of the landscape, territorial system of ecological stability, sustainable development of the region etc. This contribution is focused on evaluation of existing approaches to habitat assessment and comparison of criterions and indices, which have been used for habitat assessment. Finally we suggested four the most important criterions and their environmental limits for sustainable development of the landscape: species richness, naturalness, stability and nature conservation significance.

Key words: biodiversity; naturalness; nature conservation; habitat

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1. Introduction

Non-forest habitats as wetlands, meadows, pastures or hedgerows represent significant part of biodiversity in agricultural landscape, which play an important role from production as well as ecological point of view. Vegetation is one of the most sensitive landscape elements, which reflects not only ecological characteristic of the landscape, but also all action and changes of land, which are undertaken or conditioned by man and his activities (Prach, 1994). Despite the big attention, which is paid to biodiversity conservation on international, regional or local level (the pan-European Biodiversity and Landscape Strategy, the European Landscape Convention, Habitat Directive, Water Framework Directive, Agro-Environmental scheme, etc.), declining of biodiversity is significant issue of cultural landscapes. Non-forest habitats are threatened by abandonment or on the other hand by intensification of agriculture.

Conservation and management of agricultural landscape is resulted in outcomes of landscape ecological planning, which prepares the bases for optimal organization and creates the unavoidable database on landscape for different spatial planning procedures, as for example landscape-ecological planning,

territorial system of the ecological stability, sustainable development, ecological networks, ecological carrying capacity, integrated landscape management. Several scientists studied vegetation and their significance for landscape ecological planning (Sláviková a kol., 1998, Jurko 1990, Halada 2000). Finding the right approach to representing a given issue through an indicator is important but sometimes difficult. Several authors have proposed approaches and conceptual ideas on how to structure the process for indicator development, especially for natural resource use and management indicators (Niemeijer and de Groot, 2008, Wilson et al., 2007, Donnelly et al., 2007, Hezri and Dovers, 2006, McCool and Stankey, 2004, Failing and Gregory, 2003 and Reynolds et al., 2003).

On the basis of field habitat mapping and their species composition, the following traits can be achieved and used in landscape ecological studies (Miklós, Izakovičová, 1997, Jurko, 1990):

- status traits: stability, vulnerability, hemeroby, naturalness

- production traits: feed potential, melliferous potential, herbs curative effect

- chorology traits – distribution, range and composition changes in time

- ecosozological traits – vulnerability, rareness, species richness, presence of endemic, protected species etc.

Complex assessment and comparison of habitats can be based on multi-criterion assessment of landscape-ecological significance Jurko (1990) or nature-conservation significance. Nature-conservation significance was suggested by Halada (2000) based on 4 criterions: species richness, naturalness degree, vulnerability and regional rareness.

The aim of this contribution was to evaluate non-forest habitats from landscape ecological point of view and to develop proposal of criterion and its limits for habitat assessment, which can be applied as indicators in the landscape planning processes (landed arrangements, integrated landscape management) and for optimal land use of agricultural landscape, which will support maintenance and conservation of non-forest habitats.

2. Methods

Phytosociological sampling was carried out in non-forest habitats, as pastures, meadows, wetlands, shrubs, using the methods of the Zürich-Montpellier school (Moravec et al., 1994). Landscape ecological significance was evaluated on the basis of 7 criteria: naturalness (H), vulnerability (O), regional rareness (V_r), species richness (D), feed potential (P_k), melliferous potential (P_m) and stability degree (S_{pa}) (Jurko, 1990):

$$V_{ke} = \frac{(H + O + V_r + D + P_k + P_m).S_{pa}}{100}$$

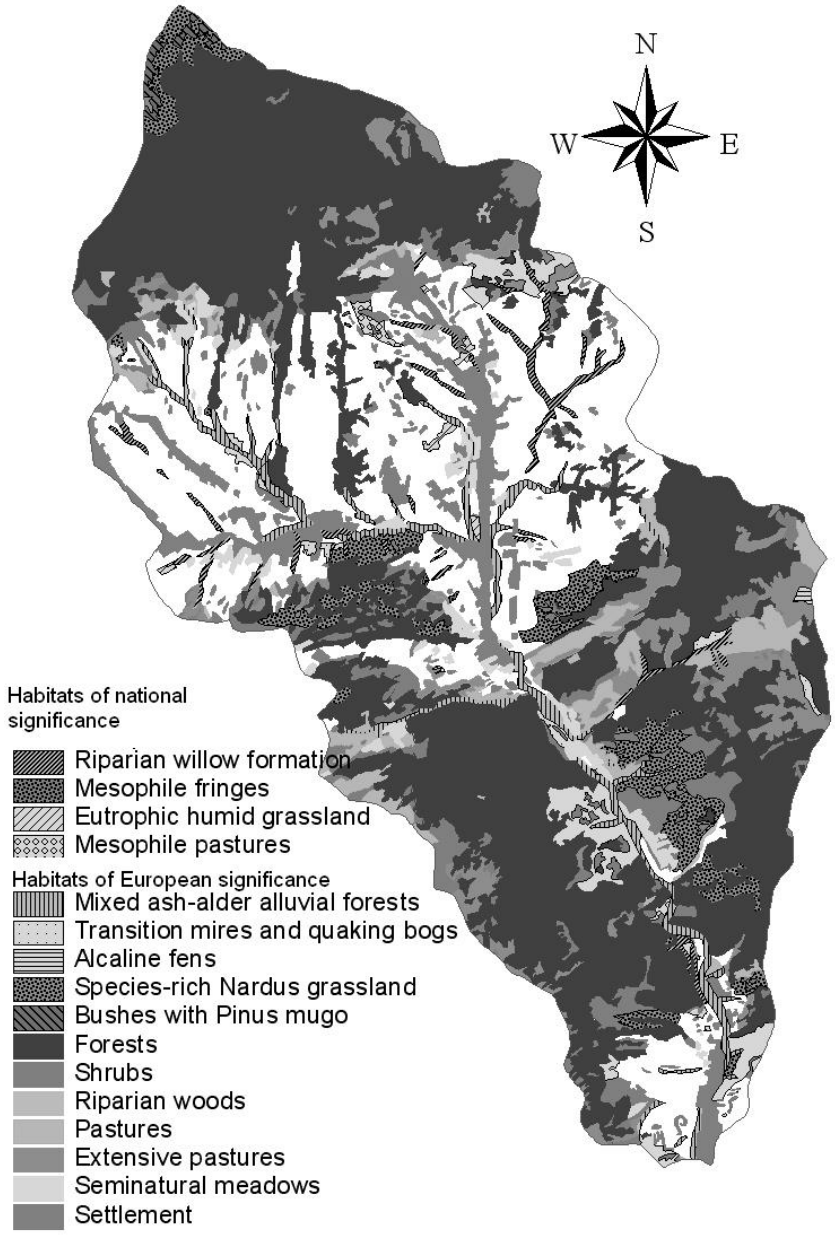
Landscape-ecological significance of habitats was classified into 8 degrees: from extremely low (1) to extremely high (8). Database of species attributes, created by Halada (2000) was applied for the assessment of particular criteria. To determinate the relationship between habitats and their characteristics, the statistical analyses of direct gradient analyses were carried out.

Proposal of 4 the most important criterions and their limits was suggested, which can be used as environmental limits for sustainable development of the landscape: species richness, naturalness, stability and nature conservation significance.

The research was realized in Biela Orava catchment, North parts of Slovakia, represented by pastures and meadows landscape. According to soil, climatic and relief conditions, the study area belongs to mountain and sub-mountain region (Landscape Atlas of the SR, 2002). The natural potential of the area is mostly conditioned by abiotic terms, characteristic dense hydrological net, great segmentation and different slope. The area

belongs to moderately cool climatic sub-region, very humid, which is conditioned by altitude, location to prevailing wind and forest density of the area. Rainfall ranges from 800 to 1200 mm per year, on Pilsko peak to 1 600 mm per year. The most spread soil-forming substrates are flysh shale and sandstones. Reaction of soil is from acid to low acid, somewhere neutral with high carbonate content. Different Cambisol subtypes (75.4 %) were developed on the soil-forming substrates. Some other types of soil are also represented in the study area, as Planosols and Stagnosols, Rendzic Leptosols, Podzols and Fluvisols, randomly occurred Histosols and Leptosols.

Fig. 1 Map of habitats of national or European significance – Biela Orava region (Source: Špulerová 2004)

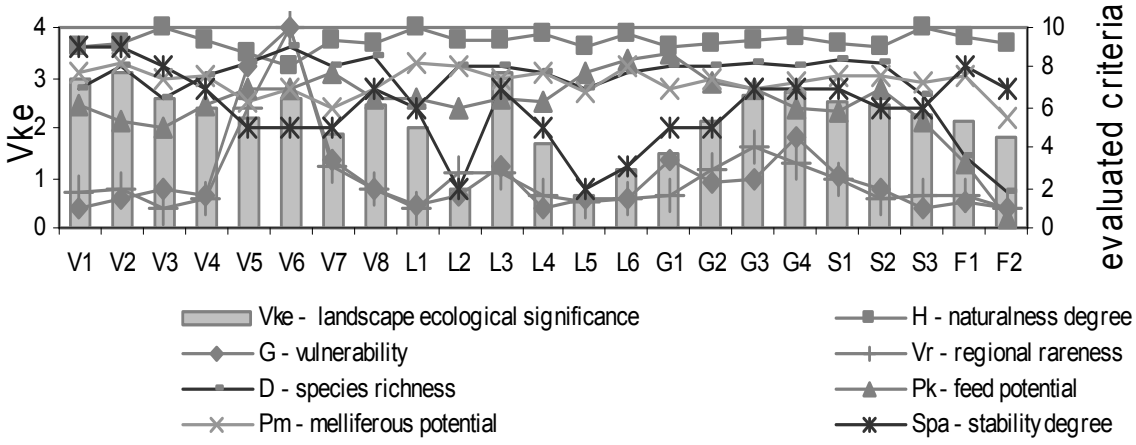


Tab. 1 List of the mapped habitats (Source: author)

Habitats		HS	V_{ke}
Wetlands	V1 Mixed ash-alder alluvial forests (*Alnenion glutinoso-incanae*)	E	5
	V2 Mountain alder alluvial forests (*Alnion incanae*)	E	6
	V3 Spruce alluvial forests (*Piceo-Alnetum*)	E	5
	V4 Pioneer willow shrubs (*Salicion eleagni, ass. Salicetum eleagno-purpureae*)	N	4
	V5 Acidic fens (*Caricion fuscae*)	E	4
	V6 Rich fens (*Caricion davallianae*)	E	5
	V7 Eutrophic humid grassland (*Calthion palustris*)	N	3
	V8 Mixed humid thickets with *Salix sp.*		4
Linear border communities	L1 Medio-European rich soil thickets (*Berberidion, ass. Ligustro-Prunetum*)		3
	L2 Medio-European rich soil thickets with alochtonous species		2
	L3 Xero-thermophile Medio-European rich soil thickets		6
	L4 Hedges		3
	L5 Nitrophile fringes (*Galio-Urticetea*)		2
	L6 Mesophile fringes (*Trifolion medii*)	N	3
Grassland	G1 Mountain hay meadows (*Arrhenatherion elatioris, Poo Trisetetum*)	N	3
	G2 Mesophile pastures (*Cynosurion, ass. Festuco-Cynosuretum*)	N	4
	G3 Extensive species–rich Nardus grasslands (*Nardo-Agrostidion tenuis*)	E	5
	G4 Mixed thickets on pastures(*Nardo-Agrostidion tenuis*)		5
Shrub land	S1 Hazel thickets (*Corylo-Populion tremulae*)		5
	S2 Mixed thickets on secondary places		4
	S3 Pioneer forest of *Sambuco-Salicion capreae*		4
Forest remnants	F1 Spruce and forest with rowan		4
	F2 Remnants of spruce plantation		3

Legend: **HS – habitat significance**: E – habitats of European significance, N – habitats of national significance, **V_{ke} degree** – 1. Extremely low, 2. Very low, 3. Low, 4. Low to middle, 5. Middle, 6 High, 7. Very high, 8. Extremely high

Fig. 2 Value of landscape-ecological significance (V_{ke}) and of their evaluated criteria (G – vulnerability, D – species richness, P_m – mlliferous potential, H – naturalness degree, V_r – regional rareness, P_k – feed potential, S_{pa} – stability degree) (Source: author)



3. Results

3.1 Evaluation of landscape ecological significance of habitats

The semi-natural habitats in Biela Orava catchment have been preserved as remnants or isolated islands in the reclaimed agrarian landscape. Together 175 phytosociological releves were done. Heterogeneity of mapped habitats such as pastures, meadows, alkaline fens, transition mires, wet meadows, shrub land, were dependent on ecological and relief condition. They were divided into 5 groups (Table 1): wetlands, linear border communities, grassland, shrub land, forest remnants. Some of them represent phytosociological units, classification of some of them is nor clear, because they represent succession communities or their creation was conditioned by human activity. The map of habitats shows fig. 1.

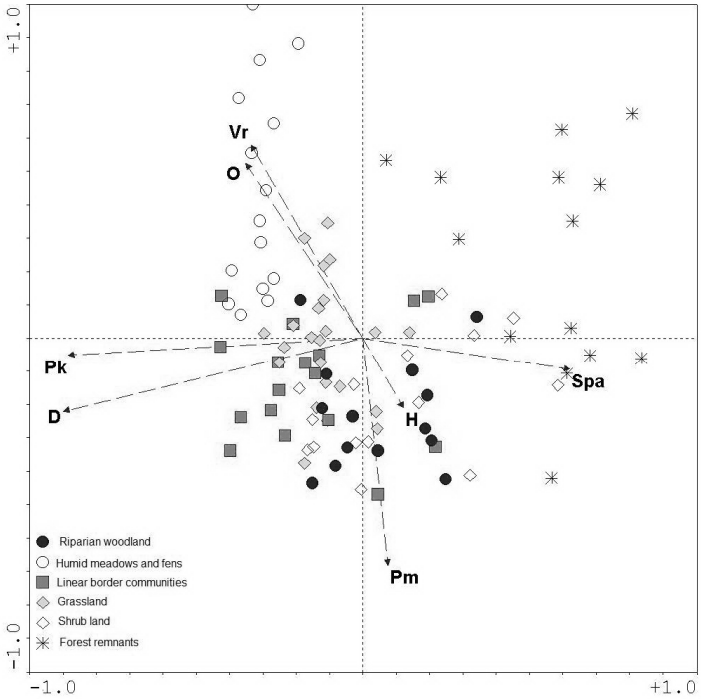
By virtue of calculation of evaluated criteria (naturalness, vulnerability, regional rareness, species richness, feed potential, melliferous potential and stability degree) for each releves, the value of landscape-ecological significance was figured out (fig. 2) for each releves and then average value for particular habitats. The highest average value was reaching the naturalness degree (9.3), melliferous potential (7.3) and species richness (6.9). None of the habitats was distinguish by extremely high value of V_{ke}. The highest value was characteristic for mountain alder alluvial forests (V2) and xero-thermophile Medio-European rich soil thickets (L3). Characteristics, which were part of the assessment of V_{ke}, were tested statistically. Correlation between particular habitats and tested characteristics is showed by ordination diagram of direct gradient analyses (RDA), done in CANOCO program and CanoDraw (fig. 3).

RDA analyses shows, that highest variability is explained by 3 variables: species richness (-0.83), feed potential (-0.79) and stability (0.56). Value of feed potential increases value of V_{ke} in linear border communities, species richness influences significance of V_{ke} in pastures, wet meadows and fens. Value of „*Cumulative percentage variance of species-environment relation*“ indicated, that 43.8 % of variability is explained by first axis.

Relationship of tested characteristics and monitoring habitats is done by results, that first four canonical axis explains 16.4 % of variability and all 7 included variables explains 19.1% of the total variability (Monte-Carlo permutation test, F-ratio = 3.02, P-value = 0.005). Results of analyses shows, that all variables have impact on the result of V_{ke}. The lowest impact was referred to variables - melliferous potential and naturalness degree,

which demonstrates similar constant value within all habitats. Their value slightly decreases in shrub remnants and riparian woodland.

Fig. 3 Direct gradient analyses (RDA) of habitats and their characteristics (Source: author)



Legend: H - naturalness, O - vulnerability, V_r - regional rareness, D - species richness, P_k - feed potential, P_m – melliferous potential and S_{pa} –stability degree

3.2 Proposal of limits and criterions for habitat evaluation

As the evaluation of landscape-ecological significance of habitats is based on multi-criterion evaluation, some information or relations between characteristics can be lost or neglected, therefore it is important to pay attention to individual characteristics and their interpretation. On the basis of literature review (e.g. Miklós, Kozová, Ružička et al., 1986, Hrnčiarová, Ružička, 1997, Donnelly et al., 2007), following characteristics were suggested as the most significant for habitat assessment and their application in landscape planning processes.

Naturalness expresses the actual natural state, as opposed to the cultural state, created by man and the original state, previous state in nature, uninfluenced by man (Scherzinger, 1996) and corresponds with degrees of hemeroby (artificiality of land cover). Evaluation of naturalness can be based on comparison of potential natural vegetation (Michalko et al, 1986, Maglocký 2002) with actual vegetation or based on species composition. On the grounds of proportion of native (A - native species with occurrence in natural habitats, B - native species with occurrence in natural or relatively far from natural habitats, C – archeophytes, plant introduced in the area before 1500 A.D.) and non-native species (non-native and invasive species, Cvachová et al., 2002) within community 5 categories of naturalness (Halada, 2000) is suggested for habitat assessment:

- high – habitats built by native species – category A

- high to middle – proportion of category B up to 5 %

- middle – proportion of category B in the range of 5 to 20 %

- middle to low - proportion of category B in the range of 20 to 50 %

- low - proportion of category B more than 50 %

Nature conservation significance expresses abundance of protected, vulnerable or rare species in habitats in compliance with Decree of ME SR No. 492/2006, Feráková et al. (2001) and Kliment (1999). Based on number of protected species we can classify 6 categories of vulnerability: 0 – absence of protected species, 1 – very low, 2 – low, 3 – average, 4 – high, 5 – very high.

Vulnerability of habitats is evaluated on the basis of their significance, national or European in compliance with Decree of ME SR No. 492/2006. Present conservation status of habitats of European significance (Habitat Directive) can be evaluated according assessment of favourable conservation status (Polák, Saxa et al., 2005). Five criteria reflecting species composition and environmental conditions were used: specific horizontal and vertical structure (typical species), locality threats (invasive species, wood and shrubs cover), natural distribution and area size. Each evaluated site can be allocated to one of the 4 categories, providing an indication of direction of change as well as its current state: favourable conditions – maintained (A), good or recovered (B), unfavourable condition – partially destroyed (C) or destroyed (D).

Species richness and its pattern is a measure of the relative diversity among organisms present in different ecosystems. "Diversity" includes diversity within a species and among species, and comparative diversity among ecosystems. It is important characteristic in processes of landscape planning and function-space optimal landscape structure arrangement, which can be used for shaping vegetation dynamic by nature conservation, forest, grassland and water management. Species richness can be expressed by number of species in a given habitat or by using indexes of species richness, e.g. the Shannon-Weiner index, the Index of scale diversity (Jurko, 1990).

Stability expresses natural-anthropogenic constancy of species communities; it means ability of habitats to maintain stable species composition also without additional energy by the form of fertilizing, mowing, grazing, cutting self-seeding and others (Ružičková et al., 1990). The most stable habitats as forest, hedgerow, are the most stable communities and are often classified as the key elements of territorial system ecological stability (Löw at al., 1984).

Evaluating proposed criteria showed similar results as the assessment of V_{ke}. Habitats, interpreted by high or middle value of V_{ke} (habitat – V2, L3, V6, G4, V1), are characterised by high species richness and natural or close to natural species richness. As the additional criterion, the significance of habitats according national law was proposed. This criterion was confirmed by presence of 5 habitats of national and 6 habitats of European significance.

4. Discussion and conclusions

Sustainable development is a way how to manage conservation and management of habitats in agricultural landscape, since there is still a high amount of conflicts emerging between biodiversity conservation and socio-economical development and the habitats are threaten, or disposed in consequence of higher community investments pressure. This is resulted in decreasing area or extinction of rare habitats or species. To maintain these habitats, it is necessary to approach to conservation and sustainable using of habitats and their environment actively (Izakovičová, 2005). Results of habitat mapping are possible to use in planning different activities in landscape and apply in different processes, such as rural development plan, territorial system of ecological stability, environmental impact assessment, nature conservation, carrying capacity of the landscape etc. Because of their landscape-ecological significance, they can be limiting factors e.g. for expansion building area, road networks, whereas it is necessary to protect them or recover their favourable conservation status. For this reason, it is

important to determine their value and significance, which can be based on multi-criteria assessment or evaluation of selected criteria. As the most important criteria, we suggested 4 criteria: species richness, authenticity and important of habitats according to an Announcement of Ministry of the Environment Slovak Republic. Non-forest habitats are important not only because of biodiversity protection, they provide different ecosystem services in the landscape, as regulating services (erosion control, water regulation), provision services (provision of habitats, recreation, products obtained from grassland and forest), cultural services (recreation and ecotourism, aesthetic and cultural heritage values, socio-economic activities) etc.

The efforts to develop sustainability indicators have strongly increased since the beginning of the 1990s, often led by intergovernmental processes. More recently, a number of sustainability indicator development processes have been initiated within large research projects that aim to design tools for sustainability assessments, funded by the European Union, e.g. : SENSOR (Sustainability Impact Assessment: Tools for Environmental, Social and Economic Effects of Multifunctional Land Use in European Regions), EFORWOOD (Sustainability Impact Assessment of the Forestry-Wood Chain), SEAMLESS (System for Environmental and Agricultural Modelling, Linking European Science and Society) and PLUREL (Peri-urban Land Use Relationships: Strategies and Sustainability Assessment). These are probably among the largest research- and science-driven efforts with regard to sustainability indicator development in Europe. The role of sustainability indicators is to structure and communicate information about key issues and their trends considered relevant for sustainable development. Indicators have been defined by Ott (1978) as a way to "reduce a large quantity of data to its simplest form, retaining essential meaning for the questions that are being asked". Indicators do more than describe current conditions or trends, they create an understanding and insight about how human and/or environmental systems operate; they suggest the nature and intensity of linkages among different components of the studied systems, and they offer a better understanding of how human actions affect different dimensions of sustainability (economy, environment, social issues). Indicators are consequently meant to support scientists, politicians, citizens, and decision-makers to monitor status and changes in key sustainability dimensions and to more clearly foresee the consequences of action or inaction. The identification, measurement, and application of appropriate indicators remains among the major challenges facing policy-makers, bureaucrats, scientists, and citizens tasked with sustainability (McCool and Stankey, 2004).

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Evaluation of landscape quality objective: model solution and method application in Bratislava V. district

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Abstract

European Landscape Convention (Council of Europe, 2000) has led into use several new and important terms. One of them is „landscape quality objective“ defined as the formulation by competent public authorities of aspirations of the public with a regard to landscape features of their surroundings. Contracting parties pledged themselves to define landscape quality objective for identified and assessed landscapes. The development of landscape typology is one of important demands made on contracting parties by the Convention. The research carried out as a part of the Master Thesis (Tománková, 2009) approaches specific landscape type – Bratislava V. district. This area of interest contents both: urban and rural landscape types. The research has aimed to gain public opinions about landscape features of their surroundings trough a questionnaire. The definition of landscape quality objectives in an area of the interest is based on the cooperation with the public. By the evaluation of public opinions differences between landscape perception and preferences in urban and rural landscape are taken into consideration. The attention is given also to factors influencing the connection between a profile of respondents and their preferences in landscape quality objective.

Key words: landscape quality; urban landscape; rural landscape; questionnaire; Bratislava

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1. Introduction

Human activities affect the landscape mostly in negative meaning. After 1990 year several important international conventions were adopted. They established new enactments in landscape protection, landscape structure and effective principles of landscape use. For achieving sustainable development of the landscape, it is necessary to adopt and put into effect international, national but especially regional and local proceedings. One of international conventions reflecting this demands is European Landscape Convention (Council of Europe, 2000). The Convention plays important role in landscape protection. It

aims to achieve a sustainable development of landscapes, and the protection of landscape diversity. It applies to the Contracting Partie´s entire territory and covers natural, rural and urban areas. It deals with everyday or degraded landscapes, as well as those, that can be considered outstanding. Until these days the Convention was ratified by 30 countries and signed by 6 countries. It came into force in Slovak republic on December 1st, 2005 (www.conventions.coe.int). The Convention has adopted several new terms, such as *landscape quality objective*. This term is defined as a formulation by competent public authorities of aspirations of the public with a regard to landscape features of their surroundings. In European Landscape Convention contracting parties bound themselves to define landscape quality objectives for identified and assessed landscapes, after public consultation. Certain methodical approaches assess attractiveness, visual quality, landscape scenery, expressing landscape quality as a combination of objectively measurable indicators and a determination of subjective landscape perception. Landscape quality objective means a new approach: not only current state of landscape is evaluated, but also a formulation of objective state is involved. It is an ideal state, that is never going to be achieved, but landscape evolution should be heading this way (Salašová, 2006). By defining landscape quality objective one of important demands is to identify and assess landscape´s types. In many European countries projects aimed on the developing of landscape typology, which have started recently. The Slovak republic is developing a methodology for creating landscape typology. Systematic review of the typology of present-day landscapes on European and national level is included in international project ELCAI (European Landscape Character Assessment Initiative) (Wascher, 2005).

In the research which was part of the Master Thesis „Evaluation of the landscape quality objectives: Model solution and application of methods in Bratislava V district“ (Tománková, 2009) attention was given to landscape quality objective defined by local citizens. The evaluation of landscape quality objective has been carried out in specific area of urban landscape. The research has aimed to gain public opinions on landscape features of their surroundings trough the questionnaire. Based on the fact that public opinions are key aspects in defining landscape quality objective, the research aimed to gain public opinions on landscape features in Bratislava V. district.

2. Study area

Research was carried out in Bratislava, capital of Slovakia. This city is divided into 5 administrative parts (Bratislava I – V districts). As study area has been chosen Bratislava V. district, which consists of 4 city parts: Petržalka, Jarovce, Rusovce and Čunovo and covers 94,2 km². This area was chosen as study area, because it contains both urban (Petržalka) and rural (Jarovce, Rusovce and Čunovo) landscape types. For Petržalka are typical high buildings, which have been built after 1970. With its 114 153 inhabitants is one of the largest habitations in middle Europe. Its population density is almost 4000 inhabitants/km². At the other side, Jarovce, Rusovce and Čunovo are typical rural areas with houses and fields used for agriculture. Its population density is not higher than 89 inhabitants/km².(Štatistický úrad SR, 2007). Petržalka became part of capital city in 1946, Jarovce, Rusovce and Čunovo in 1971 (Hrnčiarová et al., 2006). Research aimed to identify differences in landscape preferences between these two areas.

3. Methods

The research was carried out in Bratislava V. district among 100 respondents (60 from Petržalka, 40 from Jarovce, Rusovce and Čunovo) in the age over 15 years in March 2009.

The questionnaire consisted 3 parts:

- First part was concentrated on personal details (age, gender, education, city part, if he was born here or moved in here).

- Second part identified subjects, which are perceptive in the landscape as the most positive and the most negative one.

- Third part contained pictures from study area. Respondents were asked to assign them through points in the scale from 0 to 4 depending on their positive/negative perception.

By questionaire´s results interpretation special attention was given to:

- subjects /components of landscape structure and local areas, which are percepted by respondents as the most positive and the most negative;

- how „respondents profile“ characteristics affect landscape perception of respondents;

- factors influencing the connection between profile of respondents and their preferences in landscape quality objective;

- differences between landscape perception and preferences in urban (Petržalka) and rural (Jarovce, Rusovce and Čunovo) landscape types.

4. Results

Landscape quality objective was defined after the consultation with the public, for two different landscape types: urban (Petržalka) and rural (Jarovce, Rusovce a Čunovo). Based on questionnaire´s results assumed differences in landscape perception of both landscape types were confirmed. Gained information created a basis for the identification of differences between landscape perception and preferences. The research confirmed that inhabitants of rural areas are much more satisfied with a visual character of surrounding landscape as inhabitants of the urban areas. Gained landscape preferences among citizens enabled to define landscape quality objective:

4.1 Landscape quality objective in Petržalka (urban landscape type)

Respondents from this area were mostly dissatisfied with landscape features. Respondents´ demands for surrounding landscape were:

- adequate amount of natural and semi-natural subjects (such as parks, water surfaces, forests and waterside vegetation) which are places for a recreation and performs positively perceptived esthetical landscape components

- clean and upkeep public areas with an abundance of a greenery

- a house-building which is not affecting current landscape values and is not destroying places used for a recreation or any other valuable places

- reconstructed and modernized dwelling houses and administrative buildings

- a sufficiency of communal recreational and sport areas

4.2 Landscape quality objective in Jarovce, Rusovce and Čunovo (rural landscape type)

Respondents from this area were mostly satisfied with landscape features. Respondents´ demands for surrounding landscape were:

- adequate amount of natural and semi-natural subjects (such as forests and waterside vegetation, water surfaces and parks) which are places for a recreation and performs positively perceptived esthetical landscape components

- clean and upkeep public areas with an abundance of a greenery

- conserving traditional local architecture

- conserving traditional landscape scenery of rural landscape type

- a house-building which is in a harmony with traditional architecture

- adequate availability of the city center by public transport

- an availability of civic services

- a sufficiency of communal recreational and sport areas

- reconstructed cultural and historical monuments

5. Conclusion

Landscape preferences among the public may reach the scale of landscape preference variation. It is important to give an attention to the fact, that local problems are well known by local public. Identified differences and defined sources of the variation in landscape preference are important to understand the connection between the landscape and the public; and to achieve successful participation of the public. Knowledge about subjective preferences in landscape features defined by local citizens could help to improve the future landscape planning, to define suggestions for improving landscape quality and to approach to the ideal state of the landscape.

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Highways and the Landscape: a comparison of France and the Czech Republic

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Abstract

The subject of this paper is the integration of highways into the landscape in France and in the Czech Republic. The term *integration* has been commonly used in discussing highway creation since practically the origin of this type of road, but its meaning has remained vague. Today we revisit the issue and ask a major question: what is it the integration of highways into the landscape? Two case studies of recent highways, one in France and on in the Czech Republic, serve to identify present day aspects of highway planning and construction in these two countries and clarify the role of the term *integration* in the domain of highway landscapes.

Key words: landscape; highway; integration

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1. Introduction

This thesis is based on French-Czech cooperation, namely between The Department of Garden and Landscape Architecture, Mendel University of Agriculture and Forestry in Brno-Faculty of Horticulture, and Ecole Nationale Supérieure du Paysage de Versailles.

The subject of this paper is the integration of highways into the landscape, precisely in France and in the Czech Republic. The term integration, "borrowed" from sociology (Donadieu, 2001), has been used in the domain of highway construction since practically the origin of this type of road. The question of integration became topical especially in the late sixties, a period marked by the boom in the number of automobiles (Donadieu, 2001). Consequently, highway construction in France (Ladret, 1974) and in the former Czechoslovakia accelerated (Prašil, 2007). The priority of the national transport policies was to construct quickly. Other preoccupations, such as the effects on the environment, were neglected. Still, the negatives effects of infrastructures along with the emerging ecological movement have resulted in a revision of the question of integration.

The first answer, dating back to the late seventies and the eighties, was planting along highways. This approach subsequently became part of highway construction policy of both countries. However, in the nineties in France, the landscape became a great subject of criticism and many landscape theories emerged at that time, such as those of Bernard Lassus, Augustin Berque, Alain Roger, etc. The integration of the highway thus represented a major issue and some critiques stated that this subject was too complicated to be reduced to a simply policy of "planting".

Today we ask a question: What is, in fact, the integration of highways into the landscape? And in order to delimitate the research objective we ask these accessory questions: What does, in fact, the integration of highways into the landscape mean? Who use this term? What are the results of different theories and practices of the integration of highways? Are these theories and practices different in the Czech Republic and France?

2. Hypotheses

We present these two principal hypotheses: Firstly, although the term integration is commonly used in France and in the Czech Republic, its meaning is not exact and precise and depends on those who use it. It is a term "à la mode" based more on the form than on the sense. It represents a powerful word having an echo in the imagination of the public without being established on tangible realities.

Secondly, in both countries two opposed attitudes coexist under the term of integration (hypothetical poles): the *conservative* one, considering that an integrated highway is the one which is as little visible and perceptible as possible; at the other extreme the *progressive* attitude, opposed to the camouflage of the highway and inviting affirmation of the infrastructure in the landscape.

3. The case studies

The question is studied on two cases of highways, one in France and the other in the Czech Republic. In France we analyzed the case of highway A89, going from Bordeaux to Clermont-Ferrand, and in the Czech Republic highway D8 in Northern Bohemia, connecting Prague to the German border. The main criterion of our choice was the state of the project. We chose the section opened after 2000. The reason for this criterion was firstly that it represents contemporary creation and secondly, we needed to confront the project with the authors of its conception. As a highway project generally takes more than ten years, the second criterion could not be satisfied with older projects.

4. Methods

Firstly, we searched the literature on the studied subject, relevant and accessible in both countries. The analysis of model highway cases was made on the basis of data acquired in highway archives. Afterwards, the results of the analyses were confronted with the studied highways *in situ*. In order to illustrate how the project is carried out in the territory, we used photography as a support. Finally, an import source of research was interviews and questionnaires with different actors of highway construction which were used simultaneously in France and in the Czech Republic.

5. Results

Although the question of the integration of highways into the landscape has been treated in the literature since the origin of this type of infrastructure, the term remains vague and ambiguous.

In France, in contrast with the Czech Republic, the highways are the object of diverse creation of landscape architects (like Bernard Lassus, Claude Chazelle and Alain Provost) or of artists (sculptures etc.). This fact is partly related to the will and to the interest of highway societies.

The highway planning process and related legislation are similar. In both countries there is a system of environmental impact assessment. On a basis of this process, the final road is chosen among several variants. It represents a compromise between technical, political, economical, sociological and environmental aspects and the importance of aspects varies with the situation. In France this instrument has existed since 1976[1], in the Czech Republic since 1992[2]. In studied cases the observed aspects were similar as well as the importance attached to these elements in the choice of the final variant of the highway line.

In fact, the legislation (in the Czech Republic the law on roads[3] and in France the law on Landscape[4]) oblige the planner to "integrate," but it specifies neither what the term means nor what an integrated highway is. Nevertheless, the term frequently appears in the rhetoric of Czech as well as French planners. The sense, never defined, remains confused. The term is used for environmental (protection of nature), esthetical (the visual aspects of the highway in the landscape) and functional aspects (measures mitigating fragmentation of the territory, etc.) at the same time.

In France, complete studies at several phases of the project are dedicated to "integration." In these studies the aesthetic aspects of the highway are treated and the particular solution of the integration is described, such as treatment of slopes, measures for dissimulating the highway in the landscape, scenography of the highway landscape, etc. We are confronted with two attitudes: camouflage and dissimulation on one hand and on the other hand the affirmation of the infrastructure in the landscape (for example the abrupt slopes that emphasize the rupture of the landscape by the road).

In the Czech case, there was no particular study dedicated to the integration of the highway into the landscape. This question was treated exclusively after the construction of the highway, within the framework of plantation studies. The plantation rules are defined by the state with only autochthon species used (except of the central reservation/median) and respect of planting schemes. The scenography with the surrounding landscape was not treated.

Analogically, in both countries the plantings represented a standard part of highway construction. They are frequently considered as an important element contributing to integration.

Comparing the design of French and Czech highways, we observed that in French case we a preoccupation of scenography of highways could be identified, such as the conception of vistas or of slopes. In the Czech case measures like slopes and plantings were a technical answer to the present condition of the locality, without larger or any defined conception.

We also observed that in both cases the final aspect of the highway in the landscape is heavily marked by the technical measures in order to protect inhabitants. Noise barriers and other noise suppressing treatments are important elements in the semiotics of the highway landscape.

The results of interviews and questionnaires, made with different participants of the highway planning process, affirm that the term of integration is used in both countries with different meanings: in the technical sense as insertion into the terrain or in the sense of dissimulation and camouflage. Some participants consider integration as a holistic approach considering technical, environmental, sociological, etc. aspects all at the same time.

Often the planners (technical engineers) declare to be in a defensive position, under the pressure of legislation (in the sense of the protection of nature etc.) on the one hand and

[1] La loi n°76-629 du 10 juillet 1976 sur la protection de la nature.
[2] Zákon ČNR č. 244/1992 Sb., o posuzování vlivů na životní prostředí.
[3] Vyhláška 104/1997 Sb.; Zákon o pozemních komunikacích č.13/1997 Sb.
[4] Loi n°93-24 du 8 janvier 1993 Sur la protection et la mise en valeur des paysages.

of the society, of the public (anti-highway civic movement) on the other hand.

Fig. 1 France, highway A89: Some slopes were conceived in order to mark the hiatus and the rupture with the natural terrain, caused by the highway (Author: Jitka Tomsová, 2008)

6. General conclusion

In order to answer the principal question of the thesis, we state that there is no theory of integration other than pragmatism: we sought, section by section, the solutions and compromises to different problems that occurred through the process of highway planning. The final highway corridor is firstly a politic decision, influenced by scientific and technical knowledge, economical, sociological and environmental aspects. The question as to what integration is, was never really put forward in cases studied in either France or the Czech Republic. In the Czech Republic the integration of highways into the landscape is treated within the framework of plantation of greenery along the infrastructure, whereas the French conception considers aesthetical aspects of the highway in the landscape. Thus the French case illustrates how the larger landscaping approach could become a part in highway conception.

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The Evolution of the Landscape of the Southern Slope of Drahanská Highlands based on the Third Austrian Military Survey

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Abstract

The Land use studies are suitable for evaluation of landscape changes and assessment of current state. Nowadays, increased attention is paid to the study of transformation of the landscape, frequently by the interpretation of the historical maps. The detailed maps from the Third Military Mapping Survey of Austria-Hungary (3MS) enable large/detailed scale analyses using GIS tools. The paper deals with the landscape development which is studied through comparison of twice horizons. The research proved a potential of 3MS for detailed analyses of changes in landscape in large scale. The outcomes are linked with natural conditions, the historical development of society and the degree of anthropogenic influences. It helps to reveal general trends and specifics of landscape development of boundary between the Drahanská Highlands and the Vyškov Gate.

Key words: land use; third Austrian military survey; landscape change; Drahanská Highlands; South Moravia

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1. Introduction

Increased attention is currently paid to the study of landscape changes. Land use is a particular manifestation of human activity in space and time, including "certain historical, economic, social and cultural potential". Žigrai (1996, 129-130) consider it to be "a compromise between the natural assets of the territory, technical possibilities and human knowledge". Current trends in landscape change analysis (Verburg et al. 2004) have also been recognized by the Czech geographers, especially by the activity of the IGU-LUCC Study Group for Land Use and Land Cover Changes (Bičík et al. 1996; Bičík, Jeleček 2003), which is based on archival data for cadastral units, and research realised by Silva Tarouca Research Institute for Landscape and Ornamental Gardening, Pub. Res. Inst. (VÚKOZ; Skokanová et al. 2009; Demek et al. 2007), which focuses on creation of land use maps in scale 1:200 000. The methodology of this project is used in this report, with the aim

to test the suitability of the Third Military Mapping Survey of Austria-Hungary (3MS) for detailed monitoring of landscape changes in the scales from 1:5 000 to 1:10 000. Later, it will possible to include other sources for detailed analyses, like Stabile Cadastre and historical and contemporary orthophotomaps (Sklenička, Lhota 2002; Kolejka, Žaloudík 2006)

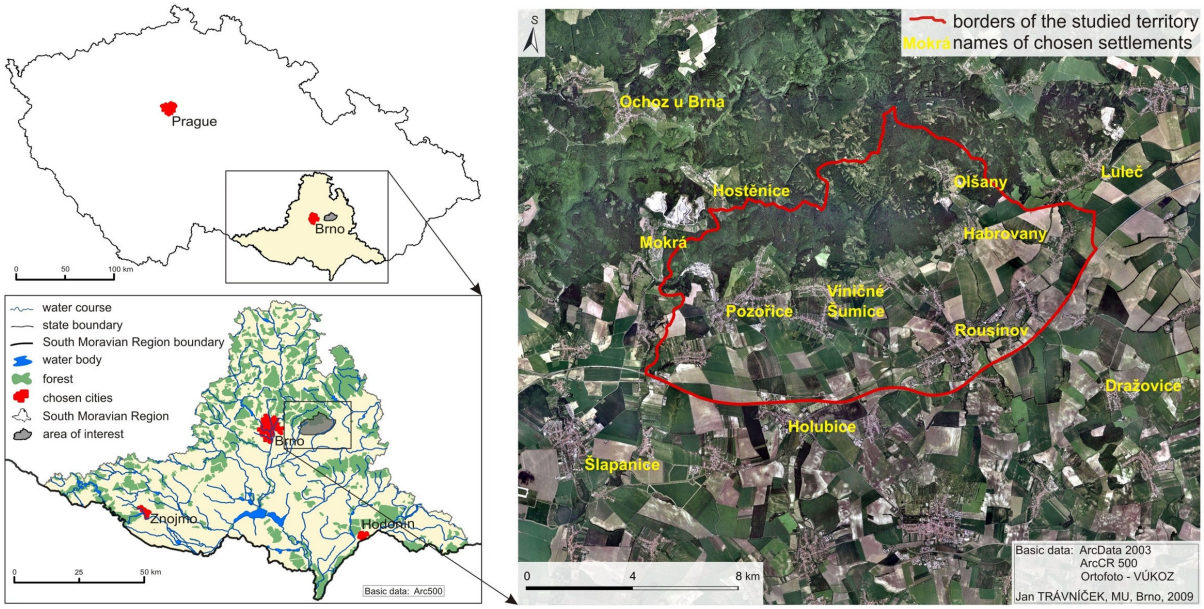
1.1 Study area

The studied area (extends 73 km^2) is situated on the Southern border of the Drahanská Highlands and central part of the Vyškov Gate (fig. 1). The Southern fault scarp of Drahanská Highlands is an important border, both geomorphological and geological. It separates the Bohemian Massif from the Western Carpathians. The influence of relief on land use is being discussed by Brabec and Lipský (2007) or Štych (2003). Fault scarp also separates the wooded edge of highland with rugged relief from the intensively exploited Vyškov Gate (part of old-settlement area) with agricultural, settlement and transport function, where the strengthening influence of Brno agglomeration comes through (Trávníček 2007).

Within the studied area, there are these settlements located: towns Rousínov and Pozořice and eight municipalities characterized by unfavourable age structure, dominance of secondary education and above-average commuting to work outside the borders of the municipality (Group of authors 2003).

The development of the land use in this area was influenced by the extinct medieval settlement and Vildenberk Castle in Drahanská Highlands (Černý 1992), dissolution of German speaking and Jewish communities after the Second World War. The significance of these events on the development of landscape is confirmed by Jeleček (2002) and Chromý et al. (2003). The fault scarp represents a border with considerable gradient of physico-geographical and socio-economical characteristics and with historical aspect. The extremes described act, communicate and blend with varied intensity in time and space.

Fig. 1 Location of the study area (Source: author)



2. Methods

For detailed comparison of two time horizons, the basic grid map 1:10 000 (2006, ČUZK) and 3MS map (VÚKOZ, in scale 1:25 000) from

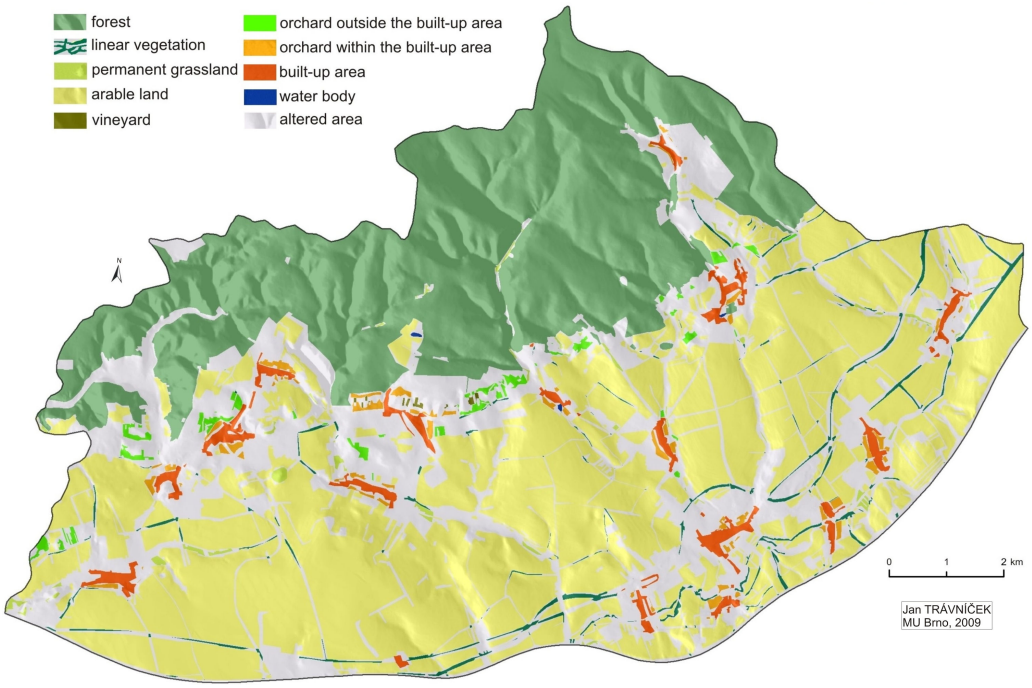
1876 are used. The precise georeference of 3MS map was followed by definition of map key. It is based on solution of VÚKOZ (Skokanová et al. 2009). The original preserved categories of land use are: forest, permanent grassland, arable land, vineyard, built-up area and water body. The change is in including of evaluation of the extent of changes of linear vegetation, monitoring of orchards within and outside the built-up area and including of new categories: quarry, other area, agricultural area and industrial area. The presented comparison of landscape situations, divided by more than a century, blurs complicated changes. The detailed maps, however, allow gaining of detailed information about over-all development and trends.

3. Results

The areas with altered land use make 25,9 % of the studied territory (Fig. 2). The stable elements are mainly wooded edge of Drahanská highland and historical centres of settlements. Changes are concentrated on the fault scarp (abandonment of orchards and vineyards with difficult access), in the surroundings of settlements (suburbanization) and in the fluvial plains of water courses (ploughing up of the fluvial plains).

The original land use of the altered areas was mainly arable land, linear vegetation and permanent grassland. Contemporary land use of the altered areas is evenly distributed between more categories (varied use). It is possible to state, that the areas with historically homogeneous land use are becoming even more homogeneous (especially the northern wooded territory of Drahanska Highlands and vast arable land in the Vyškov Gate). On the other side, the varied land use areas are further fragmentised and diversified (surroundings of settlements, fault scarp).

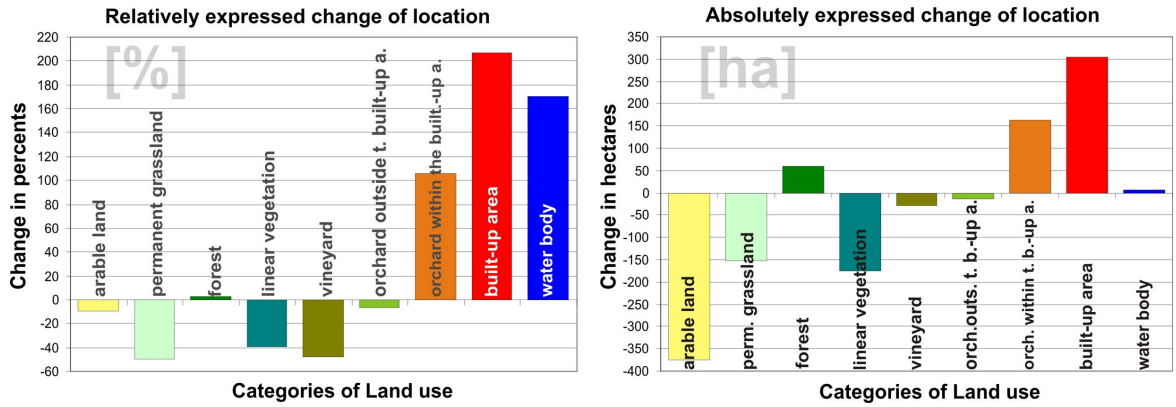
Fig. 2 Land use of stable areas (between two time horizons, 1876 and 2007) (Source: author)



Within particular categories (Fig. 3), there is an evident decrease of permanent grassland, linear vegetation and vineyard areas. Recent vineyards take only 2 % of their former area (the historical vineyards almost disappeared). It seems, that differentiation of

orchards between those, that are located outside the built-up area (decreasing area) and those inside the built-up area (increasing area) is crucial. New categories (especially industrial and agricultural areas) are found in close contact with the built-up area, often at the expense of high-quality arable land.

Fig. 3 Relative and absolute expression of changes of categories of land use between 1876 and 2007 (Source: author)



From the 117 possible combinations of the variants of changes (the matrix of variants is made of 9 categories in 1876 and 13 categories in 2007), 89 came about. It is the arable land that shows the highest dynamics (Tab. 1). Then, mutual exchanges of pairs (like line vegetation and arable land or orchards outside the built-up area and arable land) appear very often. Low stability of the linear vegetation, proved by high gains and losses in relation to the arable land, is surprising. The urban areas gained 4 % of the studied area (2nd and 3rd most common variant) at the expense of the arable land. The 5th most common variant shows ploughing-up of grasslands in fluvial plains as a benefit to arable land.

Tab. 1 Vast variants of changes (Source: author)

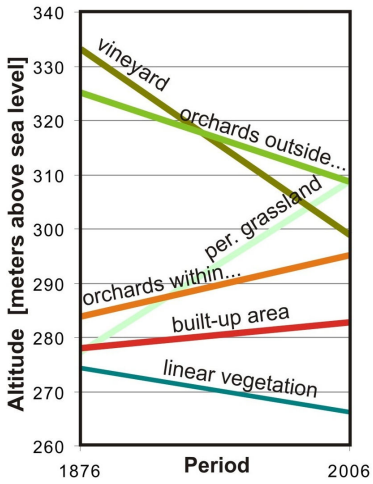
Variant of change	1876	2007	Share on total area [in %]
1	1	3	3,06
2	3	5	2,06
3	3	6	1,87
4	3	1	1,71
5	2	3	1,45
6	3	4	1,25

Numerical coloured code	Categories of Land use
1	linear vegetation
2	permanent grassland
3	arable land
4	orchard outsidee the built-up area
5	orchard within the built-up area
6	built-up area

The development of the average altitude of chosen land use categories (Fig. 4) shows quitting of intensive form of land use on the fault scarp (vineyards, orchards outside the built-up area), that is being moved closer to the settlement (despite of worse natural conditions). Like that, these areas are better accessible for the inhabitants and mechanization can be used, as the areas are united on surfaces with lower tilt. The built-up areas of settlements (orchards within the built-up area, the built-up area itself) spread even towards grounds with higher altitudes and tilts of slopes. The average altitude of orchards within and outside of the built-up areas is, thanks to differentiated development, quickly equalized. The grasslands vanished from fluvial plains (where they were substituted by

arable land) and are concentrated on fault scarp with difficult access. Its average altitude therefore increased. Line vegetation newly follows streams and roads (a complicated network dividing the former ploughland vanished).

Fig. 4 The development of the average altitude of chosen land use categories (Source: author)



4. Conclusion

The presented comparison of two time horizons using GIS confirmed the potential of 3MS maps for detailed analyses of land use categories. In the studied area, a large suburbanization (increase of built-up area) and abandonment of problematically accessible areas, which were intensively used in the past, take place. There are dynamic changes in the area of arable land. On the other side, the most stable areas are forests. The development is differentiated according to varied natural, historical and social conditions. The detail scale (with precise georeference of 3MS maps) enables to assess the continuity of very small areas (linear vegetation, particular vineyard). The dependence of usage on the distance from settlement is an important factor that was confirmed by the analyses of differentiated development of orchards (and gardens) outside and within the built-up area. Suburbanization and extinction of intensive forms in non-built-up areas will probably continue as the most significant processes in near future. We expected differentiation of landscape development by means of political, social and/or environmental priorities of local municipalities and communities in particular villages in the area of interest.

Visualizations of the results are made with the intentions of being used for "lifelong learning process" - for popularization lectures in the studied area and for education on elementary (Landscape project "Deblínsko"), secondary (project "GIS in practise") and high schools (project "Interpretation of landscape", cooperation between Masaryk University and Mendel University of Agriculture and Forestry in Brno).

Differentiation of other categories according to the distance and bonds with other elements (e.g. municipalities), further interconnection with historical development, changes of properties holding and including of other time horizons suitable for detailed analyses are perspective possibilities for future research.

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Ecological and environmental analysis in green structure plan

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Abstract

The use of green structure plan as useful and effective document in the frame of urban-planning documentation is in recession. The green structure plan is not compulsory basis and present official methods do not meet the actual problems of urban greenery. Due to this problem the authors of green structure plan adjust official methods to present circumstances. In our article we verified ecological-environmental analyses of the method used by Atelier of garden and landscape architecture in Nitra that was used in Trnava city setting.

Key words: green structure plan method; greenery ecological assessment

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1. Introduction

The present unfavorable situation of urban greenery is caused not only by strong building development but also by insufficient legislation. The effective tool for creation and maintenance of the greenery should be the green structure plan as the part of the urban-planning documentation. The green structure plan method is not binding urban-planning basis and other methods of urban vegetation evaluation are not satisfactory. At the present time there is no actual method in Slovakia equivalent to world trends. We record three different official methods; the newest one dates back to 1984 (Zibrinová a kol, 1984). The actual problems are not solved sufficiently and the methods are not based on ecological and environmental basis. Due to these reasons the authors of green structure plans adjust official methods to present circumstances. In time of the study we verified the green structure plan method created by Atelier of garden and landscape architecture in Nitra, which analytical part is based on garden-architectonic evaluation, alleys and tree lines evaluation, architectonic, urban and ecological-environmental evaluation. In this article we assess the ecological-environmental analysis in the residential area of Trnava city.

2. Methods

The new green structure plan method of Atelier is based on 5 different evaluations in analytic part: the garden-architectonic evaluation, tree lines and alleys evaluation, ecological-environmental architectonic and urban evaluation (Dobrucká, 2004). The main attention we will give to ecological-environmental evaluation, because this evaluation has the lowest attention in practice. Tab. 1 shows briefly overview of all evaluation of this method.

Tab. 1 Overview of all evaluation of our method (Source: author)

1. Garden-architectonic evaluation:

- The ´dominancy of vegetation components
- Age structure
- Vegetation etages
- The coverage of area by trees
- The index of overlay
- The health state of trees
- The vitality of trees
- Plantation value
- The importance of trees
- The perspective of vegetation
- The maintenance of area
- Flower bed
- Dominant species of trees
- Allergens

2. Tree lines and alleys evaluation:

- The compactness of tree lines
- Species
- Amount of trees
- Undergrowth
- Resistance on pollutants
- Resistance on road salt
- Vitality

3. Ecological-environmental evaluation:

- Category of area
- The connection of the greenery areas to the landscape
- Phytodiversity of the areas
- The coniferous trees proportion
- The proportion of invasive species in the area
- The introduced trees proportion in the area
- The isolation of the area
- Anthropic pressure on the area
- Stress source
- The influence on environment hygiene

4. Architectonic evaluation:

- Sort of area
- Surrounding built-up area
- The composition of area
- Genius loci
- Monument protection in area
- architectural monuments of area
- The harmony of vegetation with architecture
- Vegetation dominant
- Architectural dominant
- Elements of small architecture
- Mobile vegetation
- Barriers for handicapped on area
- The work of art

5. Urban evaluation:

- Category of area
- The utilization of area in urban plan
- The primordiality of area
- Precedence function of vegetation
- The function of vegetation area
- The function of vegetation area (draft)
- Compactness of area
- Engineering networks
- Harmony with function of architecture

This criterion allows apprehending the urban greenery as qualitative component of the environment that is presently able to improve other components (water quality and quantity, air and climate quality). The greenery significantly contributes to ecological stability of built-up area, form biocenters and biocorridors as biodiversity source.

In analyses from ecological and environmental point of view we assigned the characteristics to individual attributes as point assessment. So the higher quality area has more points. Thus the areas were divided according to overall quality and every area gained certain number of points. The higher resultant value, the higher ecological and environmental value of the area is. The sum of attributes points represents overall point evaluation:

Overall number of points = the sum of all attributes

All analyses and surveys were done from August to October 2008 in the whole urban area of the city Trnava. We excluded ruderal areas, fields, personal private land and some companies, private land as we did not gain the entry permission.

To verify the ecological-environmental part of the method we chose following attributes:

The connection of the greenery areas to the landscape – the areas that are connected to the landscape with higher species diversity, are more stable comparing to isolated localities, so from ecological stability point of view connected areas are more important for the city. The isolated areas gained fewer points (point scale from 1 to 4).

Phytodiversity of the areas – for biodiversity assessment the method of Supuka (1991) was used, where the areas with highest phytodiversity gained higher number of points (point scale from 1 to 3).

The coniferous trees proportion – the coniferous trees are not typical for the city Trnava, they lower the aesthetical picture of the city, so the areas with higher percentage of coniferous trees gained fewer points (point scale from 1 to 5).

The proportion of invasive species in the area – the areas with higher proportion of invasive species were rewarded with lower number of points due to their biological and ecological characteristics and unfavorable impact on original ecosystems (point scale from 1 to 5).

The introduced trees proportion in the area – the introduced species are those that are geographically spurious, those that are not original in the area. This indicator is very important from the impact on landscape picture. The more the species composition is in the contradiction with characteristic picture of the city, the more the vegetation appeal to be foreign, inharmonious even chaotic, mostly if we speak about public spaces. The areas with higher proportion of introduced species were rated with lower number of points (point scale from 1 to 5).

The isolation of the area - the value – it shows the occurrence of barrier elements that prevent the migration between neighboring areas for inhabitants as well as animals. These are fences, roads, railways, or other natural or artificial barriers. The isolated areas gained fewer points (point scale from 1 to 2).

Anthropic pressure on the area – the negative influence of the humans can have different levels of intensity and has various expressions. Smaller is the attack on the area, the development of the locality is of higher quality and thus the higher evaluation of such places (point scale from 1 to 5).

Stress source – it is the type of anthropic pressure on the area. The source of the stress could have influence on vegetation and life quality and should be known and minimized also using vegetation elements and its right composition. Some trees are sensitive to traffic emissions, some to substances from production etc. The correct selection of the trees according to stress source is very important. It is only informative information and does not add the importance to the

attribute. Evaluated stress sources: population (anthropic factor), traffic (emissions, noise, vibrations, barriers) static conveyance (greenery occupation, car starting, heat), technologies (factories, productions), noise and smell.

The influence on environment hygiene – the vegetation mass influence the decrease of polluting substances amount in the atmosphere or the decrease of microbes' number in the air. The effectiveness of the greenery areas is higher if all etages are represented and then they earn the higher number of points (point scale from 1 to 5).

The method incorporates also the vegetation areas evaluation in industrial areas (vegetation in the industrial area, environmental politics of the company, image of vegetation). In our study these evaluations were skipped because they were not complete. The majority of companies did not allow the entry into their areas or did not provide information needed.

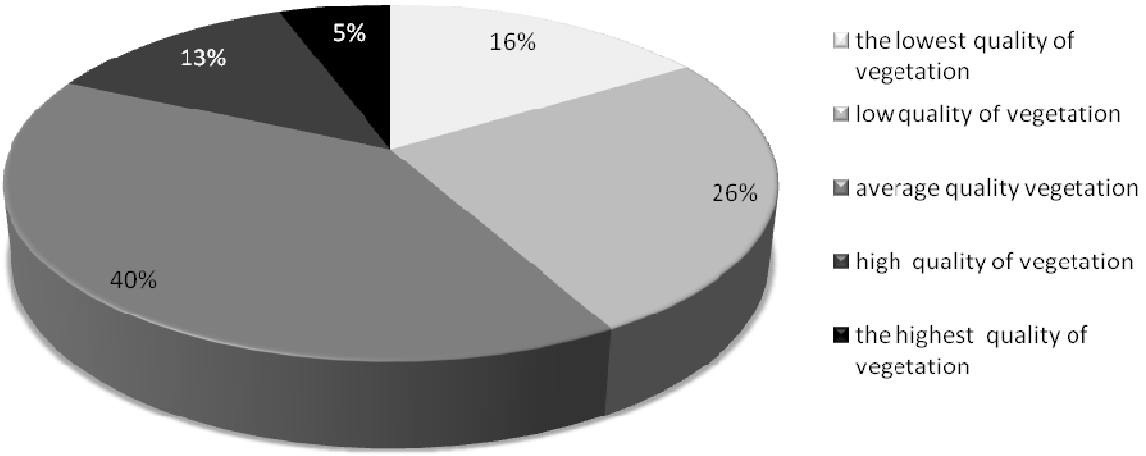
The results of analyses were processed using MS Excel and Arc View 3.2 programs we summarized the points of attributes in tables and multiplied by mesostructural index for allowance of building-up the green areas.

3. Results

During surveys and analyses we determined 887 vegetation areas. Ecological-environmental analyses of new method of green structure plan determined correctly areas with highest values places which we considered the most ecologically and environmentally valuable in the city Trnava (parks, small forests, interblock spaces with high percentage of trees and old city cemeteries). The situation was repeated with areas evaluated as worst – parking lots, industrial areas, streets in the city center without sufficient greenery.

Generally we can state that in the city Trnava the ecological value of the area is low; there is high portion of the stress mostly from traffic and technologies. As much as 42% of vegetation was of low quality (16% the lowest; 26% low quality). The average quality of vegetation was reached in 40% of the areas; the highest quality reached only 5% of the vegetation and high quality 13% (fig. 1).

Fig. 1 The percentage representation of vegetation quality (Source: author)



4. Conclusion

Ecological-environmental evaluation of new green structure plan method used by Atelier of garden and landscape architecture in Nitra was proved to be effective method of urban vegetation evaluation from ecological point of

view. Some evaluations that were skipped (as expected tree logging) should be transferred to other analyses, for example garden-architectonic vegetation evaluation. But we also suggest integrating other attributes into the method (as discharge water regime, recreational potential) that would contribute to the formation of even more objective method.

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Working in harmony with nature. Green office buildings in a present-day city

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Abstract

Metropolis - as main point of people's migration, mostly because of work, have to face sustainable development as a strategy for the near future. This article describes possible ways leading to the best office building concepts in the design process.
Searching for a workspace in harmony with nature is one of the aspects of a balanced development. The challenge is to create functional, compact, environmentally friendly and healthy workspace which corresponds to the present-day city scale and natural resources left. Sprawling cities leave strong ecological footprints. On the other hand urban density can not be achieved at the cost of loosing climatically healthy and energy efficient space for habitats and working space. Nevertheless, recognition of practical problems, whether related to urban growth, complexity of environmental conditions or technology development justifies the conclusion that guideline designing ecological office building and should be formulate from the early stages in the sense of integrated planning. The main problems that have to be resolved are: reduction of water and energy usage, reduction of waste (especially e-waste), reduction of CO2 emission.

Key words: green office; bioclimatic approach; green metropolis; evaluation methods

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1. Introduction

The present-day city is a complex entity. Composed, like a patchwork, of physical, biological, economical, organizational, social and cultural resources. Nowadays 70 % of the population live in cities and the number is increasing daily. Efficient occupancy indicators of workspace and housing are rather low and that is why urban development seizes more and more area of natural resources arounded older cities and violates its life cycle. Increasing world's population and urbanization growth have a strong impact on the environment.

In a contemporary metropolis we try to modernize and adapt old office buildings to new requirements to create more humane, healthy, environmental sensible urban spaces. The new model of working in harmony with nature, represented in this study by green offices, is part of the knowledge-based

sustainability paradigm. Architecture is that great living creative spirit which from generation to generation, from age to age, proceeds, persists, creates, according to the nature of man, and his circumstances as they change.(Wright, 1937). Thinking about cherishing the space, we have to consider possibilities of land use, site planning selection, water and energy efficiency, lower CO2 emission, reducing e-waste, use appropriate and local building materials and improve indoor environmental quality.

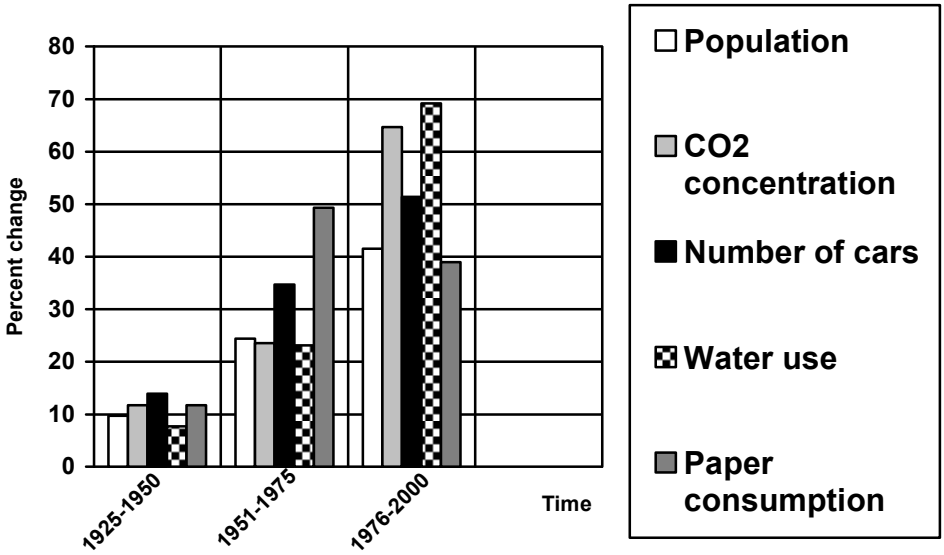
2. Methods

2.1 Ecological footprint indicator analysis

Population, resources and environment are the three determinants of human life. A great deal of resources which are used for production, building process or consumption are not renewable. Western culture and it's legacy encourage us to conquer nature in order to achieve individual goals. It is the strong ecological footprint our civilisation has left the planet.

Recommendations usually follow evaluations. The diagrams below present a global change of human life and the impact it puts on the environment. Tools (something to work with) and resources (something that will work for us) have to be used in process of moving from overproduction to multifunctional and high efficiency usage. Clearly specified needs and opposition to strong marketing influence can help us to build a harmonious relationship between city spaces.

Fig. 1 Ecological impact to the environment. Percent Change in Global Resources usage: 1925- 1950, 1951-1975 and 1976-2000 Source: International Geosphere-Biosphere Programme (Source: Stoffen et al 2004)



In the 21st century we are moving from distribution of goods to distribution of information. Knowledge resources are growing exponentially. We have to find the answers which are the best ways to create spaces for the new society. The answer could be niche marketing which reacts faster to actual needs and expectations – producing in harmony with the market. The "Cradle to Cradle"(*Walter R. Stahel)* products are designed to reduce office ecological footprint. Ecological design requires the architect to regard and to understand the environment as a functional natural system and to recognise the dependence of the built environment. (Glass, 2002). Learning from nature is the biggest challenge in the design process.

2.2 Evaluation methods analysis

The complexity of the world's contemporary offices characterizes the present-day metropolis market. Green buildings represent the idea of connection with the environment. Climate and natural resources remark the necessity of preventing upgrowth expansion progress. A new strategy for office buildings during the designing and rebuilding process as well as organizing the office work is to reuse, recharge, use renewable resources and to recycle. Sustainable design process helps to prepare building models and evaluate construction as well as technology assortment, also presents advantages of using renewable materials. Furthermore in this method the new object has to be integrated with the natural and built environment. A green office should stay in harmony with the environment as well as with human nature. Furthermore, it has to be cost effective. The life cycle of the building has to be considered carefully. It should be an architecture of multi-dimension, flexibility, mobility and occupancy efficiency, adaptable and complex. Despite the comprehensive search service the volume of scientific methods and availability varies are rather difficult to apply.

The programmes which guarantee sustainable management have to become mandatory since management and business rather direct attention to standard solutions. The keynote, that we borrow resources from future generations, should divert us to think about ecological design methodologies as a common practice issue rather than an alternative approach. The certification is a way to popularize the green buildings standards. Building eco-labelling schemes, called eco-points, are assessment tool for office designs and investors, which can encourage to involve in a green initiative. The two main known specification systems are: The Building Research Establishment Environmental Assessment Method (BREEAM) and The Leadership in Energy and Environmental Design (LEED).

2.3 Bioclimatic approach to the space shaping

The diagram below presents the architectural problems we have to consider during the sustainable designing process. Looking for the possibilities to lower the entropy we have to better understand the exergy. Energy saving designs and responsible management help to reduce the ecological harmfulness and building-related greenhouse gases. Daylighting, passive heating, shading, ventilation and cooling, water spraying and evaporation, green roofs and pathways are the bio-climatic approach of the office building system.

3. Case study

The case study puts special attention to the infill development spatial policy which considers social and economic profits from existing green city spaces which work together with the designing building. On the basis of the diagram this case study presents the preliminary design of Public Radio Station in Bydgoszcz. Main problems and questions were how to emphasize connections between existing old city structure, small park, main river bank and designed building. Main issues were to increase the quality of life in a city and to design energy efficient building. The design strategy was to divide the design process into three stages: analyse of daylighting, analyse of urban and green areas connection, as well as an analyse of people's movement in a building space to find the cost effective connections together with high quality of life factor. Research helps to find design and auditing method of present-day city office building providing a platform for improved urban scenario.

Fig. 2 Evaluation chart of green buildings design process (Author's interpretation on the basis of "Ecological circle" of buildings and building technology (interactions relevant to cooling) The technology of ecological building, K. Daniels)

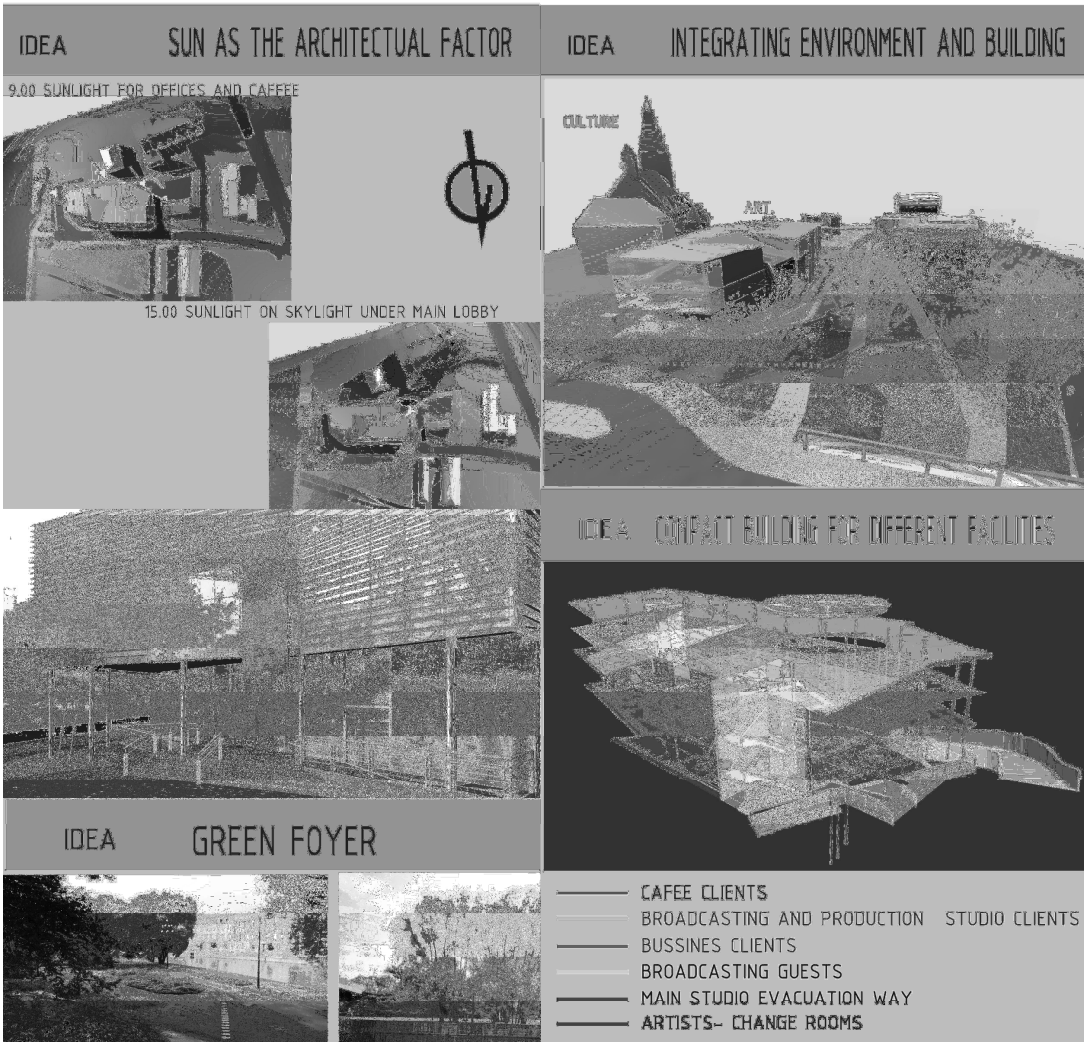
4. Results

Results and recommendations following the case study are:

(1) Genius loci of urban scenario. Dialogue between architecture landscape and built environment: integrating environment and building; shapes - complex, preservation of urban density; function - appropriate site planing; streets - wide green pedestrian area, bicycle roads; sun as the important architectural factor;

(2) Efficient green buildings. Architecture of quality: buildings in means for regeneration and renewal; compact building for different facilities; efficient green buildings- green roofs, HVAC systems, plenty of daylight; reduce, care of resources- intelligent light systems and water supply; renewable energy systems, efficiency improvement, recycling; façades- special glazing for each site, clear glass for maximum north light, sunshades control south light for maximum natural light and minimum heat gain.

Fig. 3 Analysis of possible infill development urban scenario (Source: author´s design)



5. Conclusion

According to the theory of three levels of knowing: simplicity is represented by a child or uninformed adult who is unaware of what lies beneath the surface. Complexity is characterized by awareness of complex systems without clarifying patterns and connections. Finally informed simplicity, which is an enlightened view of reality with the ability to create clarifying patterns within complex mixtures, building many competing and frequently nebulous design considerations (Frederick 2007). The sustainable design process which considers problems as presented in the last level of knowing requires well educated and aware architects.

The idea of planning for flexibility not obsolescence (Ehrenkrantz E., 2002) is the framework to provide office buildings that are going to meet future requirements of space and environment in a way to lower the costs of building, as well as long term maintenance and possible demolition. The costs of rebuilding existing objects are high but it should be considered in a long term perspective as a need for the future. This kind of approach is more important since more special funding have been made available. Exploring new options that optimize flexibility in planning, organization and servicing, leads us to the conclusion that office buildings in a contemporary city have to be designed to respond to their environments, have a high occupancy factor and an easy access to new

network solutions (Rogers R. 1995). Actually we are looking for technologies to mimic nature, to better understand everything we can find around us. The design strategies show synergy and dispersion. How to create the space for different social interactions? How to manage economic viability and resource conservation? The questions are still open. Open to the "spirit of modernity".

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