

**Society for Urban Ecology
South Eastern Europe Chapter**

Workshop
*Challenges in the assessment of urban ecosystems
services*



eco**smart**

Bucharest

2015

Workshop

Challenges in the assessment of urban ecosystems services

Cercul Militar Național - Sala Ștefan cel Mare

November 13, 2015

9.00-13.00

Chairs: Jurgen Breuste, Cristian Ioja

Why to be a SURE member? President SURE, Jurgen Breuste

SURE SEE Europe Chapter – targets and approaches. Overview of Urban Ecosystems Services Assessment in Romania

Cristian Ioja, Romania

Compact cities vs. living quality – applying the ecosystem services approach for building sustainable cities

Martina Artmann, Germany

Assessing the fragmentation of the green infrastructure in Romanian cities using fractal models and numerical taxonomy

Alexandru-Ionuț Petrișor, Ion Andronache, Ana-Maria Ciobotaru, Daniel Peptenatu, Romania

Heterogeneity predictors of urban green infrastructures in Romanian cities

Denisa Lavinia Badiu, Cristian Ioja, Maria Pătroescu, Simona Raluca Grădinaru, Alina Constantina Hossu, Romania

Discussion: Proposed subject: *Are green infrastructure the most important component of urban areas that provide ecosystems services? How could be included the urban ecosystems services approach in territorial planning?*

Components of micro-climate modification effect of urban shade trees – integrated approach promoting the development of ecosystem service indicators

Ágnes Takács, Márton Kiss, Ágnes Gulyás, Noémi Kántó, Hungary

Air temperature regulation by urban trees and green infrastructure

Vânău Gabriel Ovidiu, Ioja Ioan Cristian, Onose Diana Andreea, Șandric Ionuț, Grădinaru Simona, Uța Mihaela, Romania

Coffee break: 11.00-11.30

Discussion: Which methods could be promoted in order to better evaluation of urban ecosystems services? How could be included the monetary value of regulatory and social ecosystems services?

Wetlands change in urban areas – key indicator for ecosystems services assessment. Case study: Bucharest city

(Romania)

Cristian Ioja, Gabriela Osaci-Costache, Romania

Plant species from Bucharest as indicators of urban conditions

Onete Marilena, Manu Minodora, Bodescu Florian, Moldoveanu Mirela, Florescu Larisa, Romania

Discussion: Is it land use change an indicator for ecosystems services assessment? How could be quantified the impact of land use changes on ecosystems services supply in urban areas?

Restoration of Degraded Urban Ecosystems for Healthy Cities- Developing technical and scientific references for Nature-Based Solutions

Yangang Xing, Phil Jones, Graham Ormondroyd, Simon Curling, United Kingdom

Can biodiversity conservation be promoted when other services are targeted for urban waterbodies?

Oertli Beat, Demierre Eliane, Switzerland

Discussion: How could be improved the capacity of urban areas to provide ecosystems services? Are ecocities a solution for improvement the quality and quantity of urban ecosystems services?

Final Discussion: How is the steps for improving the data gap in Romanian urban ecosystems services assessment? What projects could be promoted in these areas? What are the common topics?

13.00-15.00 – Lunch

15.00 17.00 - Visit to Vacaresti areas (urban wetlands – new paradise for wildlife) - meeting point in the front of National Military Center (conference site) at 14.45 at clock (free of charge).

Overview of Urban Ecosystems Services Assessment in Romania

Cristian Ioja

Centre for Environmental Research and Impact Studies , University of Bucharest, Bucharest, Romania

cristian.ioja@g.unibuc.ro

Urban ecosystems services assessment represents important challenges for urban areas, interested to promote measure for increase the resilience to environmental, social, economic and political changes. At European level, more assessment tools were promoted in order to improve the city capacity for a fast response to these changes (e.g. URBES, MAES, TEEB). Thus, the evaluation of the city capacity to supply resources and services become an important step in environmental planning. In Romania, few studies were promoted linked to urban ecosystems services assessment. Cultural and regulating urban services assessment was the main subject of these researches, that is too fragmented in terms of methodological approaches. In this paper is presented main directions related with ecosystems services approaches in Romanian cities using the most relevant national and international literature. Also, it proposes a vision of the future researches in this field.

Compact cities vs. living quality – applying the ecosystem services approach for building sustainable cities

Martina Artmann

Leibniz Institute of Ecological Urban and Regional Development (IOER), Dresden, Germany

m.artmann@ioer.de

The on-going worldwide urbanization is connected with expansive land consumption. Research and policy suggest compact cities to reduce urban sprawl and its related negative impacts on the environment. However, there is the need of a more integrative view on the concept of compact cities to secure high living qualities according to the demands of urban residents also in the highly sealed and densely built-up centers. To show up if a balance of demand and supply of urban living quality is achieved, the ecosystem service approach is a powerful concept. Thus, it illustrates human demands on urban ecosystems as well as the patchy supply of ecosystem service within cities. In this study the supply of and demand on ecosystem services and quality of life aspects are studied along a sealing gradient in Leipzig and Munich (Germany). By an online survey of urban residents it could be shown that especially in highly sealed and densely built-up areas a range of living quality aspects are not supplied according to the urban dwellers' needs. This unequal distribution of living quality can reduce the acceptance of people towards a compact city. The sealing gradient approach interlinked with the evaluation of supply and demand of ecosystem services and aspects of the built-up environment can be one way to approach sustainable compact cities. Such demands and supplies in quality can also feed into decision support systems supporting the municipal planning staff in evaluating the suitability of vacant and underused land for reuse strategies.

Assessing the fragmentation of the green infrastructure in Romanian cities using fractal models and numerical taxonomy

Alexandru-Ionuț Petrișor¹, Ion Andronache², Ana-Maria Ciobotaru², Daniel Peptenatu²

¹*“Ion Mincu” University of Architecture and Urban Planning & National Institute for Research and Development in Constructions, Urban Planning and Sustainable Spatial Development URBAN-INCERC, Bucharest, Romania;*

²*Research Centre for Integrated Analysis and Territorial Management, Faculty of Geography, University of Bucharest, Bucharest, Romania*

alexandru_petrisor@yahoo.com

As the share of urban population increases globally each year, man-dominated systems tend to sprawl over the natural ones, substituting and fragmenting them. Urban sprawl is the main cause of many environmental issues, in tight connection with pollution and loss of biodiversity. One of the main consequences is a decrease of the ecosystem services provided by the urban green infrastructure. However, the extent of urban sprawl is spatially uneven due to the spatial structure of human settlements. Among the methods used to pinpoint sprawl, fractal analyses have a good potential for analyzing fragmentation, especially if used in conjunction with statistical methods. This study aimed to assess, in an exploratory perspective, the level of fragmentation in the Romanian cities covered by the Urban Atlas data, and determine its correlation with parameters related to their demographical, economic and geographical characteristics. In addition, taxonomical analyses were used to find whether cities or specific components of the green infrastructure can be grouped. The results did not reveal a general trend, although it seems that the green infrastructure consisted of agricultural/ semi-natural/ wetland areas, forests, green areas, sports and leisure facilities and water bodies in all of them, in different shares. The correlation analysis revealed that the population and its density and the share of the green infrastructure within the total area are significantly correlated with most fractal parameters. Similarly, the fractal dimension of the area, computed using Interactive Quantitative Morphology, seems to correlate with most morphological parameters. The results suggest that the degree of urban fragmentation is correlated especially with the population of cities and its density, reclaiming planning measures aimed at controlling the densification processes (sprawl, gentrification, location of specific activities etc.)

Heterogeneity predictors of urban green infrastructures in Romanian cities

Denisa Lavinia Badiu, Cristian Iojă, Maria Pătroescu, Simona Raluca Grădinaru, Alina Constantina Tudor

Faculty of Geography, University of Bucharest, Bucharest, Romania

denisabadiu@gmail.com

Urban green infrastructures are now considered key elements in improving the life quality of residents and creating an appropriate framework for the development of sustainable cities.

In Romania, however, scientific concerns related to structural and functional diversity of urban green infrastructures are relatively poorly assessed. Information available at the moment does not provide specific groundwork to assess the relationship between the dynamics of urban areas and green infrastructures at national level.

The analysis aims to identify the factors that determine the presence and the values of urban green area at national level, taking a sample of 39 randomly selected cities in order to capture the heterogeneity of urban green infrastructure nationwide. The second objective of this paper is to identify typologies of cities depending on the structure of their urban green infrastructure. We used a model of multiple linear regression to test parameters from the geographic and socio-economic fields that can explain the variation of the green surface per capita index in cities of Romania. We also applied a Multiple Correspondence Analysis to identify patterns between cities based on the structure of urban green infrastructures.

We concluded that the density of built-up space, the proximity to transport infrastructure, the founding period of the cities and the landform criteria are important predictors for the green surface per capita index, which shows an important variation, from 6.3 m² /person for Mioveni city to 27.6 m² / person for Iași.

The knowledge about the factors that determine the presence and the diversity of urban green infrastructures can contribute to an efficient management in improving the areas with urban green space deficit.

Components of micro-climate modification effect of urban shade trees – integrated approach promoting the development of ecosystem service indicators

Ágnes Takács, Márton Kiss, Ágnes Gulyás, Noémi Kántor

Department of Climatology and Landscape Ecology, University of Szeged, Szeged, Hungary

kiss.marton@geo.u-szeged.hu

Several indicators have been developed to evaluate urban ecosystem services for various purposes on different spatial scales. Microclimate regulation is one of the most important services of greenery that is directly perceived by urban population, therefore many studies have been published in the last years aiming to map and evaluate this service. However, in many instances these studies focus on the modification of only one parameter, generally of air temperature. Nevertheless, human thermal sensation is formed by the integrated effect of all thermal parameters, including air temperature, thermal radiation, air movement and air humidity. That raises the necessity to evaluate the modification effect of urban greenery, especially of urban trees, on these parameters separately, and, if it is possible, to compare different species from this point of view. We would like to present some results of a longitudinal Hungarian study with the above mentioned objective. Detailed microclimate modification capacity of four urban tree species were investigated in the city of Szeged with a pair of special urban-biometeorological stations. We compare the median values of the main thermal parameters (temperature, humidity, wind velocity, as well as the short- and long-wave radiation components from the upper and lower hemisphere) measured under the canopy of the trees, and in the sun. Our results refer to clear summer days and reveal that trees have much greater modification effect on the radiation fluxes than on air temperature and relative humidity. We discuss our study also from the viewpoint of indicator development.

Air temperature regulation by urban trees and green infrastructure

Gabriel Ovidiu Vânău, Ioan Cristian Iojă, Diana Andreea Onose, Ionuț Șandric Simona Grădinaru, Mihaela Uță

Centre for Environmental Research and Impact Studies, University of Bucharest, Bucharest, Romania

gabi_vanau@yahoo.com

A well-known effect of urbanization is the warming of the local climate relative to surrounding rural areas, creating a phenomenon known as the urban heat island (UHI). UHI intensity varies across a city and over time, but temperature differences may reach 9°C. Factors that contribute to a UHI include the thermal properties, height and spacing of buildings, the production of waste heat, air pollution, and differences in land cover and albedo. Since the UHI is related to the large extension of artificial cover, the green areas of a city, especially those with large surfaces and high plant density, as the parks, are extremely important to moderate the climate.

We have used the values recorded during 2008-2015 by a network of iDS1921G Thermochron iButton devices, located in and outside the city to prove with irrefutable data that this phenomenon exists in Bucharest. The network consisted of 30 sensors. The data we gathered was validated by using official National Meteorological Administration measurements from three ground based stations. Our map shows the atmospheric UHI and can be compared with data from Landsat and MODIS in order to assess the UHI at the soil level. We located our recording devices in the city's green spaces as they offered a good distribution across the city and conditions similar to those of meteorological shelters. One of the most important conclusions is that the UHI footprint in Bucharest is decisively shaped by the two largest parks of Bucharest, one mitigating the negative effects in the northern part of the city (Herastrau Park) and the other in the south (Tineretului Park).

The results have been obtained within the project UCLIMESA (Urban Heat Island Monitoring under Present and Future Climate), ongoing between 2013 and 2015 in the framework of the Programme for Research-Development Innovation for Space Technology and Advanced Research (STAR), administrated by the Romanian Space Agency.

Wetlands change in urban areas – key indicator for ecosystems services assessment. Case study: Bucharest city (Romania)

Cristian Ioja, Gabriela Osaci-Costache

Faculty of Geography, University of Bucharest, Bucharest, Romania

cristian.ioja@g.unibuc.ro

Wetlands became key areas for promoting urban sustainability. Over the years, their perception in urban areas has been radically changed from unhealthy and dangerous to very attractive land-use. Now, urban wetlands are considered important providers of multiple ecosystems services. The paper aims to emphasize the fact that wetlands changes are a key indicator for ecosystem services assessment. The study area is located in Bucharest, in Tineretului area (16.5 km²). Using historical maps and aerial images (1856, 1900, 1955, 1977, 1990, 2005, 2012), wetlands changes have been analyzed. The results show: (1) major decrease of urban wetlands (86%) due to conversion in built-up areas, agricultural lands and green areas; (2) increase of wetlands area due to human intervention; (3) reducing the role of urban wetlands as ecosystems services providers. Thus, in the 19th Century, wetlands in the case study area covered 1.29 km², with large surfaces (between 6 and 27 ha) and agricultural land around. In 2012, the surface has decreased to 0.18 km², located especially in urban parks or with dominant built-up areas around. Also, Dâmbovița floodplain was radically changed, through movement to the south (82-805 m), reduction of length (from 7207 m to 4938 m) and decreasing of meander coefficient (from 1.653 to 1.02). Due to massive human intervention during communist time, new wetland was created in Văcărești area (0.26 km²). However, more ecosystems services of wetlands are considerably diminishing in case study area. Our study shows that wetlands change could be an important indicator for ecosystems services assessment.

Plant species from Bucharest as indicators of urban conditions

Marilena Onete¹, Minodora Manu¹, Florian Bodescu², Mirela Moldoveanu¹, Larisa Florescu¹

¹*Institute of Biology Bucharest, Romania*

²*SC Multidimension SRL, Romania*

bogdanandrei0771@gmail.com

Bucharest is the biggest city from Romania, presenting air and soil pollution due to traffic agglomeration and other diffuse sources. On an urban-rural transect the plant species from five sites have been inventoried and chemical analyses have been performed. The multivariate statistical analysis of the vegetation reveals the differences among the sites and that the natural trees and shrubs species had mainly disappeared, being replaced by alien planted species. Remains of the natural vegetation are adapted to the modified conditions of the city. During summer (increased temperatures, low humidity, etc.) the vegetation is scarce comprised from a few dominant species and we can argue that the plants change their phenology in the city. The chemical analysis of soils and plants revealed that the heavy metal content of these components of the urban environment is different according with: the site complexity, the proximity with the main traffic roads, management of the sites and plant species diversity. Due to the structural complexity of the sites, aerial depositions (wet and dry) are kept at the soil level, vegetation's high diversity not allowing to the dust particles together with pollutant to re-suspend in the air. Plants influence and are influenced by their environment. Understanding plant species diversity and its services in urban area and surroundings can bring a better understanding and protection of biodiversity, ecosystems and proper and more use of green infrastructure.

Restoration of Degraded Urban Ecosystems for Healthy Cities- Developing technical and scientific references for Nature-Based Solutions

Yangang Xing¹, Phil Jones¹, Graham Ormondroyd², Simon Curling²

¹*Welsh School of Architecture, Cardiff University, United Kingdom*

²*Bangor University, United Kingdom*

xingy5@cardiff.ac.uk

Significant areas of ecosystems are being lost or degraded as a result of human activities. There is growing concern for the health of urban populations as cities sprawl at an unprecedented rate. Urban green infrastructures provide a notable range of environmental remediation benefits, and pioneering health policy is recognizing nature as a cost-effective tool for planning healthy cities. It is general recognized that ecosystems can provide air/water purification, soil erosion protection, flood damage control, carbon sequestration and recreational facilities (green gym) that contribute to human well-being, economic stability and physical security. However, there is limited information on how specific elements of nature deliver health outcomes. In this study, we developed a framework for identifying pathways through which nature bring environmental remediation benefits, and highlight current evidence, established measurement methods and future research needs.

Can biodiversity conservation be promoted when other services are targeted for urban waterbodies?

Beat Oertli, Eliane Demierre, Christiane Ilg

University of Applied Sciences and Arts Western Switzerland, Switzerland

beat.oertli@hesge.ch

The conservation of biodiversity is rarely the targeted ecosystem service of small waterbodies in the urban matrix. Usually other services are promoted for urban ponds and small lakes, such as water retention, flooding prevention, climate regulation, water treatment, along with providing a platform for environmental education, experience of aesthetic values and a space for leisure activities (fishing, boating, bathing). But do urban waterbodies networks also host a biodiversity valuable for conservation? Can ponds designated for other services be hotspots for urban biodiversity or, on the contrary, do they host pest or undesirable species? A study of a hundred ponds in a large European city (Geneva, Switzerland) evidenced a freshwater biodiversity with various contrasting facets. The local and regional species richness of aquatic plants, aquatic invertebrates, amphibians remained moderated if compared with natural areas, and these waterbodies hosted only few threatened taxa. Therefore, the interest for conservation of these communities is relatively low. Additionally, exotic species were numerous, especially aquatic plants, and could potentially constitute a threat. Nevertheless, pest species and nuisances were inconspicuous, biting dipterans being limited and claims of public remaining anecdotal (also regarding frog songs). Nevertheless, the biodiversity of urban ponds often included flagship and esthetics species (plants, frogs, damselflies) and provide therefore nature experience for urban citizens. The biodiversity of urban wetlands presents here an opportunity for the social aspects. Furthermore, targeted management measures to promote biodiversity could easily enhance their conservation value.