

IALE-D / Centre for Landscape Research (CeLaRE) and SURE workshop on

“Urban biodiversity versus functional design in cities? - The case of urban trees”

in Salzburg from 9th to 10th June 2016

Organized by Angela Hof and Jürgen Breuste

Programme:

WORKSHOP PART ONE		
Time	Thursday, June 9 th 2016	
	Topic	Speaker
09:00 – 10:30	Urban trees under climate change	Sten Gillner ¹ (Keynote), Márton Kiss ² (Short talk); Astrid Moser ³ & Teresa Zölch ³ (Short talk) (¹ TU Dresden, Germany; ² University of Szeged, Hungary; ³ TU Munich, Germany) Chair of discussion: Susanne Böll
10:30 – 11:00	Coffee/Tea	
11:00 – 12:30	Urban trees and adaption to climate change: measures, management, and best practice	Cristian Ioja ¹ (Keynote); Jürgen Breuste ² & Vasiliki Tsiotsiou ³ (Short talk); Sabine Wadispointner ² (Poster presentation) (¹ University of Bucharest, Romania; ² University of Salzburg, Austria; ³ University of Patras, Greece) Chair of discussion: Jürgen Breuste

WORKSHOP PART TWO		
Time	Thursday, June 9 th 2016 afternoon	
	Activity	Head
14:00 – 17:00	Field trip: Urban trees in Salzburg	Magister rer. nat. Günther Nowotny , Dept. Nature Conservation, Land Salzburg
2 h	SURE Central European Chapter - founding session	Andrzej Mizgajski (University of Poznań, Poland)
19:30	Dinner	

WORKSHOP PART THREE		
Time	Friday, June 10 th 2016	
	Topic	Speaker
09:00 – 10:45	Urban tree diversity – challenges and opportunities	Susanne Böll ¹ (Keynote), Andrzej Mizgajski ² & Janina Borysiak ² (Keynote); Tobias Scholz ³ & Angela Hof ⁴ (Short talk); Silvia Ronchi ⁵ (Short talk) (¹ Bavarian State Institute for Viticulture and Horticulture (LWG); ² University of Poznań, Poland; ³ University of Bochum, Germany; ⁴ University of Salzburg, Austria; ⁵ Politecnico Milano, Italy) Chair of discussion: Sten Gillner
10:45 – 11:15	Coffee/Tea	
11:15 – 12:15	Management and acceptance of targeted planting and adaption measures - urban trees and cultural ecosystem services	Alexander Keul ¹ (Short talk); Angela Hof ¹ (Short talk); Péter Szilassi ² (Short talk); ¹ University of Salzburg; ² University of Szeged, Hungary) Chair of discussion: Cristian Ioja
12:15 – 13:00	Conclusio and end of workshop	Chair: Andrzej Mizgajski



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Keynotes:

Topic	Keynote speaker	Date and time
<i>Targeted urban tree planting for enhancing ecosystem functions</i>	Sten Gillner (Dresden University of Technology)	Thu, 9 th June, 9:00 – 9:20
<i>Urban trees and adaption to climate change: measures, management, and best practice</i>	Cristian Ioja (University of Bucharest)	Thu, 9 th June, 11:00 – 11:20
<i>"Urban Green 2021": Testing a broad range of stress tolerant urban tree species and their potential for arthropod diversity</i>	Susanne Böll (Bavarian State Institute for Viticulture and Horticulture, LWG)	Fri, 10 th June, 9:00 – 9:20
<i>Position of trees in urban socio-ecological systems</i>	Andrzej Mizgajski & Janina Borysiak (University of Poznań)	Fri, 10 th June, 9:20 – 9:40

Venue:

University of Salzburg

Faculty of Natural Sciences

Hellbrunnerstrasse 34, 5020 Salzburg

Room: "Dekanatssitzungssaal" - on the first floor (1. OG)



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Abstracts

WORKSHOP PART ONE	
Time	Thursday, 9 th June 2016
9:00 – 9:20	Session topic: Urban trees under climate change

Targeted urban tree planting for enhancing ecosystem functions

Sten Gillner ^a, Juliane Vogt ^a and Mathias Hofmann ^b

^a *Chair of Forest Botany, Dresden University of Technology, Institute of Forest Botany and Forest Zoology, Piennner Str. 7, 01737 Tharandt, Germany*

^b *Social Sciences in Landscape Research, Swiss Federal Research Institute WSL, Zürcherstrasse 111, 8903 Birmensdorf, Switzerland*

Well-being and health of the urban population is stimulated by urban green based on a variety of benefits as microclimatic improvements, embellishment of the landscape scenery or increased interactions between people and nature. However, negative effects also exist, deriving from the plantation of trees and shrubs – incorporating the spread of toxic plant material, the allergic potential, the staining by leaf and fruit fall as well as threats caused by breaking branches and stems.

Available aboveground and belowground space, light and soil conditions, local microclimate, water supply, emissions, and other stressors, should be taken into account to promote woody species with high tolerances. Beyond endorsing longevity and vitality by considering the prevailing environmental conditions, a diverse species selection should be prioritized throughout to reduce the vulnerability to species-specific pests and diseases. Therefore, a pool of species, phenotypes and varieties should be planted to lower these risks. However, tree selection and arrangement must be embedded in the composition of structural-spatial constructions types and historical quarter development, according to urban structure types and current environmental conditions. Citree database was therefore developed to support urban biodiversity and to facilitate selection of the right tree for the right place to provide suitable tree species that are adapted under the given growth conditions, and which meet human demands in a broader sense and ecosystem service in a literal sense.

WORKSHOP PART ONE	
Time	Thursday, 9 th June 2016
9:20 – 9:30	Session topic: Urban trees under climate change

Climate-related ecosystem services of urban tree stands – species-based evaluation methodologies to aid planting and management policies

Márton Kiss ^a, Ágnes Takács ^a, Eszter Tanács ^a and Ágnes Gulyás ^a

^a *Department of Climatology and Landscape Ecology, University of Szeged, Egyetem str. 2., 6722 Szeged, Hungary*

The preservation and proper management of urban trees is undoubtedly one of the most important elements of green infrastructure based urban planning, as they have a major role in the provision of several regulating and cultural services. Field meteorological measurements can be performed most easily on micro-scale, and methods for calculating tree biomass and related parameters are available for many species. Therefore, there are suitable quantification and also model-based assessment tools for the comparison of different species from the point of view of their service providing capacity. Tree cadastre databases can also provide valuable information about the condition of the different populations, which reflect their tolerance of urban circumstances. In the first part of our talk, we summarize our results of investigations of different climate-related services carried out in Szeged (Hungary). The carbon sequestration and air pollution removal capacity of street trees were evaluated through the adaptation of the i-Tree Eco model, based on an extended tree cadastre database of the city centre. Then, the results of a one-year-long integrated microclimate measurement campaign under shade trees are presented, with the aim to compare their effects on outdoor thermal comfort. The shading effect of street trees may also have positive impact on building energetics, which were evaluated using the Autodesk Ecotect model. At the end of our presentation, we give some proposals for some further steps, to take as many aspects into consideration in ecosystem service-based urban tree management as possible.

WORKSHOP PART ONE	
Time	Thursday, 9 th June 2016
9:30 – 9:40	Session topic: Urban trees under climate change

Modelling growth and cooling effects of urban trees in Munich, Germany

Astrid Moser ^a and Teresa Zölch ^b

^a Chair of Forest Growth and Yield Science, Technical University of Munich, Hans-Carl-v.-Carlowitz-Platz 2, 85354 Freising, Germany

^b Centre for Urban Ecology and Climate Adaptation, Technical University of Munich, Arcisstrasse 21, 80333 München, Germany

Urban green infrastructure and particularly urban trees are increasingly promoted as a key measure to mitigate heat stress in cities caused by the urban heat island effect and climate change impacts, including climate variability and extremes. Trees can provide regulating ecosystem services such as carbon sequestration, reduction of rainwater runoff, pollutant filtering and especially cooling by shading and evapotranspiration and hence, improving outdoor thermal comfort for pedestrians. However, knowledge on the actual provision of ecosystem services by urban trees, also in relation to tree species and urban growth conditions is scarce. This information is crucial for developing sophisticated modelling approaches to project the performance of urban trees under current climate and future climate change scenarios. Against this background, we present results from two ongoing research projects of the Centre for Urban Ecology and Climate Adaptation (ZSK) at Technical University of Munich. First, the benefits of urban trees for outdoor thermal comfort are shown under current and future climate conditions. Therefore, simulations with the microclimatic model ENVI-met have been conducted. Second, the relationship between growth respectively age and Leaf Area Index (LAI) with the shading and cooling effects of two common urban tree species (*Tilia cordata* and *Robinia pseudoacacia*) is presented. For this, regression equations were developed based on extensive empirical data. Finally, we conclude by addressing further research potentials in the fields of urban tree measurements and their representation in microclimatic modelling tools.

WORKSHOP PART ONE	
Time	Thursday, 9 th June 2016
11:00 – 11:20	Session topic: Urban trees and adaption to climate change: measures, management, and best practice

Urban trees and adaption to climate change: measures, management, and best practice

Cristian Ioja ^a

^a *Centre for Environmental Research, University of Bucharest, 1 Bd. Nicolae Balcescu, Sector 5, Bucharest, Romania*

Urban environments are complex systems, extremely vulnerable to climate change. High population density and cities' critical role in the regional and global economy increase the need for developing strategies to increase cities' resilience to climate change. Urban trees are one of the main components of urban green infrastructure. Some of their characteristics (such as species richness, trees age, health and maintenance practices), as well as their resilience to different urban threats influence the capacity of urban green infrastructure to provide different ecosystem services, inclusively adaptation to climate change. The management of the urban environment where urban green infrastructure is entangled with blue infrastructure may increase the ability of cities and their inhabitants to adapt to climate change. The paper emphasizes the role of the urban trees in reducing the impacts of climate changes (such as extreme temperatures, heat island, increased runoff as well as drought) using some relevant case studies from the international literature (e.g. Bucharest, Athene, Los Angeles, New Orleans and Barcelona). Using examples of innovative best practices from the case studies, the paper will discuss whether is efficiently to directly transfer such practices to another cities or to translate them into cities own culture and characteristics.

WORKSHOP PART ONE	
Time	Thursday, 9 th June 2016
11:20 – 11:30	Session topic: Urban trees and adaptation to climate change: measures, management, and best practice

Urban Trees under Water Stress - Adaptation strategies in Mediterranean (Patras/Greece) and temperate mid-latitude cities (Salzburg/Austria)

Jürgen Breuste^a and Vasiliki Tsiotsiou^b

^a *Department of Geography and Geology, Urban and Landscape Ecology, University of Salzburg, Hellbrunnerstraße 34, A-5020 Salzburg, Austria*

^b *Botanical Institute, Department of Biology, University of Patras, 26500 Patras, Greece*

The cities of Patras/Greece, located in the Mediterranean, and the city of Salzburg/Austria, located in the temperate mid-latitudes are representative example cities.

Urban ecosystems are experiencing higher summer temperatures and less rainfall in summer causing water stress, while a floristic change is expected. The upkeep of existing trees and the extension of the tree stock to adapt to expected climatic changes will be an important management task.

We investigated the urban tree stock on the base of urban structural units (biotope types), examined the environmental benefits of the urban trees and we gave suggestions for their sustainability and improvement from a floristic point of view. Patras is actually already better equipped with drought-tolerant tree species (about 60%) than Salzburg (about 30%). This is caused also by much more non-native species in Patras (about 85%) than in Salzburg (about 50%).

The task is to preserve and extend the urban tree stock in all urban structural units. Urban green spaces and trees in urban structural units support necessary micro-climate regulations (ecosystem service) in a local or regional scale by modifying extremes of climate, improving soil stability, improving ground water recharge and reducing storm-water run-off, contributing to biodiversity and to plant health, and as a result to social well-being.

To upgrade the tree stock green spaces in urban structural units we propose to retain the present tree flora and enriching it by adding suitable species, mainly from the native flora, which can tolerate high temperatures and water stress.

WORKSHOP PART THREE	
Time	Friday, 10 th June 2016
09:00 – 09:20	Session topic: Urban tree diversity – challenges and opportunities

“Urban Green 2021” - testing a broad range of stress tolerant urban trees and their potential for arthropod diversity

Susanne Böll ^a

^a *Bavarian State Institute for Viticulture and Horticulture, An der Steige 15, D- 97209 Veitshöchheim, Germany*

Urban trees fulfill a number of important beneficial functions. Besides CO₂ fixation, they reduce urban heat island effects, filter pollutants and fine particles, and in addition provide habitats - for fauna and flora. However, to be able to meet these tasks the trees have to be in good vital conditions.

Traditionally, roadsides are dominated by a limited number of tree species. Especially the native species have increasing difficulties in coping with the complex stress situations at urban sites. Climate change further worsens this situation. To broaden the scarce species repertoire with more climate-stress tolerant tree species, a long-term project has been started in 2010. Meanwhile, 30 different tree species with a total of 650 trees are being tested in three Bavarian cities representing different local climate conditions. A screening of the experimental trees is carried out twice a year scoring drought and frost damages, crown vitality and health status, recording phenological data, and measuring various growth parameters. First results concerning drought and frost tolerance will be presented.

To tackle the often posed question if alien vs. native tree species harbour a lower arthropod diversity, a master thesis study will start in 2017. Over one growing season, arthropods will be collected in the crowns of three related native/ alien species pairs (*Tilia cordata*/ *Tilia tomentosa* Brabant, *Fraxinus excelsior*/ *Fraxinus ornus*, *Carpinus betulus* Frans Fontaine, *Ostrya carpinifolia*). The diversity of different arthropod groups (Hemiptera, Coleoptera, Hymenoptera) and food guilds (chewers, suckers, carnivores) will be compared between the native and the corresponding alien species.

WORKSHOP PART THREE	
Time	Friday, 10 th June 2016
09:20 – 09:40	Session topic: Urban tree diversity – challenges and opportunities

Place of Trees in Urban Social-ecological Systems

Andrzej Mizgajski^a and Janina Borysiak^a

^a *Department of Integrated Geography, Institute of Physical Geography and Environmental Planning, Adam Mickiewicz University in Poznań, ul. Dziegielowa 27, 61-680 Poznan, PL - Poland*

Trees occupy a special position in the urban fabric for cultural and ecological reasons. Their place in the urban social - ecological systems can be dealt with from diverse perspectives.

The basic approach is to consider the role of urban trees occurring at different spatial scales. It puts out the idea that the greater availability of larger spatial forms (urban forests, parks) correlates with less attention for small scale forms (squares, rows, individuals) of tree occurrence. The Poznan case study can be seen as an example of a tree-rich city. Since the wedges of urban forests occupy 20% of the city area, and it contains 43 city parks, the importance of individual trees is generally limited to the downtown area.

The range of benefits provided by trees reflects the linkage within urban social - ecological systems. Services and disservices delivered by trees have been illustrated by an evaluation of questionnaire based values related to trees in the Los Angeles region (Meghan L. et al.. 2015). Benefits from urban trees are distributed unequally between different social groups depending on their housing situation.

Some of the benefits e.g. aesthetic values or increased privacy, are predominantly private goods, while the impact on Urban Heat Island (UHI) reduction and storm water runoff retention is of a broader scale importance. This prompts the question: how far should tree maintenance be undertaken on public or on private expenses. The final part of the presentation is about threats to urban trees and ways of mitigation. The following threats have been considered: felling for land development, surface sealing, damage and spraying salt aerosols during winter periods. The respective forms of mitigation include: Restrictions in the spatial planning, design of green areas, pedestrian channelizing, active protection e.g. trees coating for winter.

Undoubtedly a growing interest in research on urban trees deals with improvement of life quality in cities. The main challenge remains the distinction between general conclusions regarding trees in cities and local conditions defining the specificity of a particular city.

WORKSHOP PART THREE	
Time	Friday, 10th June 2016
09:40 – 09:50	Session topic: Urban tree diversity – challenges and opportunities

Assessing Regulating Ecosystem Services with Urban Tree Cadastre Data – Opportunities and Challenges

Tobias Scholz ^a and Angela Hof ^b

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^b *Department of Geography and Geology, Urban and Landscape Ecology, University of Salzburg, Hellbrunnerstraße 34, A-5020 Salzburg, Austria*

The regulatory climatic benefits of trees, like temperature reduction from shading and transpiration, regulation of storm water run-off or the filtering of air pollution, in cities are well-known and understood. However, the assessment of ecosystem services of urban trees is time-consuming and there is a time lag of integrating those benefits in urban planning processes. In the face of climate change those regulation services will be more and more important to preserve and increase the quality of life in urban areas.

An opportunity to assess regulation services lies in analyzing urban tree cadastres for ecosystem services. Many cities use tree cadasters as an utility to monitor the vitality and damages on trees in order to comply to road safety regulations as an administrative task. Therefore, tree cadasters are huge databases, including much information on urban trees like species, tree location, tree height, crown width, diameter at breast height, vitality and many more variables. For example, urban tree cadastres of cities in the Ruhr metropolitan region contain 20,000 (Essen), 40,000 (Bochum) and 50,000 (Duisburg) urban trees. By analyzing those cadastres, regulating services can be evaluated with relative little costs and fieldwork.

In our talk we discuss how the cadastre can be used to analyze regulating services like carbon sequestration, air pollution filtering, reduction of storm water run-off and cooling effects through shading on the scale of an entire city. As modelling software we used the freeware i-Tree from the Forest Service of the US-Department of Agriculture. Usually not all required data for i-Tree are provided by tree cadaster data, so there is a need to close data gaps by statistical and geostatistical methods. Solutions and sources of error will be shown and discussed in detail. Additionally, we will present how to map those regulating services and how to integrate the data in urban planning.

WORKSHOP PART THREE	
Time	Friday, 10th June 2016
09:50 – 10:00	Session topic: Urban tree diversity – challenges and opportunities

Urban tree diversity – challenges and opportunities

Silvia Ronchi ^a

^a *Department of Architecture and Urban Studies, Politecnico di Milano, Via Edoardo Bonardi, 3, 20133 Milano, Italy*

Air pollution in urban cities, caused by anthropic activities, contributes to air quality degradation generating unhealthy condition for human life.

The contribution of urban trees for air pollutants removal is raising attention and is actively promote as a planning tool to enable urban areas to mitigate against climate change, enhance urban sustainability and public health benefits.

Urban trees are a key element for the definition of a Urban Green Infrastructure (UGI) as a structural layer for landscape planning for the maintenance and restoration of natural capital considering the interrelations between social and ecological aspects. UGI is based on the multifunctional use of natural capital, especially its naturalistic, recreational and landscape vocation.

Considering the framework of Green infrastructures, urban trees are the potential solution to improve human health and well-being through the provisioning of different ecosystem services: climate regulation, air pollutants removal and aesthetics/landscape services.

The potential of UGI is to support planners and policymakers with adequate technical tools that estimate the real benefit of urban trees on air quality in urban environment.

The critical aspect that limits this process is the availability of data and the lack of information which strongly affect the successful outcome.

The short talk aims to present the experience of Milano city on urban tree cadastre in terms of inventory data, costs information and update method; and a preliminary investigation on mapping UGI managing multiple Ecosystem Services for landscape conservation.

WORKSHOP PART THREE	
Time	Friday, 10 th June 2016
11:15 – 11:25	Session topic: Management and acceptance of targeted planting and adaption measures - urban trees and cultural ecosystem services

Visitor perception and aesthetics of vegetation in Salzburg City parks

Alexander G. Keul ^a

^a *Environmental Psychology, University of Salzburg, Hellbrunnerstraße 34, A-5020 Salzburg*

Urban green as a focus of sustainability and health research is a permanent topic of Environmental Psychology (Ulrich 1986, Kaplan & Kaplan 1989). When interacting, Social Sciences and Ecology should focus on microscale biodiversity, rather than talk about “overall green satisfaction”. Urban park studies already found a high public preference for tree size and species variety in Scandinavia (Gundersen et al. 2007), an accurate public perception of woodland plant biodiversity in Great Britain (Fuller et al. 2007), but a lack of knowledge about the biodiversity concept in Switzerland (Lindemann-Matthies 2008).

Austrian leisure surveys (Keul 2015) in Vienna and Salzburg City 2015 studied 243 visitors in 24 urban parks. The leisure experience showed a positive affect balance for 95-100%. About 40% felt „very free“, 20-30% „fascinated“, 35-50% forgot time (dissociation). 35-50% rated park biodiversity as very high. Special interest features were 45-60% plants and 40% animals. Women reported a more intense experience of nature.

A subsequent project together with urban landscape ecology 2016 organized a comparison of monitored plant biodiversity and visitor perception in three Salzburg City parks. Six psychology students asked visitors about subjective biodiversity, leisure experience, knowledge and aesthetic judgements about trees, shrubbery and grass/weed near favorite places in the park. Visitor results are reality-tested with the tree register of the Salzburg Magistrate garden office and with transects of plant biodiversity monitoring in summer that will run directly through visitor’s favorite places.

References

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WORKSHOP PART THREE	
Time	Friday, 10 th June 2016
11:25 – 11:35	Session topic: Management and acceptance of targeted planting and adaption measures - urban trees and cultural ecosystem services

**Enhancing the delivery of selected ecosystem services by modified and new urban ecosystems –
what about biodiversity?**

Angela Hof ^a

^a *Department of Geography and Geology, Urban and Landscape Ecology, University of Salzburg,
Hellbrunnerstraße 34, A-5020 Salzburg, Austria*

Cities differ from rural areas in their abiotic conditions and are home to novel and emerging ecosystems that continuously challenge our understanding of how these species assemblages impact urban ecosystem services. Knowledge of the mechanisms behind urban biodiversity-ecosystem service relationships is rather scarce and crucial questions remain open, as shown in a recent review (Ziter 2015). Yet in scientific literature, policy, and planning, a strong positive biodiversity-ecosystem service linkage is often assumed. In addition, a utilitarian perspective on urban green is gaining ground - promoted through the concept of ecosystem services and even more so through the concept of nature-based solutions. The talk reviews the links between biodiversity and urban ecosystem services and then discusses selected studies - including monetary valuation, and biomass park projects and models - to highlight opportunities and challenges of managing urban trees for optimized service delivery.

References

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WORKSHOP PART THREE	
Time	Friday, 10 th June 2016
11:35 – 11:50	Session topic: Management and acceptance of targeted planting and adaption measures - urban trees and cultural ecosystem services

Evaluation of cultural ecosystem services of urban parks in Hungarian case study areas

Péter Szilassi ^a

^a *Department of Physical Geography and Geoinformatics, University of Szeged, Egyetem utca 2, 6722, Szeged, Hungary*

In urban areas, green spaces have an important role on the cultural ecosystem services. The evaluation of cultural ecosystem services is a very important issue for planning and management of urban parks. The usage of green spaces is strongly connected with perceived and reported societal benefits, and not easy to find the best methods for its analyses. It is important to combine sociological methods (for instance questionnaire data), as perceived information, and quantitative information on green space usage to assess cultural ecosystem services. In the showed results, firstly the public usages of two Hungarian urban parks have been investigated based on questionnaires. Beyond that, other quantifiable information, such as number of Google Earth photographs picturing the parks uploaded to cloud services, as well as running paths uploaded to recreational online applications, being counted to provide additional park usage information. The perceived and quantitative information domain is being collectively analysed with GIS and statistical methods. The expected outcomes added new quantitative information and qualitatively analysable datasets from cultural ecosystem services. These methods would be adaptable into analyses of cultural ecosystem services of other cities. The analyses of cultural ecosystem services can add useful information for urban green space planning, and decision support practices.