URBAN FORESTS:
FULL OF ENERGY

European Forum
on Urban Forestry

EFUF 2019
Cologne
May 22-24

BOOK OF ABSTRACTS

URBAN FORESTS: FULL OF ENERGY

22nd European Forum on Urban Forestry (EFUF2019)

May 22-24, 2019 Cologne, Germany

Book of Abstracts

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#EFUF2019 BLOG

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EFUF European Forum on Urban Forestry EFI Stadt Köln RWTH AACHEN UNIVERSITY Deutsche Sporthochschule Köln German Sport University Cologne Ministerium für Umwelt, Landwirtschaft, Natur- und Verbraucherschutz des Landes Nordrhein-Westfalen

Cologne Green Belt. Hermann Schiefer

WELCOME

For over 20 years, the European Forum on Urban Forestry (EFUF) is a unique meeting place for practitioners, managers, planners, architects, researchers, public authorities and policy makers to share interdisciplinary experience and good practices within the field of urban greening, urban forests and urban forestry.

Urban forests are vibrant places for multifaceted recreational activities, social gathering and mental restoration, but also provide biomass for an urban bioeconomy. With the aim of connecting science to practice, the 22nd European Forum on Urban Forestry (EFUF 2019) explores in Cologne four major urban forestry themes through a combination of indoor talks, outdoor excursions and socialising activities. Those themes are: *The Healthy Forest* (sports, health and well-being), *The Spiritual Forest* (culture, religion and art), *The Learning Forest* (laboratories and education) and *The Co-Designed Forest* (governance, management and planning).

The venue of this years' conference (the German Sport University Cologne) is the perfect location to explore energetic interactions of trees and human beings. Moreover, it is situated in the Cologne Green Belt ("Inneren und Äußeren Grüngürtel") and at walking distance of the Cologne Forest Laboratory ("Waldlabor**"**) which has been established in 2010.

These ingredients provide the perfect mix for the 2019 edition of the European Forum on Urban Forestry. In name of the organising institutions, the local organisation committee, the programme committee and the international steering group for the European Forum on Urban Forestry, I invite you to exchange knowledge and to explore energetic interactions between trees and human beings during our event. Together we may discover that urban forests are full of energy and energise people and experts.

We wish you a fruitful event!

Dr Rik De Vreese – *European Forest Institute*

Clive Davies – *Chair of the EFUF international steering group*

EFUF 2019

Organising institutions

- Ministry for Environment, Agriculture, Nature and Consumer Protection of the Federate State of North Rhine-Westfalia
- German Sport University Cologne
- European Forest Institute (EFI) – Bonn Office
- RWTH Aachen University
- University of Applied Sciences and Arts at Göttingen (HWAK), Germany
- City of Cologne

Programme committee

- **Prof Dr Georg Winkel** |European Forest Institute Bonn, Germany
- **Prof Dr Cecil Konijnendijk** | University of British Columbia, Canada
- **Prof Dr Frank Lohrberg** | RWTH Aachen University, Germany
- **Dr Stefan Türk** | German Sport University Cologne, Germany
- **Prof Dr Liisa Tyrväinen** | LUKE, Finland
- **Dr Bianca Wyss-Bärlocher** | Urban Green Polylogue, Switzerland
- **Dr Joachim Bauer** | Office for Landscape Management and Green Areas, City Of Cologne, Germany
- **Dr Judith Kretschmer** | Ministry For Environment, Agriculture, Nature And Consumer Protection of the Federate State of North Rhine-Westfalia, Germany
- **Clive Davies** | European Forum On Urban Forestry, UK
- **Dr Andrej Verlic** | Snaga, Ljubljana, Slovenia
- **Dr Stefanie Steinebach** | HAWK, Göttingen, Germany
- **Dr Rik De Vreese** |European Forest Institute, Bonn, Germany

Facilitators

- Toyota Deutschland
- Zweirad-Einkaufs-Genossenschaft (ZEG)
- Federal Forest (Bundesforst)
- German Federal Environmental Foundation (Deutsche Bundesstiftung Umwelt)

EFUF2019 is facilitated by the members of the International Steering Committee of the European Forum on Urban Forestry. EFUF2019 is an EU Green Week Partner event.

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			19.00 – 23.00 – Social Dinner	17.00 – 19.00 – Concluding snack	

Programme

Tuesday, 21 May

18.00 – 20.00 | **Icebreaker,** Location: *Brauhaus Päffgen*, Friesenstraße 64-66, 50670 Köln

Wednesday, 22 May

08.30 – 09.30 | **REGISTRATION**, Location: Lobby German Sport University Cologne

OPENING SESSION – Moderator: Prof Dr Georg WINKEL (European Forest Institute, EFI)
Location: Lecture Hall 2 (Hörsaal 2)

09.30 - 09.45 | **OPENING** by Prof Dr Georg WINKEL (EFI), Mrs. Renate SPÄTH (Ministry for Environment, Agriculture, Nature and Consumer Protection of the Federate State of North Rhine-Westphalia) and Ms Nerys JONES (International Steering Group EFUF)

09.45 – 10.30 | **WORDS OF WELCOME**

- Mr Hubert KAISER (Director-General of Forestry, Nature Conservation, Ministry for Environment, Agriculture, Nature and Consumer Protection of the Federate State of North Rhine-Westphalia)
- Mrs. Henriette REKER (Lord Mayor of Cologne)
- Prof Dr Heiko STRÜDER (Rector of the German Sport University Cologne)

10.30 – 11.00 | **KEYNOTE**

- Dr Joachim BAUER (Deputy Head of the Office for Landscape Management and Green Areas of the City of Cologne) – *Urban Development Cologne – Historical development of the Green Belt*

11.00 – 11.30 | **COFFEE BREAK**
Location: Lobby German Sport University Cologne

11.30 – 12.45 | **KEYNOTES (continued)**

- Prof Dr Roland GUSTAVSSON (Swedish University of Agricultural Sciences) – *Landscape and forest laboratories*
- Prof Dr Arne ARNBERGER (University of Natural Resources and Life Sciences, Austria) - *Linking urban outdoor recreation with health benefits on a city scale level - a first approach*
- Mrs. Michela CONIGLIARO (Food and Agriculture Organisation of the United Nations) et al. - *Outcomes of and follow-up to the 1st World Forum on Urban Forestry (Mantova, November 2018)*

12.45 – 14.00 | **LUNCH**
Location: Mensa (Canteen) of the German Sport University Cologne

14.00 – 18.30 | **EXCURSIONS to the *Cologne Green Belt***
Departure point: in front of the Lobby German Sport University Cologne

19.00 – 21.00 | **BUSINESS MEETING of the EFUF International Steering Group** (*on invitation only*)
Location: Institutsgebäude 5 (IG V, Building 5), Room 114 (first floor))

Thursday, 23 May

08.15 – 10.30 | **PLENARY SESSION** – Moderator: Prof Dr Cecil KONIJNENDIJK (University of British Columbia, Canada)
Location: Lecture Hall 2 (Hörsaal 2)

- Prof Dr Frank LOHRBERG (RWTH Aachen, Germany) – *Introduction to Waldlabor*
- Dr Bianca BÄRLOCHER (Urban Green Polylogue, Switzerland) – *Urban Forestry Narratives in Europe*
- Dr Lorien NESBITT (University of British Columbia, Canada) – *Co-creating nature-based solutions*
- 10.00 – 10.30 | **POSTER SESSION – Lightning talks**: get a snapshot of the posters at display in one-minute teaser talks by the poster authors
  The posters are on display in the lobby from Wednesday 11.00 until Friday 13.00

10.30 – 11.00 | **COFFEE BREAK**
Location: Lobby German Sport University Cologne

11.00 – 12.45 | **PARALLEL SESSIONS**

- **SESSION 1.1** | **Sports and forests**
  Session Chair: Dr Stefan TÜRK (German Sport University Cologne)
  Location: Seminar Room 60
- **SESSION 2** | **Spiritual Forests**
  Session Chair: Prof Dr Paolo SEMENZATO (University of Padua, Italy)
  Location: Seminar Room 61
- **SESSION 3.1** | **Learning Forest – Forest Laboratories**
  Session Chair: Prof Dr Frank LOHRBERG (RWTH Aachen University, Germany)
  Location: Seminar Room 62
- **SESSION 4.1a** | **Co-Design: Governance (I)**
  Session Chair: Naomi ZÜRCHER (Aerbor Aegis, Switzerland)
  Location: Seminar Room 63
- **SESSION 4.4** | **Outdoor demonstration**
  Session Chair: Prof Dr Steffen RUST (University of Applied Sciences and Arts, Göttingen, Germany)
  Location: to be decided
- ***SIDE SESSION*** | **A stick or a carrot?** – How can cities retain existing trees and plant more trees on private lands? – Convenor: Dr Camilo ORDÓÑEZ (University of Melbourne, Australia)
  Location: DSHS, Institutsgebäude 5 (IG V, Building 5), Room 114 (first floor)

12.45 – 14.00 | **LUNCH**
Location: Mensa (Canteen) of the German Sport University Cologne

14.00 – 18.30 | **AFTERNOON PROGRAMME**
Meeting point & bus pickup: Parking Jahnwiese, Junkersdorfer Strasse (in front of Building IG V)

- 14.00 – 15.00 | Transport to the excursion venue by bus
- 15.00 – 18.30 | Parallel events
  - **EXCURSION** – Nature reserve *Wahner Heide* and *Gut Leidenhausen*
  - **SESSION 3. 2** | **The Learning Forest – Environmental Education** (*Gut Leidenhausen*)
    Session Chairs: Dr Stefanie STEINEBACH (University of Applied Sciences and Arts, Göttingen, Germany) & Anna COKER (Office for Landscape Management and Green Areas, City of Cologne)
  - **FOREST MINDED WORKSHOP** at *Gut Leidenhausen* with Katriina KILPI (ForestMinded, Belgium & Finland)

19.00 – 23.00 | **EVENING PROGRAMME**

- **SOCIAL DINNER** at *Gut Leidenhausen* (registration required), return transport by bus to city centre and German Sport University Cologne

Friday, 24 May

08.30 – 11.00 | **PARALLEL SESSIONS**

- **SESSION 1.2** | **Health and well-being**
  Session Chair: Dr Stefan TÜRK (German Sport University Cologne)
  Location: Seminar Room 60
- **SESSION 4.1b** | **Co-Design: Governance (II)**
  Session Chair: Ian WHITEHEAD (RWTH Aachen University, Germany)
  Location: Seminar Room 61
- **SESSION 4.2** | **Co-Design: Management**
  Session Chair: John PARKER (Transport for London)
  Location: Seminar Room 62
- **SESSION 4.3** | **Co-Design: Planning**
  Session Chair: Dr Andreas BERNASCONI (Pan Bern)
  Location: Seminar Room 63

11.00 – 11.30 | **COFFEE BREAK**
Location: Lobby German Sport University Cologne)

11.30 – 12.45 | **CLOSURE of EFUF 2019** – moderator: Mrs. Renate SPÄTH (Ministry for Environment, Agriculture, Nature and Consumer Protection of the Federate State of North Rhine-Westphalia)
Location: Lecture Hall 2 (Hörsaal 2)

- Concluding remarks by Clive DAVIES (Chair EFUF International Steering Group)
- Feedback from the EFUF International Steering Group (Clive DAVIES)
- Introduction to EFUF2020 (Prof Alan SIMSON)
- Young Urban Forester of the Year Award (YUFA) (Clive DAVIES)
- Introduction to the *Waldlabor* excursion (Prof Frank LORHBERG, RWTH Aachen University)

12.45 – 14.00 | **LUNCH**
Location: Mensa (Canteen) of the German Sport University Cologne

14.00 – 17.00 | **EXCURSIONS to the *Waldlabor Köln***
Departure point: in front of the Lobby

Thematic focus: Presentation of the results of the student forest workshop and discussion on how to make the urban forest a public space.

17.00 – 19.00 | **EVENING PROGRAMME**
Concluding snack at the Waldlabor (joint event with the Student Waldlabor Workshop participants)

Saturday, 25 May – Post-Conference Excursion Drachenfels

08.30 Bus leaves from German Sport University Cologne (Parking Jahnwiese)
09.30 Visit to EFI Bonn (with coffee and croissant)
10.15 Bus leaves from EFI to Königswinter
11.15 Arrival at Drachenfels (http://www.der-drachenfels.de/)
12.30 Walk to the Museum
13.00 Visit to the German Museum for Nature Conservation History (*Deutsches Museum für Naturschutzgeschichte*)
15.15 Bus leaves to Cologne-Bonn airport and Köln
15.45 Arrival in Cologne-Bonn airport (CGN)
16.15 Arrival at Cologne Central station (Köln Hbf)

Venue and Excursion Sites

The German Sport University Cologne hosts the 22nd European Forum on Urban Forestry. Keynotes, plenary sessions and most parallel sessions will be held within the university premises, while excursions will take place in the surrounding areas of Cologne. Field trips include guided visits through: the Cologne Outer Green Belt, the Waldlabor Köln (Forest Laboratory of Cologne), the Wahner Heide Nature Reserve and the Gut Leidenhausen historical manor.

Cologne Outer Green Belt

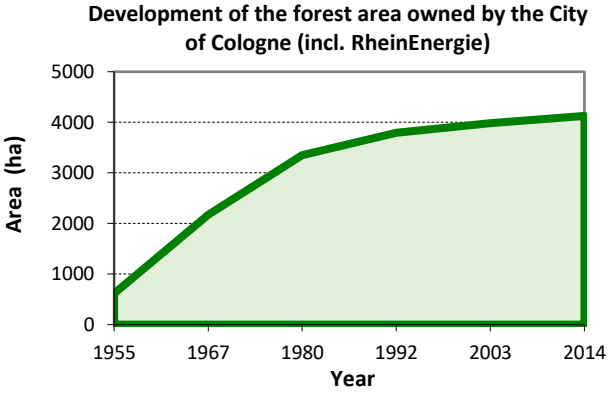
Cologne Green Belt. City of Cologne

Mixed deciduous forests, meadows and ponds characterise Cologne's largest recreation area, which has been created in the last 100 years. Today it is an outstanding example of the implementation of a coherent green system in urban space.

Cologne's urban planning situation up to the beginning of the 1920s was shaped by the fortress conditions of the city. The outer fortress area enclosed the left and right bank of the Rhine, and it needed to be destroyed according to the Treaty of Versailles. After the abolition of the fortress, the Federal Chancellor Konrad Adenauer (Cologne's Lord Mayor between 1917 – 1933) decided to develop of an urban green system instead of the establishment of cultivars. Fritz Schumacher, Director of Construction of the City of Hamburg, planned a radial green system that surrounded the city and was connected to the city centre by green corridors in order to create a ventilation system.

The conversion of the fortress belt into a green belt was essentially carried out in two construction phases as part of emergency work with the unemployed between 1919 and 1929: The site was divided into different zones: an allotment garden zone adjoined to the city's buildings, a zone of playgrounds and sports facilities followed by a military ring road which merges into a free afforested green area. The fact that the green belt was laid out on the former fortress site and that some of the design of the fortifications could be integrated is of importance in terms of heritage conservation.

While forests were sacrificed for urban development purposes in other cities after the Second World War, Cologne took the opposite path in its green policy. In the mid-1950s, the city began a major reforestation programme (graph below). The Outer Green Belt was expanded by afforesting agricultural lands and creating the Forest Botanical Garden. Forests were established next to industrial plants and along motorways to protect against visual disturbance and air pollution, and water protection forests were established. Today, with a forest area of 4.000 ha, Cologne is one of the largest municipal forest owners in North Rhine-Westphalia (see Fact Box p.16).



Waldlabor Köln – Forest Laboratory of Cologne

In 2010, along a stretch of the Cologne Green Belt, the City of Cologne and its sponsors installed the Waldlabor Köln (Forest Laboratory of Cologne) to test out innovative forms of urban forestry in the face of climate change and changing society, greatly inspired by the landscape laboratory in Alnarp, Sweden. It is divided in four major zones: the Energy Forest, the People's Forest, the Climate Change Forest and the Wilderness Forest.

For the moment, the Energy Forest is the most operational zone of the Waldlabor. It is a full scale experiment where energy production is part of the recreational landscape. Fast growing species are pruned, cut and trimmed into temporary forest spaces resulting in dynamic and dramatic designs. The area has a rotation cycle of two to five years and thus changes tend to happen quickly; sculpted landscapes and paths disappear with harvests. Through cooperation with RWTH University of Aachen, researchers explore not only the spatial qualities, but also how to best communicate with the public regarding experimentation, process and outcomes.

Waldlabor Köln 2016. City of Cologne

The other zones of the Waldlabor develop over a longer time span. The People's Forest aims to introduce experimental compositions to create new experiences in an urban forest open to everyone. Specific seasonal qualities and development stages are under scrutiny, and the attention of the public is drawn to experiencing aesthetic aspects such as blossom, fall foliage and leaf shapes. The trees have been sponsored individually by local citizens.

The Climate Change Forest allows the study of drought resistant species. In the face of global warming and the expectation of drought conditions, this zone mimics Cologne's urban environment to allow the evaluation of site-specific species for future use.

The Wilderness Forest is a control zone with no human influence. Here, one can learn about how unstaffed and unmaintained urban forests develop. This process shows the effects of absentee management, but also highlights the qualities of wilderness.

The Waldlabor hosts workshops where students are allowed to camp on site and intervene with the management of the area. As such, parallel to and in cooperation with EFUF 2019, the Institute of Landscape Architecture (RWTH Aachen) develops a hands-in International Waldlabor Student Workshop to learn about the experimental character of the site

Wahner Heide Nature Reserve and Gut Leidenhausen historical manor

Together, Königsforst and Wahner Heide nature reserves constitute one of the biggest natural conservation areas of European importance in North Rhine-Westphalia (NATURA 2000 area). The large, coherent natural area is a substantial recreation area in the Cologne/Bonn region, which accommodates nearly 1.3 million inhabitants.

The Wahner Heide is a 4000 hectare large nature reserve and the second-largest of its kind in North Rhine-Westphalia, a German federal state. It is covered by various types of vegetation, mostly by deciduous forest but also by grasses on open heath squares. As high as its variety in soil types is also its biodiversity, it is considered one of the most species-rich ones in the whole country. For

instance, there are given more than 700 species endangered by extinction.

The north is a former military training area, today part of the National Natural Heritage of the Federal Republic of Germany and owned by the Deutsche Bundesstiftung Umwelt. The south of the Wahner Heide is still used as a military training area by the Bundeswehr. Through military use and targeted maintenance and conservation measures, special biotopes that provide habitats for many endangered animal and plant species have been developed and preserved. First efforts to protect the area date back to the 19th century. The wide open spaces are kept open by goats, Glan cattle, donkeys and water buffalos. The core zone in the military training area must not be entered, in order to ensure the military security restrictions which also helps to preserve the nature and diversity of Wahner Heide.

In order to manage the access to the area and to inform visitors about its extraordinary quality, four visitor centres were established in 2010 within the framework of regional cooperation, namely: Gut Leidenhausen in Köln-Porz; Burg Wissem in Troisdorf; Turmhof in Rösrath; and, Forsthaus Steinhaus in Bergisch-Gladbach. Each of these centres has its own exhibition topic that covers valuable information about the multiple facets of the natural reserve.

Gut Leidenhausen has a strategical location right at the interface between the urban area and the natural environment of the Wahner Heide. Originating as a knights' manor, the building was mentioned in 1329 as the property of Hermann von Deutz, making it one of the oldest heritage sites of the town of Eil and thus the city of Cologne. It constituted the administrative centre for the whole region between Bergisch Gladbach and Siegburg until 1803. It was renovated in the 19th century and was extended in the 1920s and 1930s according to the plans of Ludwig Paffendorf. In 1963, the city of Cologne acquired the estate with a total area size of 170 hectares. The municipal forestry commission office converted the surrounding territory into an area designated for public and ecological recreation. Among others, particularly compelling attractions are both a reserve for red deer and wild boars, and a nursing ward for owls and other birds of prey.

Gut Leidenhausen. R. Schallehn

Today, the municipal estate is home to nature-related associations that conduct common environmental education activities. The barn and stables were reconstructed into a multifunctional conference room that serves to host nature-related educational and cultural events, as well as local exhibitions to inform visitors about the surrounding area. Gut Leidenhausen also hosts the Schutzgemeinschaft Deutscher Wald Köln e.V. (SDW) forest school, which is attended by more than 5000 children every year. As such, Gut Leidenhausen has been an environmental education centre for Cologne since 2018.

THE FOREST OF THE CITY OF COLOGNE – FACT BOX

Cover area - 4.125 hectare (ha)

- Forest ownership City of Cologne: 3.650 ha (3.275 ha wooded)
- Forest ownership RheinEnergie (municipal utility): 475 ha (370 ha wooded)

Goals of the Cologne Metropolitan Forestry Administration

- Forest conservation and afforestation
- Development of a (near-)natural, stable forest through close-to-nature management according to the principles of the FSC® (certified since 2001) with special consideration of the recreational and protective function.
- Attractive offer of recreational facilities
- Achievement of cost recovery contributions through the marketing of wood, etc.

History of forest ownership

- Reforestation in the 20th century (Outer Green Belt 1919 to 1929, post-war reforestation from 1960)
- Purchase of private forest with the aim of creating recreational and protective forests in the city (water-, immission-, and noise protection)

Tree species

- Mixed hardwood stands rich in species, ratio between hardwood and coniferous wood 80:20.

Age structure, timber stock, growth, harvest

- 85 % of the forest is younger than 90 years
- Timber stock: 190 m³/ha
- Increment: actual increment: 6,9 m³/ha/year, average increment: 5,2 m³/ha
- Actual timber harvest mainly thinning 8.000 - 10.000 m³/year (possible sustainable harvest: 4,4 m³/ha, 14.000 m³/year)

Forest management for safety reasons

414 km borders along roads/railways/buildings have to be controlled every year

Wilderness areas

520 ha (16% natural forest development areas)

Special forest facilities

- Forest botanical garden and “Friedenswald“, 50 ha
- Forest laboratory 25 ha (climate forest, energy forest, convertible forest, wilderness forest)
- Lindenthal Animal park: fallow deer, pet animals (goats, donkeys, Scottish highland cattle, sheep, poultry)
- Game Park Dünnwald: bison, fallow deer, mouflon, wild boar
- Wildlife enclosure Brück: red deer, wild boar
- Recreation area Gut Leidenhausen with game reserve (red deer, wild boar), large nature playground, avenue of annual trees
- Forest pedagogy: Forest school in accordance with Schutzgemeinschaft Deutscher Wald Cologne, mobile forest school in social hotspots (planned from 2019)

Forest management organisation

- Forest management head office: 1 forestry officer,1 administrative officer
- 1 forest engineer with focus on forest pedagogy
- 2 forest districts (each about 2.000 ha) with 2 forest engineers, 2 forestry foremen (FWM)
- Forest maintenance unit (1 forest engineer, 2 FWM, 2 tree inspectors, 14 forestry workers, 4 trainees, 2 Welte skidders) carries out forest work as a functional unit across all districts. In addition, private forestry companies are used (use of logging horses in the "Cologne logging procedure", approx. 5.000 m³/year).
- Staff for recreational facilities: 1 master gardener, 6 animal keepers, 2 gardeners, 1 forestry worker, 1 carpenter

Plenary Talks

The Cologne forest and green system

Dr-Ing Joachim BAUER

Institution: Office for Landscape Management and Green Spaces of the City of Cologne- Germany

About: *born in 1957, Dr- Ing. Joachim Bauer studied land management at the TU Hannover. From 1978 to1980 he worked as a teacher in gardening and landscaping, followed by a position as landscape planner at Raderschall, Möhrer and Peters in Bonn Bad-Godesberg (1987-1989). During 1989-1993 he worked as a Research Associate at the Institute for Green Planning and Garden Architecture, University of Hannover. Since 1993, he is the Head of Department of Urban Green and Forest, and since 2012 Deputy Head of the Office for Landscape Management and Green Spaces of the City of Cologne.*

Contact: Joachim.bauer@stadt-koeln.de

Keywords: *Cologne, Urban Development, Green System, Forest Development*

Cologne is a growing city. The associated challenges are manifold and open up opportunities for green and forest development in the big city as well as risks.

The city of Cologne can look back on more than 2,000 years of history. The floor plan of the Roman city is recognizable in the city plan. Today's urban structure is essentially shaped by modern times and is representative of the European city. Cologne was never the seat of a secular ruler, palace gardens or similar there is therefore not. The city growth of the Wilhelminian era, and especially the fortification of the city by the Prussians at the end of the 19th century, have characterized the urban structure to this day.

The foundation stone for today's green system was laid in the 1920s by the city builder Fritz Schumacher and the Lord Mayor of Cologne, Konrad Adenauer. The formal design of the green system is based on the contemporary urban planning objectives of a radially structured city body. Thus, in the area of the inner fastening ring, the inner green belt and in the area of the outer ring the outer forest and meadow belt were created. For Schumacher, however, the plan of radial green compounds was also of great importance, so that the citywide green system received a wheel-like basic structure.

Despite Schumacher's basic framework of the green system, it has proved to be particularly sustainable, despite changing urban planning concepts. With this urban development and green planning continuity over decades, Cologne stands out clearly from other cities in German-speaking countries. The basic structure of the green system, which can be traced back to the historical plans and concepts, has remained the basis for urban planning and green planning activities to this day. The Cologne green system can therefore be described in its shape and dimension as unique in Europe. Current developments build on this and develop the city-wide green system in terms of content and space.

Closely connected with the development of the urban green system is the development of the forest in Cologne. The city of Cologne had until the end of the 19th century initially no significant forest ownership. It was not until about a hundred years ago, with the large-scale reforestation of agricultural land and extensive forest purchases, that a forest-based development began, which is exemplary for forest propagation in the metropolitan area. With the expansion of the outer green belt in the 1920s, an extensive forest and meadow belt was created around the city, which was supplemented by extensive plantations after the Second World War. Today the forest covers a total of 6,000 hectares, of which 4,000 hectares are owned by the city. With the "Forest Laboratory Cologne" and the citizen project "A forest for Cologne", the forestry administration faces the current challenges.

Landscape and forest laboratories

Prof Dr Emeritus Roland GUSTAVSSON

Institution: Swedish University of Agricultural Sciences, Alnarp – Sweden

About: *Prof Dr Roland Gustavsson completed in 1976 his Masters degree in Landscape Architecture and immediately took up a research and teaching position. After obtaining his Ph.D. in 1987, as only the second landscape architect in Sweden with a doctorate, his ambition was to pioneer a bridge between academia and practice through a position at the university. In 1994 he was appointed Professor in Planting Design and Landscape Management at the Department of Landscape Planning at the Swedish University of Agricultural Sciences (SLU). He is a member of the European network group Periscapes, employing the 'landscape ambassador' approach based on Real Life Studios stressing communicative approaches and the meeting of different landscape competences and cultures of Europe. In 2016 he was guest professor at Ohio State University, USA.*

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Keywords*: Landscape Laboratory at SLU-Alnarp, Summarizing Forty Years, Dynamics, Aesthetics, Design*

This presentation aims to bring attention to a book release, with the preliminary main title "Urban Woods", summarizing major concepts through the years and the experience of the first generation of Scandinavian landscape laboratories, in which woodlands have been a central issue. In particular the book brings attention to The landscape laboratory at SLU-Alnarp. We are many co-writers, who have been involved, now sharing the different chapters. As the starter and coordinator during decades, and actively involved in several projects that the book is based on, it is a privilege to be part of the book writing, including reflections of the forty years, and many perspectives I wouldn´t have been capable to understand when I was in the middle of it. Covering a period of more than forty years makes it quite unique when considering the length of one single major project. It is also one of the rare European examples in which landscape architects have been working very close to, and interacting, with foresters in an overlapping process. The world knows a lot of the contribution of foresters and forest ecologists. Here, we wish to bring attention to the landscape architecture as a profession and its contribution.

Being a landscape laboratory it realizes a wish for the landscape architect profession to balance the "indoor professionalism" and "conceptualism" by acting in an outdoor pedagogic, embodying knowledge, contextualize it, elaborating in full-scale, identifying and testing new innovative prototypes of landscape and woodland elements and patterns similar to the car industry test-driving new models. The landscape laboratory is realized in a close cooperation with foresters, ecologists, and also artists. The presentation will be very much hands on, talking about what should have a general interest, and at the same time letting the concrete examples realized out in the laboratory talk. Some issues that will be highlighted: forest and landscape dynamics & dynamic attitudes, perceptions, engagement and the environmental aesthetics, places and walks, the teen ager phenomena, complexity ladders, and woodland edges and hydrology.

Linking urban outdoor recreation with health benefits on a city scale level a first approach

Prof Dr Arne ARNBERGER

Institution: Institute of Landscape Development, Recreation and Conservation Planning Vienna – Austria

About: *Dr Arne Arnberger is Associate Professor at the Institute of Landscape Development, Recreation and Conservation Planning, Department of Spatial, Landscape and Infrastructural Sciences, University of Natural Resources and Life Sciences, Vienna, Austria ("BOKU"). He is also faculty member at the West Virginia University's Recreation, Parks, and Tourism Resources Program. He is chair of the Austrian UNESCO Man & the Biosphere-committee, member of IUCN WCPA and IUCN TAPAS and involved in the Austrian communication platforms "Forest & Human Health", "Biodiversity and Human Health" and "Forest & Tourism". He is co-founder of the Conference on Monitoring and Management of Visitors in Recreational and Protected Areas (http://mmv.boku.ac.at/). His current research activities focus on outdoor recreation and effects of nature on human health.*

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Keywords*: Green Space Access, Green Infrastructure, Outdoor recreation, Physical Activity, Vienna*

Currently more than half of the world's population live in cities, and this proportion is expected to increase. City life challenges residents who suffer from physical inactivity, obesity, mental fatigue, stress and averse environmental conditions such as air pollution and urban heat. Green spaces are seen as nature-based solutions, contributing to human health and well-being while counteracting these challenges. Outdoor recreation in urban green spaces (UGS) is one of the key mechanism for human health and well-being. However, the link between urban outdoor recreation and health benefits on a city scale level is poorly understood. City and green space planning need information about which green spaces of a city provide the most health benefits to urban society in total. Consequently, city and green space planning need information on amount and intensity of recreation use, and has to consider visitor access to UGS. Unfortunately, there is a knowledge gap about the total amount of recreation use and physical activities per green space on an aggregated level to identify the hot spots of recreation use among the UGS network. This presentation compared several green spaces in Vienna along a gradient from urban to suburban and used physical activity as a key indicator for health benefits. Physical activity was expressed as total visitor kilometers per green space per year, including total visitor kilometers for accessing the green space. The comparison found that green spaces heavily vary in total visitor kilometers per year, total visitor kilometers in access, and the proportion between access kilometers and green space kilometers. Results show that accessing green space by foot or bicycle can be an important physical activity compared to the amount of visitor activities in the UGS itself. Larger inner urban green spaces are hot spots of recreation use and therefore potentially hot spots for health benefits. Recommendations for city and green space planning as well as recreation and human health research will be provided.

Outcomes of and follow-up to the 1st World Forum on Urban Forestry

Michela CONIGLIARO[a], Simone BORELLI[a] and Fabio SALBITANO[b]

Institution: [a]Food and Agriculture Organization, [a]University of Florence – Italy

About: *Mrs Michela Conigliaro works for the Forestry Policy and Resources Division at the Food and Agriculture Organization of the United Nations on the topics of urban and peri-urban forestry and agroforestry. She was co-organiser of the 1st World Forum on Urban Forestry (Mantova, 2018).*

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Keywords*: WFUF, Call for Action, Tree Cities of the World*

The 1st World Forum on Urban Forestry (WFUF) was held in Mantova (Italy) from 28-30 November 2018 and was organized by FAO, the Municipality of Mantova, the Italian Society of Silviculture and Forest Ecology and the Politecnico di Milano. Over 600 experts gathered to exchange knowledge on approaches that cities have used to optimize the contribution that urban forests and green infrastructure provide in economic development, environmental conservation, improved social cohesion and increased public involvement. The two main outcomes of the Forum were a Call for Action and Tree Cities of the World programme. The Call for Action is intended to provide a reference for cities that aim at develop communities where urban and peri-urban forests help to achieve the Sustainable Development Goals and are recognized for the wide range of benefits they provide. Trees and green spaces should be viewed as critical infrastructure, like utilities or transportation, and as a strategic component of the landscape. Tree Cities of the World is a recognition scheme for greener cities that was developed by FAO and the Arbor Day Foundation. The aim of the scheme is to stimulate and support cities to reach the goals that are outlined in the Call for Action. In addition to promoting the efficient management of urban tree resources, it also aims to create an international network of cities, facilitating the sharing of knowledge and good practices towards the sustainable management of urban forest and green spaces. The programme is based on five key standards that a city must meet to be recognized as a Tree City of the World:

1. Establish Responsibility – The community has a written statement by city leaders delegating responsibility for the care of trees within the municipal boundary to a staff member, a city department, or a group of citizens

2. Set the Rules – The community adopts policies, best practices, or industry standards for managing urban trees and forests

3. Know What You Have – The community has an updated inventory or assessment of urban trees so that an effective long-term plan for planting, care, and removal of city trees can be established

4. Allocate the Resources – The community has a dedicated annual budget for the routine implementation of the tree management plan

5. Celebrate Achievements – The community holds an annual celebration of trees to raise awareness among residents and to acknowledge citizens and staff members who carry out the city tree programme

Introduction to Waldlabor Köln – experiments for the future of urban forests

Prof Dr Frank LOHRBERG

Institution: Chair of Landscape Architecture, RWTH Aachen University – Germany

About: *born in 1964, Prof Dr Lohrberg studied landscape architecture at Hanover University and won the Peter Joseph Lenné Award in 1990. Beginning in 1994, he worked at the University of Stuttgart where he received his doctorate in 2001, which dealt with urban agriculture and city planning. Since 2002 he is principal of Lohrberg Stadtlandschaftsarchitektur, the office focuses on landscape architecture. In 2010, he was appointed as chair of the Institute of Landscape Architecture at RWTH Aachen University. Prof Lohrberg is member of the German Werkbund, the German Association of Landscape Architects and the German Chamber of Architects. He was admitted into the German Association of Town Planning and Regional Planning in 2009.*

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Keywords: *Urban Forestry, Landscape Laboratory, Productive Landscape, Action Research, Co-design*

Cologne's spatial structure has been defined by its 1920ties Green Belt, initiated by, the then mayor, Konrad Adenauer and designed by urban planner Fritz Schumacher. The Green Belt is characterised by large woods framing a linear open space dedicated to recreational, social and aesthetic functions. In 2010, adjacent to this prominent feature and a noisy motorway, the City of Cologne and its sponsors created the "Waldlabor Köln" to test new forms of urban forestry, greatly inspired by the landscape laboratory in Alnarp, Sweden. This introduction will explain the short history of the Waldlabor, its four components and general layout.

The most intensively managed section since its development, has been the "Energy Forest" (1), where fast growing trees, mainly poplars and willows have been cultivated for sustainable energy production. Plantations are harvested every 3-5 years leading to abrupt changes in the landscape; but how have people reacted? Have they accepted this harvesting? A research project funded by the federal state of North Rhine-Westphalia provided some initial answers; it became obvious that the Waldlabor should promote its aims more clearly. To this end RWTH Aachen University conducted a workshop in 2016 allowing students to modify the forest through cutting, pruning and trimming the trees. The one-week interventions resulted in inspiring designs which shed light on hidden functional and aesthetic values of the forest.

Meanwhile other parts of the Waldlabor have also thrived and were selected as the setting for a follow on Waldlabor workshop with students in 2018. The "People's Forest" (2) aims to introduce experimental compositions of trees which will create new aesthetic experiences based upon contrasting bark colours, autumn foliage and leaf shapes. The trees planted have been individually sponsored by local citizens. The "Climate Forest" (3) consists of 6 compartments which spread out across the area. Each compartment comprises of just one tree species, creating a unique spectacle. Trees such as Quercus pubescens or Sorbus aria were chosen to test their adaptability to climate change within an urban setting. The Wilderness Forest (4) is a 'control group'; this area has been left to develop naturally, and will illustrate the effects of non-intervention and potential wilderness qualities.

The whole site has been designed as a public space. Paths meander through the area and various signs explain the Waldlabor concept. Now ten years' old, the Waldlabor is well established as a unique component of the Cologne Green Belt. However, research still continues; as the trees grow, experiments are developing new knowledge and perspectives on the future of the Waldlabor. Hence, there is now a need to refocus its aims and methodologies for the next decade.

Urban Forestry Narratives in Europe

Dr Bianca BÄRLOCHER

Institution: Urban Green Polylogue – Switzerland

***About**: Bianca Baerlocher was born in 1981 in Berlin and lives in Switzerland since 2001, where she has studied Sociology and Media Sciences at the University of Basel. Since her PhD time she has been interested in the human-environmental interrelation and therefore further developed the theoretical framework of social-ecological regimes as an analytical basis for sustainability issues. In the forestry department of the Bern University of Applied Science (BFH) she worked as a scientist on diverse sociological topics pertaining to societal demands of urban forests, including gender and social diversity aspects in participation processes. In 2016 she founded together with other members a Swiss Network on Urban Forestry, called ArboCityNet. In 2017 she founded her company Urban Green Polylogue, where she is working as a mediator in the field of urban green infrastructure.*

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***Keywords**: Public Narratives, Climate Change, Collective Action, Digital Storytelling*

Humans are storytellers. Storytelling is a discursive and narrative practice which constitutes and circulates meaning, a certain coherence as well as regularity in society (Viehöver 2008 cit. Ricoeur 1991). All communication, ranging from media, comments or even scientific article contain narratives. Sociological Research on climate-change has been illustrating, that the success or failure of "climate narratives" in the public sphere is not depending on "facts", but on the way "how" incidents, data, pictures and people are positioned in the process of narrativisation toward a coherent narration including certain knowledge for action (ebd., 129). The case of climate change narration as a climate catastrophe is not only high lightening the abuse of nature through human society it also allows a reflection of collective institionalised practices. It showcases different narrated "worlds" which could lead to a correction of recent climate policies and politics (Viehöver 2012, 210).

Against this theoretical background I will a) discuss whether the "Urban Forestry narration" follows the principle of the narrated climate change catastrophe and therefore trees becoming a boundary maker and b) reflect on the Urban Forestry narrative in Europe in general. I assume that there is no coherent Urban Forestry narrative in the non-English speaking countries. Based on this assumption I will introduce an example of narration, the method of digital storytelling and how it could be instrumentalised to better narrate on Urban Forestry values for different levels of collective action.

References

Ricoeur, Paul (1991): Myths as a bearer of possible worlds. In: M.J. Valdés (Ed.): Reflection & Imagination. New York, pp. 482-490

Viehöver, Willy (2012): Öffentliche Erzählungen und der globale Wandel des Klimas. In: M. Arnold, G. Dressel, W. Viehöver (Ed.): Erzählungen im Öffentlichen. VS Verlag für Sozialwissenschaften, pp. 173-215.

Viehöver, Willy (2008): CO2-Moleküle und Treibhausgesellschaften: Der globale Klimawandel als Beispiel für die Entgrenzung von Natur und Gesellschaft in der reflexiven Moderne, In: Berichte zu deutschen Landeskunde. 82. Band. Heft 2. 115–172

Co-creating nature-based solutions: An urban green equity perspective

Dr Lorien NESBITT, Cecil KONIJNENDIJK, Michael MEITNER, Cynthia GIRLING and Stephen SHEPPARD

Institution: University of British Columbia – Canada

About*: Lorien Nesbitt is a Postdoctoral Research and Teaching Fellow with a joint appointment in the Faculty of Forestry and the School of Population and Public Health at the University of British Columbia (UBC). Starting in July 2019, Lorien will be an Assistant Professor of Urban Forestry in UBC's Faculty of Forestry. Her research focuses on urban forestry and socio-ecological interactions in urban environments, with an emphasis on environmental justice, human health and well-being, and climate change. Lorien employs mixed methods approaches, as appropriate to the research project, and has expertise ranging from spatial analysis and machine learning to qualitative interview analysis and survey design. Lorien's current research examines 1) the relationship between greenness exposure and public health outcomes in urban environments, with a focus on spatio-temporal metrics and new remote sensing data sources; 2) urban forest governance and resilience to social and ecological stresses; and 3) urban green equity in multicultural cities.*

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Keywords: *Urban Forests, Nature-based Solutions, Urban Green Equity, Environmental Justice, Sustainability*

Urban forests are a key tool to provide nature-based solutions (NBS) to create more liveable cities. Given the importance of NBS to urban residents, it is important to evaluate 1) the distributional equity of urban forests that form part of NBS, and 2) the recognitional equity of processes to co-create and manage NBS at the local level.

This research examined the distributional equity of urban forests in 10 US cities. Urban forests were characterized three ways (mixed vegetation, woody vegetation, and public parks), to reflect the variable NBS associated with different types of urban vegetation. Data were analysed using Spearman's correlations and spatial autoregressive models. The research also examined the key dimensions of recognitional equity in co-creating NBS via an analysis and synthesis of relevant literature.

Strong positive associations were observed between urban forests, higher education and income across most cities. Negative associations between racialized status and urban forests were observed but were weaker and less common. Park area was more equitably distributed than mixed and woody vegetation, although inequities existed across all cities and vegetation types. Four dimensions of recognitional equity emerged from the analysis that can inform how NBS are designed, planned and operationalized at the local level.

Cities are spaces in which the world's populations meet and co-create urban forests and NBS. This reality provides opportunities for mutual learning and improved resilience but can also lead to inequity in our access to and governance of NBS. Our findings can stimulate strategies to foster equitable planning and implementation of truly co-created NBS.

Session Talks

1.1 The Healthy Forest – Sports

Chaired by Dr Stefan TÜRK

Jerylee WILKES-ALLEMANN & Ludvig ALICE | ETH Zürich, NARP
Austria and Switzerland: a comparative case study analysis to understand decision-making Processes in innovations in the urban forestry sector - A mountain-bike trail study

Katriina KILPI et al. | BOS+ / Nature Minded
A campaign to encourage physical movement in a natural environment for 30 minutes a day during 30 days in Belgian Flanders

Nerys JONES | Nerys Jones

Parkrun - a popular and energetic use for urban forests

Tom ZEIDLER & Stefan SIEBERT | German Sport University Cologne
Mountain biking on urban greenspace – evaluation of unauthorized trail technical features using geographic information systems (GIS)

Tomáš KVASNIČKA, Alexander ARPACI et al. | Singltrek s.r.o. Czechia; Singltrek DACH Germany
Recreational Trail Networks for MTB and Shared Use as a Tool for Urban Forest Management

1.2. The Healthy Forest – Health & Well-being

Chaired by Dr Stefan TÜRK

David MOTZENBECKER | Motz Studios LLC
Immersive Healing: Why Cities Should Incorporate Forest Therapy & Biophilic Design Into the Urban Fabric

Franziska KRAINER | BFW Austrian Research Centre for Forests
Green Care FOREST

Jo SAYERS et al. | The Mersey Forest
Forest School impacts in northwest England, encouraging more natural play, increased physical activity and social interaction

Vitalija POVILAITYTE PETRI & Katriina KILPI | BOS+ / NatureMinded
Nature connection in Brussels urban forests for human health and resilience

Tina GERSTENBERG et al. | FVA Forest Research Institute of Baden-Württemberg
Spatial behaviour in urban woodlands: Linking landscape features to activities and sociodemographic characteristics of outdoor recreationists

Tessa HEGETSCHWEILER et al. | WSL Swiss Federal Institute for Forest Snow and Landscape Research
Integrating physical forest characteristics into socio-cultural forest monitoring – a new approach

2. The Spiritual Forest

Chaired by Prof Dr Paolo SEMENZATO

Alan SIMSON | Leeds Beckett University
New light through old windows - promoting the spiritual aspects of urban forestry and its future role in delivering viable multi-cultural urbanism

Andreas BERNASCONI | PAN Bern AG

Funeral Forests: Bridges between two worlds

Cecil KONIJNENDIJK | University of British Columbia
The Spiritual Urban Forest - a journey of re(discovery)

Romena HUQ | Scottish Forestry
Connecting with traditional faith groups to contemporary urban forests

Sibylle ROTH & Andy SELTER | University of Freiburg
"Come take a walk with me" Exploring forests between timber production and sentience - a qualitative study on place perception of individuals

Stephanie BETHMANN & Eva BLAISE | FVA Forest Research Institute of Baden-Württemberg
"Being nature" – historical, spiritual and political dimensions of a walk in the woods

3.1. The Learning Forest – Forest Laboratories

Chaired by Prof Dr Frank LOHRBERG

Julia GÄCKLE | RWTH Aachen University
Waldlust – Urban forests as community hubs and experimental design spaces

Joost MEYER | RWTH Aachen University
Wald_interior, learning from forest behavior as a base for creative design procedures

Robin WINOGROND | Vulcano Studio
Dynamic Tranquility: Woodland Park meets Airport Shopping Mall

Stefan Darlan BORIS | Aarhus University
Experimenting with adaptation and transformation in the Aarhus Landscape Laboratory

3.2. The Learning Forest – Environmental Education – *Chaired by Dr Stephanie STEINEBACH & Anna COKER*

Verena NIEHUIS, Peter KEIL et al. | Biological Station West Ruhrgebiet
Environmental education in urban forest(s) in the Ruhr area

Oliver BALKE | Wald und Holz NRW
About the effects of a near-residence industrial forest on towns-children in the first years of their life

Urša VILHAR et al. | Slovenian Forestry Institute
Green Learning Environments – Toolbox with good practice examples for non-formal learning in the natural environment for children with special educational needs

Mojca NASTRAN & Aleš GOLOB | University of Ljubljana
Visiting urban forest as part of education program in Slovenian kindergartens

Zhaohua CHENG et al. | University of British Columbia
A 'Citizen's Coolkit' on climate change and urban forestry - Canadian experience in engaging the silent majority on climate change and urban forestry issues at the micro-neighbourhood block scale

Sylvie NAIL & Barry MCGONIGAL | Université de Nantes
Environmental education and international networking at university level

4.1a. The Co-designed Forest – Governance *Chaired by Naomi ZÜRCHER*

Caitlin CAMERON & Jeff TARLING | City of Portland, Maine
Re-foresting "Forest City" – Portland, Maine: Co-Design + Innovation using Public Art and Community Partnerships

Dan YE et al. | University of British Columbia
Urban green space promoting social cohesion among older adults: A conceptual framework and case studies in China

Ian WHITHEAD | Institute for Landscape Architecture, RWTH
Promoting citizen engagement in GI and urban forestry – understanding and overcoming barriers in NRW

Maria Paula CANON BERMUDEZ et al. | University of Copenhagen
Building Bridges in Urbanplanen, new cultural practices between the young population and green spaces

Sarah FEDER et al. | European Forest Institute / Lund University
Pluralities and Pines: An Exploration of Immigrant Integration in the Catalonian Forest Sector

4.1b. The Co-designed Forest – Governance *Chaired by Ian WHITEHEAD*

Anna STEIDLE | Institute of Urban Landscape Management
Advocacy for Urban Forest

Camilo ORDÓÑEZ et al. | University of Melbourne
Governance of the urban forest in Melbourne, Australia: from local strategies to metropolitan policy

Lena WUNDERLIN | ETH Zürich
Bridges and barriers for Urban Green – A comparative case study of Vienna and Zurich

Naomi ZÜRCHER | Arbor Aegis
Creating an i-Tree Eco-based Urban Forest Management Toolbox: Turning i-Tree outputs into Climate-Adaptive outcomes, offering management strategies for growing the Swiss Urban Forest

Monika WINCZEK et al. | University of Agriculture in Krakow
Comparing scientific and social perspective of urban forests' Ecosystem Services – case study of Planty Park – the green heart of Krakow, Poland

René VAN DER VELDE | Delft University of Technology
Delta City Trees: Emerging Paradigms in Rhine Delta Cities and their Impact on the Research Agenda for Urban Forestry

Robert HOSTNIK et al. | Slovenia Forest Service
Participatory integrated management of urban and peri-urban forests in the Danube region (URBforDAN project)

4.2. The Co-designed Forest – Management *Chaired by John PARKER*

Eeva-Maria TUHKANEN et al. | LUKE Natural Resources Institute Finland
Sampling method affects the applicability of i-Tree results for communicating the ecosystem services of planted and maintained urban trees

Jessica QUINTON & Peter DUINKER | Dalhousie University
The role of cemetery management in maintaining the urban forest of Halifax, Canada

Jule NIEPMAN | University of Applied Forest Sciences Rottenburg
Making regulating ecosystem services visible - a GIS-based analysis of Cologne's Urban Forests

Piotr WEZYK et al. | University of Agriculture in Krakow; ProGea 4D Ltd.
LIFE URBANGREEN - an innovative technological platform to improve management of green areas for better climate adaptation

Remigijus ŽALKAUSKAS | Vytautas Magnus University
Woodlands spatial arrangement and different degree of urbanization (Lithuania case study

Tine NINGAL & Gerald MILLS | University College Dublin
Urban Trees, Property Prices and Associated Environmental-Economic Benefits – Dublin, Ireland

4.3. The Co-designed Forest – Planning

Chaired by Dr Andreas BERNASCONI

Annalisa GIOCOLI, Teresa GÓMEZ-FABRA, Eugènia VIDAL-CASANOVAS et al. | Àrea Metropolitana de Barcelona
Nature Based Planning model in the Barcelona metropolitan area

Giovanni TRENTANOVI, Thomas CAMPAGNARO et al. | University of Padova
Wild woodlands across Italian cities: their potential role in urban regeneration

Gwij STEGEN et al. | Groendienst, City of Ghent
To each their own kind of WILD: the Gentbrugse Meersen, Ghent (Belgium)

Isabella DE MEO & Alessandro PALETTO | Council for Agricultural Research and Agricultural Economy Analysis (CREA)

Combining forest planning and ecosystem services provision: the experience of Monte Morello peri-urban forest (Italy)

Luisa PEDRAZZINI | Politecnico di Milano
The Landscape Green Network: a new deal for planning in Lombardy

Mohammad A RAHMAN et al. | Technical University of Munich
Optimizing ecosystem services provision using suitable tree species and open space design

Julia DINGENDAHL & Norbert BÖSKEN | City of Essen
BaumAdapt: Optimization of eco-system services of urban forests in compliance with the resilience of critical infrastructures in regard to convective events and adaptation to climate change

4.4. Outdoor demonstration

Chaired by Prof Dr Steffen RUST

Steffen RUST | HAWK University of Applied Sciences and Arts
Advanced Tree Assessment

Steffen RUST | HAWK University of Applied Sciences and Arts
Comparison of two methods to assess the vitality of old trees - a test on beech and sycamore maple

Posters

1. The Healthy Forest

Pyung-Rae KIM et al. | National Institute of Forest Science Seoul. A Study on the Influences of Aerosol on Urban Forest in Korea

Renate EDER et al. | University of Natural Resources and Life Sciences, Vienna; Institute of Landscape
Inside or outside? Where to take a break to reload batteries during a stressful school day?

Tae-Hee KIM et al. | National Institute of Forest Science. Effect of Urban forest Landscape proportion on temperature mitigation in Seoul

2. The Spiritual Forest

Ana VIŢA & Vladimir BOC | University of Agronomic Sciences and Veterinary Medicine of Bucharest
Biblical gardens surrounded by forest in Cheia mountain resort, Romania

Katalin TUBA & Geza KELEMEN | University of Sopron
Shaded Resting Places in Landscape: Religious Memorial

Vitalija POVILAITYTE PETRI & Katriina KILPI | BOS+/NatureMinded
Forest culture, spirituality and nature connection in urban forests practices of Belgian cities

3. The Learning Forest

Verena NIEHUIS, Peter KEIL et al. | Biological Station West Ruhrgebiet
Environmental education in urban forest(s) in the Ruhr area

4.1. The Co-designed Forest – Governance

Andrew SPEAK, Hilary SOLLY et al. | UNIBZ – Italy
Working together: Experiences from an interdisciplinary urban forest research project in Bolzano, Italy

Silvija KRAJTER OSTOIĆ et al. | Croatian Forest Research Institute
Exploring, quantifying and mapping cultural ecosystem services of urban green infrastructure – case study city of Zagreb, Croatia

Sophie NITOSLAWSKI & Nadine GALLE | University of British Columbia; University College Dublin
Smarter trees for smarter cities? Exploring cases of "smart" urban forest management from Europe and Canada

Willem de FREIJTER & Mark BODE | Stadsboswachter, Wolfpack, Lab for the Next Economy
Smart Urban Forest

Dan YE et al. | University of British Columbia. Urban green space promoting social cohesion among older adults: A conceptual framework and case studies in China

4.2. The Co-designed Forest – Management

Chang ZHANG et al. | Chinese Academy of Forestry
Characteristics and changes of rural residential forest in LingHe, middle south of Shandong province

Urša VILHAR & Erika KOZAMERNIK | Slovenian Forestry Institute. Assessment of urban forest hydrological ecosystem services for an reserve drinking water source in the City of Ljubljana

Rocco PACE et al. | Karlsruhe Institute of Technology (KIT)
Temperature mitigation by urban trees: Modelling the cooling effect of transpiration and shading on a single tree basis

Piotr WĘŻYK et al. | University of Agriculture in Krakow
Change detection of city high vegetation using 3D LiDAR point clouds and its impact on ecosystem services provided by trees in Raciborz (Poland).

Corinne BUCH, Peter KEIL et al. | Biological Station West Ruhrgebiet Germany
Industrial Forest Project – A synthesis after 24 years of accompanying ecological research on industrial brownfields

4.3. The Co-designed Forest – Planning

Vladimir BOC et al. | University of Agronomic Sciences and Veterinary Medicine of Bucharest
Reintegrating an Emblematic Landscape of Bucharest: the Surrounding Green Areas of the Parliament Palace

Jiali JIN et al. | Chinese Academy of Forestry
The spatio-temporal dynamics of urban greenspace during the last three decades in four typical cities, China

4.4. Outdoors demonstration

Tatiana VALADA et al. | LPVVA Instituto Superior de Agronomia Portugal
Basidiomycetes common to standing urban trees

Maja JURC & Mihaela ŠKULJ | University of Ljubljana; The Tree Institute Slovenia
Forestry laboratory as a tool for improving the health of urban forests: Pest and disease research of urban trees and forests in the city of Ljubljana

Filipa MAIA et al. | LPVVA Instituto Superior de Agronomia Portugal
Use of VTA in Celtis, Fraxinus, Platanus and Tilia trees in Portuguese cities

Session 1.1

The Healthy Forest

Sports

Austria and Switzerland: a comparative case study analysis to understand decision-making processes in innovations in the urban forestry sector - A mountain-bike trail study

Jerylee WILKES-ALLEMANN[a] and Ludvig ALICE[b, c]

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Keywords: *Innovation, Urban Forestry, Outdoor Recreation, Austria, Switzerland, Mountain-Bike Trails, Decision-Making Process*

Outdoor recreation has in the last decade changed from being passive (e.g. walking) to more active forms (e.g. mountain-biking). Forest roads are not only used for harvesting timber, but also serve as trails for hiking, jogging, etc. Third parties, such as the community and organised recreational users (e.g. bikers), use the initial setting to add recreational infrastructure next to the roads (e.g. barbecue and picnic areas) and inside the actual forest (e.g. mountain-bike trails, fitness trails). Thus, the infrastructure for recreational purposes is also provided through innovative projects in urban forest areas (Wilkes-Allemann and Ludvig, 2019). This evolution poses challenges (e.g. liability and costs issues, conflicts) to forest managers and forest owners. Innovation has, traditionally, been defined as a process by which new products and techniques are introduced into the economic system (Schumpeter, 1934). In the forestry sector, these products and techniques are often combined with the provision of new services and goods such as mountain-bike trails (Weiss et al. 2011, Ludvig et al. 2016a, Ludvig et al. 2016b). So far, few studies have analysed innovation from a governance perspective (Wilkes-Allemann and Ludvig, 2019). Subsequently, our research addresses the governance processes resulting in the development of recreational infrastructure to answer the question: How and to what extent are innovations in the urban forestry sector crucial in fostering outdoor recreation infrastructure provisioning?. To do so we analyse innovation from a governance perspective (Ostrom 2011). We center on two mountain-bike trail cases located in urban forest areas of Austria and Switzerland so as to examine the role social innovation plays and to analyse the decision-making process behind. The research is based on several empirical sources including semi-structured interviews. The findings suggest that conflicts are crucial in fostering innovation.

A campaign to encourage physical movement in a natural environment for 30 minutes a day during 30 days in Belgian Flanders

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***Keywords**: Campaign, Prevention, Health Promotion, Practice Oriented Research, Restoration Indicators, Urban Nature, Urban Forests*

In the Flemish provinces in Belgium, accessible nature is unequally distributed. The matter is rising higher on the political agenda, as the links between exposure to nature and health have received stronger evidence. The observed naturalness of the residential environment has been associated with a lower prevalence of depression, anxiety and stress. Furthermore, people who have access to green spaces in their neighbourhood, use these areas more and tend to be physically more active. Finally, people with a strong connection with nature, spend more time in nature and thus become more exposed to the beneficial effects of natural environments.

Three stakeholders based in Flanders, a health insurance provider (CM), a state agency for forest and nature (Regional public authority for Nature and Forests of Nature & Forests, government of Flanders) and a forest advocate organization (BOS+) partner annually to run a campaign to encourage physical movement in natural environments for 30 minutes per day during 30 days. Since 2017, an assessment of the impact of the campaign on the participants´ subjective health and wellbeing has been conducted. In the autumn of 2018, altogether 1720 participants started the campaign. They reported their daily activities in an online diary and through the three surveys that were administered throughout the campaign. The impact of the campaign on participants´ subjective health and wellbeing, their connectedness with nature and the level of naturalness of their perceived living and exercising environments, were measured by using a set of validated scales, an objective measure and qualitative questions.

Regardless of a number of constraints in the study set up and execution, for the second time in a row, similar results come about. The campaign succeeds to attract and engage a rather homogenous group of highly educated women over 35-year of age. While the respondents are in average or better health, they seek the encouragement of the campaign to remain physically active regardless of lack of time, tiredness or bad weather conditions. The lessons learnt from the impact assessment include the highlighted difficulties this segment of the society faces in their attempts to maintain their health; the issues that come about when attempting to conduct scientific research close to practice; and possible points to be looked into for further research.

Parkrun - a popular and energetic use for urban forests

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***Keywords**: Parkrun, Health, Well-Being, Running, Volunteering, Recreation*

"Parkrun" is a fast-growing worldwide recreational phenomenon; it is a network of 5km running events that take place every Saturday morning at over 1,400 locations in 20 countries across five continents. Participation is free and it is organised entirely by volunteers. It started in the UK in 2004 with just 13 runners in a single park in London and by October 2018, 5 million people had registered to take part.

As the name suggests, parkruns are often staged in parks, but an increasing number are held in and around woods and forests, lakes, beaches, promenades, racecourses and even prison grounds. Forests, both urban and rural, offer softer, trail-type courses, in contrast to urban parks with hard surfaces and they offer a location for those looking for a slightly “wilder” run experience. Parkrun is an ideal activity for urban forests: it requires very little effort to organise, minimal infrastructure to set up and within 30 minutes of finishing, there is almost no evidence that it took place.

The runs are very inclusive: anyone can take part, from serious athletes to walkers, club runners to parents pushing child buggies, wheelchair users and people with dogs. Ages range from under 5 to over 80 and all runners are classed as “athletes” by parkrun. The size of individual parkruns varies enormously from as few as 10 runners to as many as 1300.

People register just once, on-line, and they may then run at any parkrun event worldwide. There is no need to book in advance. The athlete downloads a personal bar code, which is carried during the run and is then scanned at the finish line. Runners receive their personal time by text or email, usually within an hour or two of finishing.

The physical health benefits are becoming more apparent, with doctors in the UK now starting to prescribe parkrun as a way of encouraging people to become more active. The mental health benefits of participation, whether through running or volunteering, are also increasingly recognised.

The parkrun ethic is that “it is a run, not a race – it’s you against the clock”. There is a very supportive, collegiate atmosphere, welcoming beginners, those who are less able and people trying to lose weight, as well as celebrating faster runners. The social aspect is also very important – there is always somewhere to meet for coffee and cake afterwards!

Mountain biking on urban greenspace – evaluation of unauthorized trail technical features using geographic information systems (GIS)

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***Keywords**: Outdoor Sports, Urban Greenspace, Mountain Bike Trail Technical Features, Geographic Information System, MTB, GIS*

Introduction

Mountain biking is a megatrend and is practiced by an estimated number of 45,800 athletes in the city of Cologne. At the same time, recreation grounds of 40 m2 per citizen are provided in this urban area. Those spaces are intensively used by sports clubs, commercial providers and recreational athletes.

Mountain bikers are legally allowed to use the paths of public parks. However, it has been noted that the majority of mountain bikers prefer to ride on narrow trails. Bikers specialized in disciplines such as freeride, dirt and BMX also prefer routes that integrate technical features into the trails. Since there is no supply for the demand of such locations in the area of Cologne, informal sport sites developed on a public green space in the district of Lindenthal.

Methods

As part of the investigation, a spatial analysis of the study area was carried out to assess the status quo of mountain bike specific facilities. The area was navigated, while geographical data was collected using GPS devices. Based on a study by Pickering et al. (2010), a survey record was developed, in which locations and characteristics of the technical features were noted. Afterwards, the data was processed using ArcMap and Excel.

Results

Several trail technical features have been connected by trails to form mountain bike facilities. Of these, four were identified in the area. The total space occupied spans 1.25 ha, which is equivalent to 4.7% of the sports facilities in the study area. Mounds, jumps and cambers are the three major types of features. 87.6% of the technical features are in good or moderate condition, 12.4% are defective or only left as remnants. 25 of a total of 105 features are higher than 60 cm. On three out of four sites, considerable ecological pollution from waste and vegetation damage was found. At least 24.7% of the routes in the study area are informal trails that are used by athletes of various sports.

Conclusion

Informal mountain bike sites hold great potential for conflict on an ecological and social level. The spreading of the areas cannot be influenced, so removal measures were initiated in the past. However, there was no lasting success as the sites were soon rebuilt.

In terms of an integrated sports area development, a concept for a public mountain bike facility needs to be carried out. It would be conceivable to have a plan that agrees with the normative foundations and the structural conditions of the existing sites

Recreational Trail Networks for MTB and Shared Use as a Tool for Urban Forest Management

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Keywords: *Trail Networks, Sustainable Trails, Trail Planning and Design, Risk Management, Visitor Management, Shared Use*

Providing sustainable recreational trails is one of the most effective ways how to manage the interface between silvicultural activities, nature protection and recreation. Trail networks for MTB and share-use can substantially decrease the problems arising from increased visitor numbers to forested nature areas. They do so in three main areas. They provide users with desirable experience, they establish visitor flows through landscapes and they provide effective risk management solution.

Session 1.2

The Healthy forest

Health & well-being

Immersive Healing: Why Cities Should Incorporate Forest Therapy & Biophilic Design Into the Urban Fabric

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***Keywords**: Shinrin Yoku, Forest Bathing, Forest Therapy, Biophilic Design, Healing, Nature, Landscape Architecture, Urban Design, Urban Planning*

The effects of stress and constant exposure to cortisol are harming our bodily systems - Type 2 Diabetes tops the charts, along with obesity and heart disease. What causes stress? Long commutes; poor housing; poor neighborhood conditions, and poor workplace design; high demand/low control jobs; lack of access to retail, jobs, services. Our environments affect our quality of life. We – designers, wellness practitioners, forestry professionals, and policy makers – all help set the context for where health happens (or doesn't). A solution currently on the vanguard is the incorporation of nature into designs that support health.

Researchers at the Center for Environment, Health & Field Sciences at Chiba University think that this need is rooted in evolution. Throughout our evolution we have existed within, and as a partner with, nature — we are comfortable and feel a symbiosis with it. By contrast, our modern "artificial" society is inherently stressful.

Place as Green Infrastructure can not only help your body become healthier by producing oxygen and phytoncides; but it can also create place for stormwater to infiltrate and be cleansed, people to ride bikes and walk, plants to grow, and habitat created. All that, and it can save billions – yes, with a B – on city budgets.

By understanding the benefits and metrics that have emerged from studying the power of nature to reduce stress; participants will learn about interventions to create green, healing spaces in and near urban centers. During the presentation participants will also be introduced to elements from biophilic design and methods of forest therapy. Participants will learn how these modalities can work in tandem to create remarkable and experiential healing spaces.

Learning Objectives

1. Understand the qualities of a healing environment from the biophilic/forest therapy perspective.

2. Identify specific actions that can be taken to create an integrative, immersive, and healing space.

3. Learn about evidence-based studies on how spaces and nature affect healing and well-being**.**

Forest School impacts in northwest England, encouraging more natural play, increased physical activity and social interaction

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***Keywords**: Forest School, Natural Play, Learning outdoors, Health*

Over the past 10 years, Forest School provision in Northwest England has rapidly expanded. Corresponding studies during this time have demonstrated a range of benefits to the children participating. Forest School has had a positive effect: connecting children to nature, influencing children's natural play and their knowledge of the world around them, providing a mechanism to break down the barriers and encourage children and their families to play more in natural settings during their leisure time.

Additionally, within the school setting, Forest School research has shown impacts of increased social interaction, confidence, improved mental wellbeing and physical activity levels, ensuring more schools are training staff as Forest School Leaders.

These projects were undertaken in partnership with Liverpool John Moores University, Physical Activity Exchange and The Mersey Forest, one of the leading environmental regeneration initiatives in the North West of England.

***References** (reports & collaborative research include)*

Ridgers, N.D, & Sayers, J. (2010). Natural play in the forest: Forest School evaluation reports.

http://www.merseyforest.org.uk/our-work/forest-school/.

Ridgers, N.D, Knowles, Z.R, & Jo Sayers. (2012). Encouraging play in the natural environment: a child-focused case study of Forest School. Children's Geographies, 10(1), 49-65.

Austin, C.L., Knowles, Z.R. and Sayers, J. (2015) Evaluation of the Natural Health Service- Forest Schools. The Mersey Forest and Liverpool John Moores University. Unpublished Report

Clare Austin, Zoe Knowles, Kaye Richards, Mel McCree, Jo Sayers, and Nicola D. Ridgers Springer Press publication – Chapter on: Play and Learning Outdoors: Engaging with the Natural World Using Forest School in the UK – P1-22

Emilia Trapasso, Zoe Knowles, Lynne Boddy, Lisa Newson, Jo Sayers and Clare Austin (2018). Exploring gender differences within Forest Schools, as a physical activity intervention. Children — Open Access Journal (MDPI)

Green Care FOREST

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Introduction

Forests offer many opportunities for relaxation and leisure activities. Nowadays, the challenges in the work environment are increasing and people often lack physical and mental balance in their everyday lives. Forests can counteract this development and become an important resource for recovery and resilience. The Austrian Research Centre for Forests strongly focuses on identifying and releasing the potential of forests to improve the health and social aspects of today's society. The project Green Care FOREST deals with social sustainability, health and well-being in the forest.

Method

Green Care FOREST is a communication project funded by the Austrian Rural Development Program 14-20. We connect people from the forestry, health, education, tourism and employment sector. Our goal is to act as communicative interface between these different stakeholders in order to initiate green care activities and pilot projects in the forest. Green care stands for projects and activities that take place in nature. The goal is to maintain, foster or improve the health of our target groups: children, adults, people with mental/physical problems, socially disadvantaged people. Green Care FOREST aims to find forest based solutions to societal challenges related to health, education and work. Forest owners play a key role: Innovative Green Care FOREST simultaneously develop diversification and new income opportunities for forest owners.

Result

The project Green Care FOREST acts as an interface and mediator between forest owners and stakeholders from the above mentioned sectors. The basis for our communication work are best-practice pilot projects, which we initiate and lead to realization in tight collaboration with our partners, practical and/or scientific experts and stakeholders from different sector. Our pilot projects deal with social forestry and work integration, forest therapy for people with addiction problems or chronic pain, recreational forest trails, forest kindergartens, forest education for school kids and elderly people.

Conclusion

With Green Care FOREST, we strengthen the role of forests as places for health and well-being, education, employment opportunities and social integration. We present case studies and share our hands-on experiences. We encourage fruitful discussions on yet untapped possibilities forests provide for health and well-being, especially in the face of societal challenges.

Nature connection in Brussels urban forests for human health and resilience

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Keywords: *Nature, Connection, Health, Resilience*

Almost 50 % of the City of Brussels territory contain non-built spaces. The urban forest contains 20 % of Brussels green areas which provide various ecosystem services and benefits for human health and wellbeing. In addition, Brussels City hosts large number of nationalities and ethnical bio-cultural traditions rooted in forest and nature cultures from all over the world. This makes Brussels City a unique place with specific geographical situation, cultural diversity and large number of urban green territories with lots of potential for connecting people with nature for their health and resilience, and development of pro-environmental behaviours.

The case study on nature connection activities such as forest bathing, forest therapy, nature mindfulness and urban foraging of wild food plants in urban forests of the City of Brussels has been carried out through analyses of available literature, information on relevant websites and social media, visits to the urban forest sites, meetings with professionals working in the field, environmental education and nature conservation organisations, creative artists and ecologists, following the activities in urban forests, as well as taking part in various events related to urban forest based health interventions and foraging of wild food plants in City of Brussels.

The study results showed that the interest in urban forests based interventions and urban foraging in Brussels has been highly increasing lately. This regained focus on healing effects of urban forests has been applied to modern life styles in urban areas through various local community-driven health, social, cultural and educational projects. The examples of such numerous, interesting and useful projects are being found in different sites of urban forests. Many of them are directly related to sustainable, efficient, safe and rational management of urban nature resources to promote recreation, healthy lifestyles, disease prevention, social integration or intangible cultural heritage protection. They include various forest based interventions for human health restoration and arts-based environmental education. The identified activities are individual needs-centred and aim to grow healthy, resilient, environmentally responsible and empowered EU citizens of all ages and situations

Integrating physical forest characteristics into socio-cultural forest monitoring – a new approach

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***Keywords**: Monitoring Forest Recreation, National Forest Inventory, Online Survey, Forest Characteristics*

Information about social aspects of forest such as aesthetic or recreational values is frequently collected with off-site questionnaire surveys. Several countries regularly conduct nation-wide surveys in order to monitor outdoor recreation and the relationship of the people to the forest. In these surveys, respondents often are asked to describe their last visit to a natural area or to describe the forest they visit most often. While this gives a representative picture of the respondents' preferences and behaviour, it is not possible to link their answers to the real characteristics of the forest they are describing. On the other hand, characteristics such as tree species, stand structure, etc. are commonly recorded in National Forest Inventories (NFIs). Regarding forest recreation, both the physical characteristics of the forest in which recreation takes place as well as the social aspects such as visitor preferences and behaviour play an important role. In order to establish a link between socio-cultural forest monitoring and the Swiss NFI, we used photos from the NFI taken in all four cardinal directions from the centre of the NFI sample plots. The photos were integrated in an online survey dealing with visual attractiveness of forest, general forest preferences, motives for visiting forests and the importance of forest during the respondents' childhood. Because the photos are not congruent with the sample plots, forest characteristics were derived from the photos according to NFI-criteria. Results show that visual attractiveness could be explained by a combination of several NFI-parameters and social factors. An evaluation of the method used to gain physical forest data from the photos revealed that apart from some exceptions most parameters studied could be deducted reliably from the photos. We conclude that this approach is a possibility to integrate forest characteristics into socio-cultural forest monitoring.

Spatial behaviour in urban woodlands: Linking landscape features to activities and sociodemographic characteristics of outdoor recreationists

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***Keywords**: Spatial Behaviour, Landscape Characteristics, Public Participation GIS (PPGIS), Machine Learning, Cultural Ecosystem Services*

An increasing number of scientific papers describe and explain the connections between natural landscape features and hotspots of cultural ecosystem services, values, and preferences. The results help environmental planning and decision making with prioritising and balancing management objectives. However, there is a lack of knowledge on associations between physical landscape attributes that characterise used routes and individual background features as well as activities of outdoor recreationists (e.g., cycling, dog walking, jogging, walking). In order to address this research question, we applied Public Participation GIS (PPGIS) to assess spatial behaviour, i.e., way usage, in urban woodlands of city dwellers from three densely populated regions in Germany's Southwest. Respondents also stated their activities for mapped routes, sociodemographic backgrounds, and perceived cultural ecosystem services. In order to characterise each mapped route according to physical landscape features, we used a 50m buffer around each route and measured area sizes (in m²) of land cover classes represented within this buffer, e.g., water bodies, broadleaved, coniferous and mixed species dominated stands, meadows, and human-made infrastructure. Data on these features were derived from Open Street Map, inventory maps, high resolution LiDAR satellite imagery, and forest function maps of the provinces' forestry administration. For data analysis, we use Getis-Ord Gi statistics and machine learning techniques. We present linkages of individual background information, perceived cultural ecosystem services, and activities to mapped routes' characteristics. If applied in urban forest management, this knowledge may contribute to visitor-centred planning and decision-making as well as development of visitor guidance concepts for urban woodlands.

A Study on the Influences of Aerosol on Urban Forest in Korea (Poster)

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Keywords: *Urban Forest, Aerosol, Particulate Matter*

Atmospheric particulate matter can reduce visibility, affect cloud formation and precipitation, and harm human health. Health effects related to particulate matter include impacts on pulmonary, cardiac, vascular, and neurological systems. Particulate matter can result from direct emission or as secondary products, both of which contain natural and anthropogenic sources.

Urban forests play an important role in reducing atmospheric pollution and improving pollutants more the quality of the urban environment. Trees are efficient scavengers of PM10 and can serve as skins for particle, gas and aerosols at the canopy level. As a result of the large canopy area of leaves and the turbulent air movement created by the structure trees effectively capture more particles than shorter vegetation.

In this study, Comparison of Particulate matter characteristics in urban site and urban forest site, Korea. In addition, we try to identify the factors affecting the Particulate matter reduction by identifying the weather factors.

Inside or outside? Where to take a break to reload batteries during a stressful school day? (Poster)

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Keywords: *Green Infrastructure, Urban Parks, Cognitive Performance, Wellbeing, Adolescents*

Adolescents spend many hours a day at school and are challenged cognitively. This results in an increased stress level and concentration difficulties. Therefore, it is crucial that pupils have places within the school environment where they can restore their cognitive capacities. The project Green4brain addresses the following research questions: (1) Are there any places within the school environment where pupils can restore their cognitive performance? (2) Are there any effects of different in- and outdoor school environments on the psychological and cognitive health of pupils?

The study is carried out in cooperation with three Viennese schools and is funded by the Austrian research programme “Sparkling Science” of the Austrian Federal Ministry of Education, Science and Research. Due to the focus of the funding program, an inter- and transdisciplinary approach was applied: Researchers from recreation planning, environmental health and environmental engineering work together with pupils who act on three levels: as a study group, as affected actors and as researchers. In order to explore the first research topic, the pupils created mental maps of their school environment. The second research question was answered by measurements of psycho-physiological health effects of different environments, which were carried out between May and June 2018. Close to 80 pupils (from 15 to 17 years) participated in the measurements, spending a 30-minute recreation period in the following areas: classroom, green classroom, school grounds in-/outdoor, urban parks. The standardized measurements included psychological (self-condition scale by Nitsch, perceived restorativeness scale) and cognitive (d2 Test of Attention) methods.

The mental maps indicated that the own class was often chosen as a stress location due to bad air while gymnasiums and sports fields were always considered as restorative places. Results of the psychological and cognitive measurements showed that the subjective well-being significantly increased after the stay in all selected in- and outdoor locations. Comparison of classrooms and parks indicated that subjective perceived stress was significantly reduced at both sites, with a higher level in the parks. It can be concluded that school breaks are crucial for pupils to restore mental performance and increase the well-being whether the break is held in a classroom, on school grounds or in a park. Generally, parks are seen as more relaxing places.

Effect of Urban forest Landscape proportion on temperature mitigation in Seoul (Poster)

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***Keywords**: Heat Wave, Heat Island, Landscape*

More frequent and more severe heat wave events due to climate change alongside with increase in urban heat island caused by continuous urbanization are becoming serious issue in many regions around the world. The extreme temperature has dangerous effect on human health, especially for those with higher vulnerability, such as very young or elderly generations.

Seoul has a very high population density (16,000 people/km2), which is eight times higher than New York and three times higher than Tokyo and London. A high urbanization level and the high population density, makes it easy to accumulate heat energy within the city. Urban heat island phenomenon occurs very often in summer, and phenomenon such as tropical night has persisted for a long time, causing great damage due to heat. In 2018, the number of days of heat waves with maximum temperature of more than 33 degrees Celsius, continued for 31 days, and the duration of heat waves (2018 Korea Meteorological Administration) has also gradually increased. The number of deaths from heat stroke has also steadily increased. Due to the city's thermal characteristics, in Seoul, it is essential to reduce the temperature. Urban forests are effective in solving these thermal energy accumulation, which is why people's demand for urban forests continues to grow and research is underway.

We examined the change in temperature according to the landscape structure of the city and effect of the urban forest. To calculate the surface temperature of the city, we used the Landsat 8 satellite data. In order to analyze the effect of urban forests, Seoul was divided into a grid with a resolution of 1km x 1km. Moreover, the landscape analysis tool of QGIS was used to analyze the landscape of Seoul. In addition, basic research was conducted to establish policies for urban forests by analyzing the structure of urban forests in Seoul and additionally by investigating the mitigation effect by trees.

Session 2

The Spiritual Forest

New light through old windows - promoting the spiritual aspects of urban forestry and its future role in delivering viable multi-cultural urbanism

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***Keywords**: Urban Forestry, Psychological Emotional and Spiritual Ties with Trees, Multi-Cultural Urbanism*

The felling and clearance of trees to make way for agriculture and the expansion and progress of human civilisation is an activity which has gone on practically uniterupted for thousands of years, and is still continuing. In one sense, because trees have always stood in the way of progress, it might appear that human beings had little regard for such natural objects. Paradoxically, nothing could be further from the truth, and whilst human beings have seemingly striven in recent times to tame nature, in earlier times trees had a dominant influence upon human life, imagination and spiritual development, and were considered sacred in many cultures in every corner of the world. Now that most of us live and work in towns and cities, it could be argued that, compared to our forebears, we are now more alienated and divorced from the land, the natural world and this intimate relationship with trees.

That said, the benefits that trees can bring to our urban areas have been known for some time, but it was really only with the advent of the concept of urban forestry in the late 20th century, and the resulting research into the benefits of urban forestry that has subsequently taken places, that the very broad spectrum of these benefits has been established and quantified. Without a doubt, trees and woodlands have the potential to play a significant role in the viability and experiential quality of our multi-cultural urban environments, and thus urban forestry has increasingly gained political traction in many towns and cities across the world, improving the health and well-being of their citizens as a result.

It could be argued however that the promotion of urban forestry has all too often centred upon a fairly narrow spectrum of scientific benefits, the merits of which have not always chimed with or convinced local communities. This presentation will suggest therefore that a much broader perspective is required when promoting urban forestry and engaging with local multi-cultural communities. This perspective must promote and take into consideration the deep psychological, emotional and spiritual ties that people potentially have with their urban forests, in the full knowledge that the trees in around our towns and cities have the potential to be the quintessential symbol of biological evolution, interconnecting all our multi-cultural communities with nature by shining new light through old windows, and thus promoting viable urban futures for us all.

Funeral Forests: Bridges between two worlds

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***Keywords**: Funeral Forests, Cultural Ecosystem Services, Forest Management*

Spiritual forest spaces have a rising importance in society. One example of this trend is the funeral forest. In Switzerland only 10% of the deceased are still buried in a coffin, it is common to spread or bury the departed's ashes (Donner 2018). Between 2009 and 2013 in Germany the number of tree burials doubled up to 45'000 per year (Bauer und Schraml 2018).

Funeral forests are sacred places, grounded on two Cultural Ecosystem Services (CES) of outstanding importance: (a) spiritual and religious meaning and (b) a space of long duration, linking ancestors with nature. As CES are linked to symbolic meaning, they cannot be explained by the functioning of Ecosystems alone (Kirchhoff 2018).

Funeral forests are attractive examples for practitioners as well as for researchers: the object of interest – a single tree – can be considered at the same time as a topic of the ecological world (as well as a symbol of people's expectations. Forest management measures therefore bridge two worlds and sustain natural as well as social values.

In a case study within SINCERE (2018) funeral forests were analysed focusing on 3 aspects. (I) Around 130 trees, offered for burial places, were inventoried. What kind of trees were selected by the forest owner and why? On the other hand: Which trees attracted – so far - interest of clients and why? And how will the forest be managed in the future? The criteria for selecting the trees and the reasoning and preferences of clients for choosing specific trees are presented.

(II) The case is also an example of innovation: new offers had to be created, new procedures to be established and new skills to be developed. The most important innovation mechanisms are explored. (III) On a more general level fostering and inhibiting policy factors for or against the creation of funeral forests were analysed. The results are shown and consequences for future forest management, policy and capacity building discussed.

References

Donner S (2018) Letzte Ruhe nach Mass.

Bauer und Schraml (2018) Der Wald als Bestattungsort. In: AFZ-Der Wald, 13: 34-37.

Kirchhoff T (2018) "Kulturelle Ökosystemdienstleistungen". Eine begriffliche und methodische Kritik. Verlag Karl Alber. 187 S.

SINCERE (2018) Spurring INnovations for Forest ECosystem SERvices in Europe" (a European Un-ion's Horizon 2020 research and innovation programme under grant agreement No 773702).

The Spiritual Urban Forest - a journey of re-discovery

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***Keywords**: Spirituality, Cultural Values, Place, Immigration*

The spiritual values and importance of our urban forests are often ignored in design, planning and management. However, these and related (cultural) values are often crucial, for example in connecting local urban residents and place. This presentation reviews the current state of knowledge and practice on this topic, focusing on historical and present spiritual values of urban forests. It also identifies some examples and good practice of inclusion of these values into urban forestry. In a globalising and urbanising world, urban residents are looking for meaningful connection to the landscapes in and with which they live. Spirituality, religion, belonging and place identity, creativity, and learning are all contributing to this connection, and urban forests can contribute to all. From the First Nations to Canadian cities to the many 'newcomers' to cities across the world who bring along their own cultural and spiritual interpretations of landscapes, examples exist of how urban forests have spiritual importance.

Connecting with traditional faith groups to contemporary urban forests

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***Keywords**: Faith, Communities, Cultural Perceptions*

Diversity has always been at the core of the Scottish Forestry work and at the heart of our culture.

The aim of the Central Scotland Engagement Programme is to increase the use of woodlands by people with protected characteristics. Since 2010 over 110 different diverse organisations have been engaged in a range of activities and events to encourage access and enjoyment of woodlands.

In Central Scotland it was clear that the majority of events and activities delivered within woodlands were based around Christian festivals with very few participants from ethnic minority communities or other faith groups. Most major faiths have a common thread linking them to nature and guardianship of the earth. This link was used to engage with groups and explore the opportunities that their local woodlands had to offer in helping them to celebrate their faith.

The faith groups engaged lead on the design, preparation and delivery of the celebrations with support from Scottish Forestry. We involved the Volunteer Community Champions who went through our training course some of whom are from the engaged faith community to inspire; encourage and break down the barriers to their groups accessing their local and urban woodlands.

There are inspiring visual images of over 20 faith celebrations including:

- Holi: The Hindu Spring festival also known as the festival of colours. Activities included making natural coloured dyes representing the seven colours of Holi, fire building and Rangoli, on the forest floor.
- LagB'omer: Jewish holiday there is a tradition of lighting fires in the memory of two rabbis; bows and arrows were made with native willow and a competition at the end of the day in reference to the rainbow, a symbol of divine protection.
- Eid al Adha: Muslim festival which incorporates the story and rituals of the pilgrimage to Mecca, healthy woodland circular walks symbolised the Hajj and pilgrimage stations.
- Vaisakhi: marking the Sikh New Year and Spring harvest. Environmental art in Spring colours was created along with health and wellbeing activities such as yoga and breathing workshops.
- Interfaith: A series of interfaith sessions were delivered focusing on significant and holy trees in different faith traditions. A short film captured how all faiths share an appreciation of nature and care for the environment (https://www.youtube.com/watch?v=NsuooxXSPAc)

"Come take a walk with me" Exploring forests between timber production and sentience - a qualitative study on place perception of individuals

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***Keywords**:* Place Making, Forest Usage/Perception, Walk along Interview, Wellbeing, Muße

The aim of this presentation is to introduce to the framework of place making of humans in forests through the lenses of the concept "Muße". This concept is understood as a state that can be experienced in times of self-determination and self-regulation. Within this experience, individuals can follow their own interests with inner peace and without the pressure of time. All studies, dealing with the Muße state a strong affinity between spaces and the components being detached from daily routine, and its time restrictions as well as concentrativeness and awareness. Simultaneously studies which investigate the recreation use of forests consistently describe that people percept their visits of forests as immersion into another world and hence into a possible spaces for Muße. We start from the assumption that place making and the perception of Muße is a matter of individual frames and as well strongly influenced by social discourses providing the structure for individual frames. However, so far the literature dealing with Muße relevant issues in forests concentrated either on the discursive (macro) level or on the perceptions of individuals (micro level). To overcome the separated research tradition and better understand the interlinkage between the structure providing discourses and the individual perceptions, we developed a bridging theoretical framework. Once introduced to this framework we are sharing results and open for discussion on our empirical study. We aim to identify the aspects that constitute Muße spaces in forests.

The method used and material gained during an empirical phase in summer 2018 are 30 individual place perceptions of urban forest visitors represented through qualitative go-along interview sets. These interviews where transcribed and coded to gain a thematic overview. The results are showing which aspects determine the construction of individual Muße places in forests. The health research in forests identifies Muße as one of the basic factors of wellbeing and health.

The results show new insights into perceptions and experiences of individuals in forests. Through the studies been undertaken, we can identify causalities regarding to individuals appreciate the most during their forest visits and what they rather want to avoid. A significant amount of forest visitors of our study group seeks the forest for diverse concepts like solitude, peace and quiet, which will be explained in the presentation.

"Being nature" – historical, spiritual and political dimensions of a walk in the woods

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***Keywords**: Forest Recreation, Spirituality, Cultural Ecosystem Services, Forest Conflicts, Participation, Qualitative Research, Sociology, Oral History*

When forest visitors describe their experience of walking in the woods, they rarely put their feelings in religious terms. But a close reading of their narratives and practices shows that forests are an important source for spiritual experiences. For many people, forests serve as reminders that as humans they are not opposed to nature, but rather intimately connected with it, themselves subject to the order of the natural world. Through their (recreational) practices, people produce a specific nature experience that we coin here "being nature".

The talk traces the changing meanings of "being nature" through a wide range of qualitative data: interviews with citizens from rural and urban areas in south-west Germany, with members of forest-related citizen initiatives, and with forestry practitioners. We account for historical change by comparing between older and younger generations. And based on a study of forest conflicts, we also consider some political implications of the spiritual dimension in relationships to forests: The ways that citizens address their views and worries about legitimate forest use are in many ways incompatible with the scientific and bureaucratic jargon that alone is deemed "rational". This antagonism occasionally escalates conflicts and limits the possibilities for political discourse and participation.

Biblical gardens surrounded by forest in Cheia mountain resort, Romania (Poster)

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Keywords: *Spiritual Forest, Biblical Gardens, Sacred Space*

The paper deals with the research and valorisation of the relationship between sacred spaces and forest landscapes through the insertion of biblically-themed gardens into a 20 ha monastic domain, surrounded by the forests of Cheia mountain resort, located in central Romania. The site is crossed by a natural water course with two ponds and comprises a series of mixed tree groups and groves, increasing the landscape diversity of Cheia Orthodox Monastery area.

The first stage of the project consists in a complex research of the site from a cultural, historical, functional, ecological and visual point of view. Following the site assessment, a landscape redevelopment strategy is proposed through minimal interventions. It is intended to introduce biblical thematic gardens focused on the conservation of the dendrological vegetation, on the valorisation of the local ambiances through visual and functional integration of the site in the context of the mountain forest landscape and Cheia resort. The proposed vegetation presents a distinct symbolic value in each thematic area that confers a particular visual identity and a specific spiritual role.

The conclusions reveal the high potential of the site from visual, environmental and touristic point of view. The opportunity to increase the attractiveness of the monastic domain is highlighted by inserting multiple uses, such as educational, religious, cultural, recreational etc.

Shaded Resting Places in Landscape: Religious Memorial (Poster)

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Keywprds*: Crosses, Wayside Shrines, Grove, Local Communities, Local Historic Events, Harmony*

Religion and forests have always been linked since the very beginning. A forest can serve as a relaxing place both physically and mentally. It is like a shelter, a hermit or even a burial place. Countless signs of this connection can be found in our close environment.

In 2014 the bishop of County Vas turned to the local environmental and agricultural authorities: the forest department and the plant protection and soil conservation department His aim was to help to collect the religious memorial sites in the area. In our study, we completed and analysed this database, based on different aspects.

These religious sites have been investigated in order to observe these locations, their surroundings and the changes that occurred from their establishment. We also intended to find out if they have any historical context. Who takes care their maintenance? And in what way?

Nearly 500 religious sites was gathered in framework of this project. Several types of religious memorial sites were registered.

A substantial number of these sites are situated inside the urban forests, not far from the towns or villages. The religious monuments that are located in settlements, almost always stand in a grove or close by trees. Numerous shrines are located nearby springs. The religious memorial sites usually have a close connection to the local history, sometimes to national historic events.

In the last five or six years the state forest companies have spent substantial amounts of money on the development of recreation facilities in forest areas. The maintenance of religious sites are managed by local communities regardless of their location. This care is more intensive than the care of other well-known recreation tools and places. It is partly due to this fact that these shrines are unusually old.

These shrines have had an extended role lately. They used to be established to sign important spots and to inform people about those who passed away here, about a story or a danger, to protect against hail, ice storm or diseases, to symbolise the recollection and the gratefulness. Nowadays these shrines are included in tourist and thematic paths or they are linked to pilgrimages or geocaching places.

The religious memorial sites and their surroundings have become the eternal part of the landscape in Hungary because they create a triple harmony: that of the psyche, the local history and the nature.

Forest culture, spirituality and nature connection in urban forests practices of Belgian cities (Poster)

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Keywords: *Forest, Culture, Spirituality, Nature, Connection*

According to Rio Forest Principles "forest resources and forest lands should be sustainably managed to meet the social, economic, ecological, cultural and spiritual needs of present and future generations" [1]. Social values of the forests include positive psychological effects, aesthetic quality, and emotional and spiritual benefits [2]. Understanding of spiritual needs and benefits related to sustainable urban forest management is a complex issue, especially in diverse metropoles like Brussels that is home to nearly 200 nationalities with different cultural, religious and educational backgrounds [3]. Some attempts to understand the meaning of spirituality to contemporary individuals and to investigate links between nature-based recreation, spirituality and health in urban environments have been published [4]. In 2009 Roscoe addressed spirituality in terms of a system of personal values and beliefs that help human being to find meaning and purpose in life through "a shared connection or community with others, nature, the universe, and a higher power" [5].

In our study we analysed links between forest culture, spirituality and nature connection in urban forests practices in and around two Belgian cities, Brussels and Ghent, focusing on on-going forest activities and interventions, namely forest bathing, forest therapy, nature mindfulness, green exercise, forest walks and forest foraging.

We listed and analysed the number of urban forests based interventions and classified them according to the following criteria: to which target groups those activities are directed, what is their aim, on which cultural tradition and values are the interventions built and developed, what methodologies are used and how their efficacy is evaluated.

References

https://www.un.org/documents/ga/conf151/aconf15126-3annex3.htm [1]

Chiesura, A. The role of urban parks for the sustainable city. Landscape Urban Plan., 2004, 68, 129-138 [2].

http://statistics.brussels/figures/did-you-know/how-many-different-nationalities-live-in-brussels#.XFBSvzrsZD8 [3].

Baur, J. W. R. Urban green spaces, recreation and spiritual experiences, Leisure/Loisir, 2018, 42(2), 205-229 [4].

Roscoe, L. J. Wellness: A review of theory and measurement for counselors. Journal of Counseling & Development, 2009, 87(2), 216–226 [5].

Session 3.1

The Learning Forest

Forest Laboratories

Waldlust – Urban forests as community hubs and experimental design spaces

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***Keywords**: Urban Forest, Experimental Design, Open Space Planning, Local Identity*

Recently themes like forest bathing, contact with nature or a return to the human senses are increasingly featured on the covers of lifestyle magazines, which shows that these topics are becoming more relevant to the public.

Public green spaces can serve as places of recreation and relaxation, especially for people who live and work in the urban environment. Newer publications discuss questions regarding two abilities of these spaces: to follow new trends for usage as well as function (WGBU report: "Der Umzug der Menschheit - Die transformative Kraft der Städte) and to satisfy the desire for " special moments "in everyday urban life.

This presentation will present and compare projects which test innovative green spaces as new design forms for urban spaces.

New, experimental forms of urban green, compact, sometimes temporary urban forests, are already being explored in many public space projects. For example, the architect Asif Khan combines architectural elements with green structures in his "Forest Bathing" installation in London, offering people in this public place a special place to come together. People can easily socialize in this way and becoming a part of the local community. The Bankside Urban Forest project in London also manages to design comfortable green spaces with a focus on the human scale with new green structures. The theory of Biophilic Urban Acupuncture, states that humans often need "green" to feel comfortable and that especially many smaller green spatial interventions in the city can have an enormous effect on well-being.

Experimental green structures in the urban landscape seem to strengthen a sense of environmental awareness as well as a sense of community. However, for these kinds of interventions to be feasible in the long term and at different places, a new understanding of responsibility for maintenance has to be established at the local citizen and community level. Relating to these problems, I will give an outlook on possible ideas for the future.

Wald_interior, learning from forest behavior as a base for creative design procedures

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***Keywords**: Concept for Architecture Student Excursion, Aesthetical Awareness and Change of Perspective for Forest Condition, Sustainable and Resource-Conscious Design Procedures*

Report on a 5 day student excursion (RWTH Aachen University, faculty for architecture) in cooperation with the Vallendar City Forestry Bureau.

What starts with a childhood dream of immersing into the forest to build your own treetop hut under easiest circumstances aims at sensitizing architecture students for ecological balance, sustainable and resource-conscious design procedures.

Some things can´t be learned, they have to be experienced to let theoretical become applied knowledge. The primary task of this excursion was to investigate the demands and conditions for sustainable living during a "survival camp" in the forest: Building a tree house only from materials gathered on site to sleep at night. It embodies a playful approach to the archaic origins of architecture as well as its tight connection to forestry resources; resources in the sense of material related aspects, as well as the aesthetical perception of them.

This hands-on approach was only possible through the cooperation with the forester of the City of Vallendar, sharing his knowledge and inside view into the specific situation and allowing to intervene in the scene. Only condition to this was to handle the forest in a respectful manner and that the built structures could be reassembled without maintaining harm to the forest: the intention was to learn from the forest and understand its “behaviour” as a catalyst for explorative and sustainable design strategies. The results were woven, bound and easily connected leaves, branches and smaller trunks assembled into atmospheric shelters and installations, which directly responded to the requirements. The core of the exercise lies in the perception of the environment and its influence on one's own actions in a practical way. This was accompanied by a dialogue and discussions with foresters, hunters, visitors and wanderers on site.

Operating on a complex, active environment left traces on all participants. On one hand, participating students left a trace in the forest and on the other, the forest experience left a trace in the consciousness of the students for ecological balance in aesthetical and resource related issues. This approach was only possible with a small group of participants, but the aspiration is, that through the ongoing discussions this gained knowledge is shared in a multiple way: to understand the forest neither as a passive material resource, nor recreational place only, but to get a multifaceted perspective onto it.

Dynamic Tranquility: Woodland Park meets Airport Shopping Mall

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***Keywords**: Woodland Park, Forest Laboratory, Airport Park, Processual Design, Forestry Laws vs. Recreation*

In 2017 Studio Vulkan won an international competition for the new park at Zurich Airport, in which the transformation of the 80'000m2 existing landscape fragment choreographs the strict laws of natural and woodland protection as central design elements of the park. The airport is currently being catapulted to one of the most dynamic and dense sites of Switzerland, with the new 180,000 m2 multi-complex Circle building from Japanese architect Yamamoto surrounding the humble hill, ironically setting it up as a place of contemplation for potential thousands of daily visitors and employees.

In Switzerland the project is seen as a pioneer in the city forest trend, sussing out freedom for recreational spaces within strict forestry laws. In the face of rapid densification on the urban fringe the central question of the winning design is the compatibility of recreation, woodlands and natural protection. Our answer lies in the choreography of the site's inherent characteristics to become a strongly atmospheric experience of the complex, contemporary urban landscape. The hill, a glacier moraine, has been transformed over the years by layerings of excavation material and artificially implanted ecological measures to form a kind of wedding cake of artificially natural landscapes. The design searches to express this strange compilation of and dialogue between urban and landscape elements. Within this design narrative the existing woodland, planted in 1980, is a young, dense and inaccessible, monotone thicket. Newly, the woods must become a multi-tasker, being redefined to offer rich experiences in a process-oriented transformation over time.

Anders Busse Nielsen, founder of the Swedish Waldlabor (forest laboratory) and already aboard in the competition team, is project consultant. The transformation of the woods through "creative management" is now guided by our "forest team" of biologists, governmental and private foresters and landscape architects. Radically new for the Canton of Zurich are measures such as the conversion from woodland to "open woodland", allowing grass as ground cover, sowing perennials in the woods or allowing chosen solitary trees to unfold in their natural, poetic form.

The lecture will describe the analysis of this heterogeneous site, its forest challenges, goals and concrete measures to integrate recreation, imagination, ecology and forest practice construction.

Experimenting with adaptation and transformation in the Aarhus Landscape Laboratory

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***Keywords**: Landscape Architecture, Landscape Laboratory, Experimentation, Adaptation, Transformation, Urban Nature*

This paper takes its point of departure the newly established Aarhus Landscape Laboratory on Eskelund, a 20 hectares urban-industrial woodland placed on a former waste deposit along the Aarhus River less than a kilometer from the city center of Aarhus, Denmark.

The Aarhus Landscape Laboratory is the fifth of its kind in the Nordic countries, the others being Alnarp Västerskog, Snogeholm, Sletten and Københavns Byskov, and differs from its fellow landscape laboratories on three points: Firstly, by being an already established site with existing 25-year old plantings and self-established habitats. Secondly, by having a deep and profound history of transformation over time. Thirdly, related to the second point, it is placed in a highly urban context in the larger territory of the Aarhus River Catchment Area (AARCA), which is undergoing a continued series of transformations caused by anthropogenic processes and urbanization.

Apart from incorporating methods and approaches from the other landscape laboratories this calls for an explorative approach to both territory, site and experiments where (1) adaptation, as in acknowledging and exploring the potentials of the existing, and (2) transformation, as in exploring the continued act of change on the site, both play a big role in creating new futures for Eskelund.

This has been explored in two ways. Firstly, by using the site as an out-door classroom where architecture students from the Aarhus School of Architecture have made a series of temporary interventions that explore and communicate spatial and experiential aspects of Eskelund. Secondly by using the site as a cross-disciplinary research platform for architects, biologists and artists to explore new urban natures in 1:1. Two experiments are of particular interest (established 2017 and 2018):

The first experiment consists of a 5.000m2 transplantation of nutrient poor but biodiversity rich habitats from a donor site further downstream to Eskelund as a nutrient rich but biodiversity poor recipient site. The key goals of the transplantation being to explore adaptation of the donor site to the site-specific conditions of Eskelund and to investigate if and if so how this adaptation continues in the future.

The second experiment consists of the establishment of 8 x 10 m wide clearings in a 25-year old planting with an overarching goal to explore the relationship between site history, spatial atmospheres and potential increase in biodiversity

Session 3.2

The Learning Forest

Environmental Education

Environmental education in urban forest(s) in the Ruhr area (Poster)

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***Keywords**: Urban Forest in the Ruhr Metropolitan Area, Extracurricular Learning Environment, Education for Sustainable Development*

The urban forest in the Ruhr metropolitan area offer as an extracurricular learning environment an ideal setting for action-oriented nature experience. Schoolchildren get to know and appreciate the surroundings of their urban quarter. Children are sensitized to their environment and teachers are encouraged to do more teaching outside the classrooms. Through environmental education in urban forest the children learn how diverse their environment and the urban biotopes are. So leisure activities beyond hanging around indoors or to be on the internet are made possible and they see urban nature as a varied enrichment. This allows to act in accordance with the requirements of BNE (Bildung für nachhaltige Entwicklung = Education for Sustainable Development). Extracurricular environmental education favours natural science skills, motor skills, language development, creativity and social skills in the group. Therefore, it is possible to adapt to future challenges. Exploratory learning in cooperative learning units in an extracurricular learning environment (industrial brownfields and urban forests) educates at social, communicative, inclusive and integrative levels. Own ideas and experiences are brought in by the children and the BSWR employees only act as moderators and supporters. Six included (integrating disabled children/inclusion) and integrative projects in urban forest with the aforementioned environmental pedagogical approaches are presented. They cover widely knows sites as Landschaftspark Duisburg Nord as well as small industrial, semi-forested areas within settlements or forest parks and larger forest areas in the Ruhr metropolitan area. Schoolchildren of all ages and all types of school are addressed.

About the effects of a near-residence industrial forest on towns-children in the first years of their life

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***Keywords**: Consequences of an Urban Growing-Space for Small Children, Needs of Children in the First Years of Life, Offers and Effects of Industrial Forests*

Subtitle: Observations, concerns and hopes as an output of twenty years in forest practise

In the meantime seven of ten human beings in Germany are living in urban areas. The urban living space cause more and more well-known detrimental effects on the physical and mental health.

In this context frequently the grown-ups are in the center of examinations. But enduring consequences, at least for the whole further life-time, are the result of an urban growing-space for small children after their first years.

As a key-factor of the environmental education in the industrial forest project, up from the start in 1996, the kindergarten-groups are having a very particular importance. Out of which situation in life does the forest ranger catch these kids today? What are the specific offers of an industrial forest with focus on the needs of these small patients? In which way does the offered forest experience cause direct and long-time influence?

An industrial forest-ranger reports as a practical person on these questions.

Green Learning Environments – Toolbox with good practice examples for non-formal learning in the natural environment for children with special educational needs

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***Keywords**: Nature, Non-Formal Learning, Children, Special Educational Needs, Erasmus+ Project*

Playing and learning in forest and nature stimulates the imagination, creativity and entrepreneurship. Besides, nature is a great place to gain experience for the development of social and motor skills. The positive impact of a green learning environment is even more significant when working with children with mental disabilities, learning disorders, attention disabilities (such as ADHD) and autism spectrum disorders. In an informal natural environment, these children learn better than in a classroom. A green learning environment therefore increases their chances in society meaningfully.

We present the results of the ERASMUS+ co-funded project "Green Learning Environments – Taking advantage of the Stimulating Green Environment for Non-Formal Learning with Children with Cognitive Disabilities and Learning Disorders". In this project six specialised schools and four organisations working with environmental education from Belgium, UK and Slovenia exchanged knowledge, collected and tested the best practice in non-formal learning in the natural environment for children with special education needs. For this case studies were used and interviews with experts from the three countries in which currently there is no standardised nature-based skills on the curriculum.

We present a comprehensive Toolbox, developed and tested during the project for teachers and educators with 18 activities including useful pictures, pictograms and examples for more inspiration. With this toolbox, teachers and educators are provided with a very useful resource to maximize the benefits of forest, greenery and nature as an informal and powerful learning environment for children with special education needs.

The Toolbox is accompanied by a detailed pedagogical approach which contains background information about the advantages of a green learning environment for children with special educational needs. In addition, a policy brief was summarised with practical recommendations for policymakers, stakeholders, teachers and educators as well as organisations working with environmental education.

References

https://www.bosplus.be/nl/educatieve-projecten/green-learning-environments-eng

Visiting urban forest as part of education program in Slovenian kindergartens

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Keywords*: Forest Pedagogy, Kindergarten Teachers, Urban Forest Preferences, Educational Forest Function*

Trends in children education which attribute less importance to direct experience in nature, the structure of cities and the time pressure on parents and educators have a significant impact on reducing the time a child spends in nature. Outdoor education and forest pedagogy developed in Slovenia relatively late in relation to other European countries. Urban forests play in forest pedagogy an extremely important role, since they are usually the closest natural environment for many children involved in child care programs. Institutions such as kindergartens are important in the life of children in the pre-school age, as they spend there a considerable part of their time. For children to spend more time in nature, one of the useful alternatives is visiting the forest with the kindergarten through its programs.

In the last decade, forest pedagogy has been introduced into the annual plans of schools and kindergartens in Slovenia, primarily through the project work. In 2010, the Institute for Forest Pedagogics has been established, who initiated the Network of Forest Kindergartens and Schools of Slovenia in 2014 (Network). A great factor determining the frequency, the way and the reason for visiting the forest with the kindergarten groups is the preferences and perceptions of the kindergarten teachers. With the survey, we determine which factors influence the visit of forests within the kindergartens' programs and how kindergarten teachers perceive the forest as an environment for learning and play. We compare the views of public kindergartens' teachers, which are included in the Network and the ones not included. There are some differences in perceptions, which probably have occurred through the education of teachers about forest pedagogy and with the more frequent practice of visiting the forest.

The survey also observed what kind of forest seems to be the most appropriate to teachers for a visit with a group of children. On the basis of these findings we propose areas of urban forest with an emphasized educational function on the case study of The city of Ljubljana, which should be one of the basis for planning and managing urban forests.

A 'Citizen's Coolkit' on climate change and urban forestry - Canadian experience in engaging the silent majority on climate change and urban forestry issues at the micro-neighbourhood block scale

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***Keywords**: Climate Change, Urban Forest, Experiential Learning, Citizen Engagement and Education*

As climate change intensifies and city densifies, many cities are losing their urban forests, thus many benefits from urban forests are lost. In order to restore healthy urban forests, we not only need the public and private sectors, but also the 'silent majority' – regular citizens, students and youth to engage with & preserve our urban forests. Evidence shows that traditional media and science communication methods have not been successful in engaging a broader audience and scaling up action. Instead, we need an engaging, interactive process that uses place attachment, peer sharing, and experiential learning to motivate collective action.

The Citizen's Coolkit on Climate Change and Urban Forestry ('Coolkit' for short) <http://calp.forestry.ubc.ca/home/urban-forestry-toolkit/> is an example of a new tool that draws on these principles to create an engaging process for building urban forest literacy and climate resilience. Co-created by a group of researchers, university students, high school teachers and students, and local citizens in Vancouver, Canada, Coolkit is a 'do-it-yourself' toolkit with fun activities to increase people's awareness and understanding of urban forests and climate change, and the potential for local improvements through individual/collective action. It focuses on the micro-neighbourhood scale that triggers personal connections (e.g. how do the trees in my street benefit my family); it encourages communication and comparison between neighbours for peer sharing and learning (e.g. which household has the highest tree canopy cover); It encourages place-based, hands-on activities for experiential learning through indoor/outdoor activities (e.g. how many trees do I have on my block). The Coolkit uses compelling visuals such as mapping with Google satellite imagery and visioning new ideas for a greener and more resilient future community.

The presentation will demonstrate some novel engagement tools in the Coolkit and summarize evaluation outcomes from testing with more than 200 participants in high schools and communities in Vancouver. Evaluation results show that the Coolkit significantly increases user's awareness of local climate change and urban forest issues, benefits of trees, city policies and individual/collective action they can take to green their community/school.

Environmental education and international networking at university level

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Keywords: *Environmental Education, Networking, Europe, Watchgroup*

The theme of the International Day of Forests 2019 will be « Forests and education », which reminds us of the value of greening our cities and of educating urban populations into the importance of doing so. It seems that the younger and the more educated people are, the more seriously they take environmental issues and the more they believe they can act on them (Phillips et al., 2018). Yet, an education on forests, or environmental issues in general, is not contained in most national curricula and, « whilst few would doubt the urgency and importance of learning to live in sustainable ways, environmental education holds nowhere near the priority position in formal schooling around the world that this would suggest » (Palmer, 2003).

This paper thus has a two-fold purpose in relation to young people's environmental education.

First, it will present the LEARNING ABOUT FORESTS (LEAF) programme, a structured approach to outdoor learning: how it engages students and teachers to learn outdoors in nature and experience a reconnection to the natural world, as well as a study of the benefits exposure to nature has on students' psychology and learning outcomes. Offering concrete examples from the LEAF network to back up an overview of the programme and what it aims to do, this presentation will also address the scientific basis for outdoor education and cite works highlighting the importance of contact with nature, especially for the ever-increasing number of children growing up in urban environments.

Secondly, it will present work in progress, in the form of a recently-designed project aimed at giving all the students of a university an opportunity to learn about environmental challenges and good practices in Europe, so as to be informed and responsible citizens. From then on, a network of students will be developed on these issues with our Erasmus partner universities all over Europe, so as to promote good practices and concretely develop more initiatives for sustainability in each university. From the information gathered, the idea is both to push all universities to do more/better, and to create an international communication tool that could act as a watchgroup and a bottom-up instrument to give more voice to young people on these issues.

References:

Palmer, Joy, 2003. Environmental Education in the 21st Century. London: Routledge.

Phillips, D. et al. (eds.) (2018), British Social Attitudes. London: The National Centre for Social Research.

Sessions 4.1a – 4.1b

The Co-Designed Forest

Governance

Re-foresting "Forest City" – Portland, Maine: Co-Design + Innovation using Public Art and Community Partnerships

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***Keywords**: Co-Designed Forest, City Arborist, Maintenance, Local Government, Cultural Heritage, Public Art, Spiritual Forest, Grassroots*

Portland, Maine was given the nickname "The Forest City" in the early nineteenth century and had a reputation as a city blessed with an abundance of trees. Unfortunately, the city's urban forest has suffered over the years from disease, depletion, and the stress from a growing urban environment. It is difficult in 2019, to look across the skyline and understand where the moniker "Forest City" came from. The urban forest has been impacted by the great fire of 1866, rapid development in the 1800s, Dutch Elm disease in the 1960s, urban renewal efforts in the 1970s, and now, popularity of this waterfront city has led to strong and steady building development. Portland is the largest city in the state of Maine – a rural state where the forest economy continues to be an economic engine, though this, too, is fading in importance compared with tourism and tech industries. Remarkably, this small historic city has 70 miles of trails and green space; the City owns and manages roughly 20,000 trees on streets and in parks. The City struggles to balance the 21st century needs of new development, transportation, utilities, and sidewalk and snow maintenance with the desire to re-establish the "Forest City" identity and heritage. These competing interests within the public realm do not have to be at odds. An innovative array of efforts are being deployed to re-forest "Forest City." And the City does not do this alone – the City's Forestry Division and the Parks Department are aided by community partners such as the Tree Trust, Portland Trails, Friends of Forest City Trees, Cultivating Community, the Portland Resilience Hub, the public school system, and the Portland Public Art Committee. In this oral presentation, City of Portland Urban Designer Caitlin Cameron and City Arborist Jeff Tarling will outline specific strategies being used by the City and community partners to co-design a rejuvenated urban forest for the 21st century. In a small, New England town balancing historic infrastructure, climate change, and a new-found popularity, the urban forest is actively being regenerated with public art installations, grassroots food forests, and tree trusts. Where resources are constrained, maintenance and stewardship is being enhanced with GIS tools and partnerships with non-profits and volunteers. Through partnerships, the community of Portland is working to ensure the urban forest remains a significant feature of our city landscape.

Urban green space promoting social cohesion among older adults: A conceptual framework and case studies in China (Poster)

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Keywords: *Social Cohesion, Urban Green Space, Older Adults, Policy Arrangement Approach, Park Design and Management*

Introduction

Several studies have shown that social cohesion can promote public health and stimulate urban social sustainability. However, only few studies have focused on the contributions of urban green space to cohesion in China, specifically in relation to the subgroups such as the elderly who experience social exclusion and loneliness. Making maximum use of urban green space to provide for the aged can be an intelligent way for society.

Method

The present study aims to help fill this gap, building on research from Western countries. Taking a socio-ecological perspective, a conceptual framework was developed based on literature review of contributing attributes on the personal, physical and social level. This framework was then used to study local parks of three different scales to explore how these stimulate social cohesion among the elderly in today's China.

As a first, explorative use of the framework, Observations and semi-structured interviews with 15 elderly park users were carried out in local parks to explore behavior (e.g. physical activity, gardening) and perceptions. We also used the Policy Arrangement Approach as a 'lens' to analyze the role of the parks in building social cohesion. These helps reveal how social interaction (bonding and bridging) and place attachment.

Results

Our findings show that people like to use well-designed spaces, and greening is the key factor. Informal rules have been established among actors. Different types of social relationships can correspond with varying activities, which can affect elder adults' experiences. Place attachment is linked with landscape memory, behavior habits as well as cultural tradition. Parks can strengthen the connection between the elderly and their city. The elderly expressed clear needs for park infrastructure to undertake various activities.

Discussion & Conclusion

The developed framework and theories from Western countries can be used in China for further research, but differences need to be taken into account related to, for example, cultural aspects and preferences for specific types of park design and landmark. The majority of the interviewed elderly park users expressed a wish to be more involved in park management, implying that a range of co-management practices could be explored. Urban green space can stimulate cohesion among urban elderly, especially for those undertaking activities as part of a group.

Building Bridges in Urbanplanen, new cultural practices between the young population and green spaces

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Keywords*: Urban Forest, Green Spaces, Biocultural Diversity, Cultural Landscapes, Co-designed Forest*

This study focuses on how urban green areas support social and ecological resilience in the social housing area of Urbanplanen in Copenhagen, Denmark. Urbanplanen is home to diverse cultural groups sharing the same green space and therefore the quality and accessibility of the green infrastructure is relevant and in focus. Based on spatial analysis and semi-structured interviews with residents and a survey, the current social-ecological interactions in Urbanplanen have been analyzed. Results of the study reveal that green spaces have become a tool to encourage social and ecological resilience in Urbanplanen. Communal activities within green space as well as incentives for active citizenship aim to preserve and encourage past and new cultural interactions between social groups and nature. However, most of these activities are designed for communal use of specific groups in Urbanplanen, which has led to the marginalization of young people who do not get involved in the active management and care for green space. These results highlight a need for increased focus on environmental justice, specifically procedural and representative aspects of green equity.

Pluralities and Pines: An Exploration of Immigrant Integration in the Catalonian Forest Sector

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Keywords: *Immigration, Integration, Social Inclusion, Labour, Regional Development, Forest Management*

As migrations from within and outside of Europe continue to increase steadily, particularly in the Mediterranean region, the integration of immigrant populations is one of the most pressing issues faced by many European countries. Although there is significant research on immigrant integration in urban areas, the settlement and integration of immigrants in rural areas is largely understudied, even as growing populations seek work in forestry and agriculture in rural and peri-urban environments. Migration flows are shifting the dynamics of rural areas, with increased movement between urban and rural environments, as well as demographic revitalisation of rural areas that have faced decades of social and economic decline.

This research project seeks to explore the integration experiences of foreign workers and their employers within the southern European forestry sector. Through a case study in rural and peri-urban areas of Catalonia, Spain, we aim to examine the approaches employed by immigrants to integrate to their host society, their real-life experiences with integration through their work in the forestry sector, and their perceptions of the integration process. The study examines integration as a multi-dimensional process that encompasses five overall areas: personal, social, economic, political, and spatial. These five dimensions were identified by a conceptual modelling process based on an extensive systematic review of integration literature across disciplines— including geography, migration studies, political science, sociology, and psychology— which will also be a key output of this research project.

The results of this research could be central to informing forest users, policymakers, and future research on topics of immigrant integration policies and the role of immigrant labour in the forest sector; it may also have implications for holistic regional development planning. Furthermore, the influence of new movements in European forestry toward climate-adapted and socially conscious methods could extend this research to address social, economic, and environmental resilience across the Mediterranean region, with implications for all of Europe.

Advocacy for Urban Forest

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***Keywords**: Urban Forest, Advocacy For Urban Forest, Urban Transition, Citizen's Participation, Integration of Stakeholders, Acceptance of Urban Transition*

World is changing and urban areas are changing. The urban transition needs advocacy for Urban Forest and advocacy advertising to make UF part of the City Planning and part of livable cities.
It should be a common knowledge that Cities need trees. However, to make the urban transition sustainable the cooperation of policymakers, stakeholders and the public is required.

Professional circles (e.g. City Planners, Landscape Architects, Urban Foresters) all over the world are looking to "Smart Cities". E.g. the City of Munich/Germany where (among others) two projects of urban transition are just in the focus. One project is "Smarter Together". The EU Commission has chosen Munich, Lyon and Vienna to pilot ground-breaking smart city solutions. It is turning Munich into a laboratory for the European city of the future, as local government collaborates closely with numerous partners in the business and academic communities.

The research project will answer the question: What are the interests of policymakers, stakeholders and the public? What do citizens living in the area know about the future of their neighbourhood? How could citizens' participation be improved in order to increase the acceptance of both projects? What can we learn for the future to increase the cooperation between policymakers, stakeholders and the public?

First results show that the cooperation between the policymakers, stakeholders and the public is poor. Although there is a lot of citizens' participation, the concerns of people living in the area are not taken seriously, at least people do not feel that their concerns are considered. This could be a risk for the acceptance and the implementation of the whole process.

Other results and observation will be presented with the hope to improve the citizens' participation in other projects of urban transition and to establish Urban Forest.

Governance of the urban forest in Melbourne, Australia: from local strategies to metropolitan policy

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***Keywords**: Urban Sustainability, Institutions, Government, Nature-Based Solutions*

The successful governance of urban forests depends on how municipalities address fragmentation across a metropolitan urban area. Metropolitan areas are usually fragmented in many municipalities, each characterized by varying levels of expansion of urban physical elements and institutional character. For example, the city of Melbourne, Australia, one of the 32 municipalities in the Melbourne metropolitan area, is a world-renowned case study of urban forest planning, and is leading an effort to design and implement a metropolitan-wide urban forest strategy. Many municipalities across the Melbourne metropolitan area participate in this initiative and now have ambitious targets and tree-planting initiatives to increase tree-canopy cover. The success of this initiative is greatly influenced by the decisions municipal managers make about urban forests and how they understand and facilitate governance processes, such as the coordination of policies and stakeholders. There is currently no clear understanding of how municipal managers do this at a metropolitan scale. We seek to answer these questions using a framework of governance and empirical data sourced through interviews and surveys from municipal managers involved in making decisions about urban forests in various municipalities across the metropolitan area of Melbourne. These data were analysed to understand decision-making priorities and the underlying structure of governance processes in different types of municipalities, in order to understand how municipalities coordinate their efforts at a metropolitan scale. We discuss how are findings can shed light on the governance of urban forests.

Promoting citizen engagement in GI and urban forestry – understanding and overcoming barriers in NRW

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***Keywords**: Citizen Participation, GI and Urban Forest Governance, Bottom up Enabling Processes, Germany and Scotland*

This paper summarises research undertaken in the Aachen City Region of Germany to evaluate the extent of local bottom up initiatives relevant to the management of urban forests and GI. It seeks to understand how these projects are supported and what barriers exist to successful citizen participation.

The management and implementation of urban forestry and green infrastructure within Germany is generally undertaken through top down processes by governmental bodies acting on behalf of local citizens. Citizen participation may therefore be limited in scope to activities such as state organised tree planting or specific management activities. Mechanisms for involvement of citizens in wider decision making roles are consequently less developed and are hindered by a rigid division of governance functions.

A series of case studies were examined in detail from across Aachen City Region using GIS analysis, structured interviews, literature searches and site assessments to consider aspects of project delivery, governance and structure. The results were compared through use of a structured comparison framework, SWOT analysis, radar charts and stakeholder mapping. Key themes were identified including positive and negative learning points from each case study. A number of statutory agencies and mentoring bodies were also interviewed to determine their role in terms of providing support to groups.

Discussion is presented on the effectiveness of the selected case studies and on what needs to be done to further support participative approaches in NRW; this could include new legislative mechanisms, financial incentives, policy instruments and through third sector mentoring organisations. Comparisons are also made with Scotland, using existing case study material, where more enabling approaches to GI and urban forestry are now mainstreamed.

In summary, it is suggested how support structures in NRW might evolve to more effectively facilitate and enhance the role of bottom up community initiatives. This might include development of enhanced enabling capacity within statutory authorities, increased cross sector and partnership working, a greater role for the third sector, financial incentives, policy instruments and delivery of multifunctional outcomes.

Bridges and barriers for Urban Green – A comparative case study of Vienna and Zurich

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***Keywords**: Urban Green, Urban Green Management, Urban Green Policy, Vienna, Zurich*

Switzerland is a very blank spot on the map of Urban Forestry. At the moment its cities are small and maybe the need for green spaces in urban settlements is not very urgent, because citizens are out in the green in no time. Still the cities are growing and with climate change Urban Green Spaces must become more important to provide a liveable city climate. But Zurich, the biggest Swiss city with around 400'000 inhabitants, just voted to replace a huge green space in the city by a football stadium. This case study shows the barriers and incentives to Urban Green by comparing Zurich to Vienna. Vienna, being the capital of Switzerland's neighbour Austria, got elected the most liveable city in the world, also because of its immense amount of Urban Green. There are institutional differences between the two cities and the two countries. The main being the fact that Switzerland is a federal semi-direct democracy, whereas Austria is a federal parliamentary republic. Also Vienna is bigger than Zurich, having 1.7 Million inhabitants. By comparing these differences and setting them in relation to the differences in Urban Green strategies, reasons for this difference can be evaluated. The focus lies on the strategies for Urban Green Spaces in newly urbanized areas on the peripheries of the cities. A comparison of the two cases even allows to see what might change and if or how these two cities can learn from each other.

Creating an i-Tree Eco-based Urban Forest Management Toolbox: Turning i-Tree outputs into Climate-Adaptive outcomes, offering management strategies for growing the Swiss Urban Forest

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***Keywords**: Urban Forestry, Ecosystem Services, I-TreeEco, Spatial Development, Best Management, Practices*

Switzerland, in developing strategies to deal with the impact of a changing climate, has wisely chosen to focus on urban green and blue spaces in its scope and has awarded a grant to the submitted i-Tree Eco project, modeled in 6 diverse Swiss cities.

Given the demands of sprawling spatial development, the impact such development inflicts on the environment and thus, the public's health and well-being, combined with an inadequate implementation of Urban Forestry protocols and Best Management Practices, it was necessary to frame i-Tree within a much larger context. The resulting project presents new and experimental planning, design and management strategies from an Ecosystem Services perspective.

This current undertaking uses i-Tree outputs - the quantifying of today's tree-related Ecosystem Services (ES) - and invests that data into an Urban Forest Management Toolbox, enabling Climate Change adaptive Swiss Cities of tomorrow.

In addition to:

- translation of i-Tree Manuals into German and French,
- development of a multi-language i-Tree Eco "Field Cheat Sheet",
- training in the i-Tree Eco application and data collection,

Urban Forest Toolbox methodologies, based on city-specific analyses, will:

- elucidate the use of i-Tree outputs as a foundation for creative, ES-oriented solutions to planning and managing an adaptive Swiss Urban Forest;
- incentivize increasing mature tree canopy by growing the existing Urban Forest / Forest resource;
- increase professional, decision-maker and the public's understanding of the climate-relevant ES Services provided by a healthy, viable tree resource through innovative communication tools;
- develop actionable strategies to realize a resilient and sustainable Urban Forest Ecosystem.

Participatory integrated management of urban and peri-urban forests in the Danube region (URBforDAN project)

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Keywords: *Urban Forest Management, Danube Region, Participation*

The presentation deals with the new initiative of the URBforDAN project, a partnership of seven cities in the Danube region with population of 6,5 mio, 35 km2 of urban forests and 15 mio visitors per year. The City of Ljubljana (Slovenia) as leading partner has brought together cities of Budapest (Hungary), Cluj-Napoca (Romania), Vienna (Austria), Zagreb (Croatia), Belgrade (Serbia) and Ivano-Frankivsk (Ukraine). Together with associated partner cities of Podgorica (Montenegro), Sarajevo (Bosnia and Herzegovina) and Prague (Czech Republic) the partnership includes 10 countries and 8 capital cities.
All cities face similar challenges. All manage substantial urban forest areas within their city limits, which attract many users (citizens, tourists) and many stakeholders (managers, owners, interest groups). Increasing number of users of urban and peri-urban forests in Danube cities, diverse activities implemented in them and increasing demand for “green tourism” in urban areas indicate, that forests potentials within city limits, as well as its ecosystem services, are currently far underestimated. On the other hand, uncoordinated management, increasing pressures and conflicts between key actors threaten these important but vulnerable natural habitats to the point, where some of them are being severely affected.

The project is based on participatory approach in the context of joint development of integrated management plans elaborated specifically for urban forest areas. It focuses on the collaboration among key actors (local public authorities, forest managers, forest landowners, forest users and visitors, experts and non-governmental organizations), especially on their active participation in project activities and actions.

The project is introducing participatory integrated management of urban forests, including development of a proposal of financial compensation model for landowners. It will deliver a new type of Integrated Multi-use Management Plans (IMMP) on the strategic and operational level. While strategic parts are targeting a wider area of urban forests of each city, operational parts will be prepared for pre-selected focus areas to resolve their specific challenges. The INTERREG project URBforDAN includes also implementation of the operational plans with installation of urban forest equipment in 7 focus areas to resolve conflicts and support new sustainable development opportunities.

Comparing scientific and social perspective of urban forests' Ecosystem Services – case study of Planty Park – the green heart of Krakow, Poland

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Keywords: *Urban Greenery, Human Well-Being, Social Participation, I-Tree Eco, Air Pollution, Carbon Sequestration, Avoided Run-Off*

As humans, we undeniably depend on nature. In our urbanized world, urban vegetation is often the only expression of nature in people's everyday lives. According to scientific predictions, the trend of urbanization will continue. Therefore, it seems evident that the role of urban greenery in our, urban dwellers, lives increases. So should do our awareness and knowledge.

Various forms of urban green infrastructure – parks, street trees, boulevards, gardens etc., are known as urban forests, despite their differences from vast areas of woodland, commonly associated with the term of forest. Numerous functions performed by urban forests are known as ecosystem services (ES) and range from impact on microclimate of cities to spiritual experiences.

The aim of this paper is to evaluate ES provided by high vegetation (trees) of Planty Park (Krakow, Poland), investigate purposes and motivations of visitors of the park and compare both scientific and social aspects of the role of urban forests in cities.

For the ES evaluation, the I-Tree Eco software was used, with a complete inventory dataset from MONIT-AIR project as an input. The survey of visitors included questions regarding reasons behind visits, importance of park's functions and social participation. It was aimed at the social perspective of an impact of Planty as an urban green infrastructure on its visitors.

Based on the tree inventory (R3TREES database owned by Urban Greenery Authority of Krakow) of Planty Park (21.55 ha) we found that 2,158 trees (mainly *Acer platanoides, Tilia cordata* and *Aesculus hippocastanum)* stored 1,738.5 t of carbon, removed 0.83 t of air pollutants and at the same time contributed to 990.11 m3 of avoided run-off. The total value of ecosystem services taken into consideration in Planty Park, calculated for 2015 was in total 21,439.47 EUR (9.93 EUR per tree).

Presented work is just a small step toward a full understanding of the complexity of urban forests' role in the contemporary world. Further work including direct measurements on trees and their surrounding is needed to widen scope and improve accuracy of such research.

Delta City Trees: Emerging Paradigms in Rhine Delta Cities and their Impact on the Research Agenda for Urban Forestry

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Keywords: *Rhine Delta Cities, Urban Forestry, Research Agenda, Climate Adaptation, Sustainable Energy, Circular Economy, Mobility Revolution, Agglomeration*

Rhine Delta cities demonstrate particular patterns, features and details of urban green space, of which trees and woodlands form historically critical components. Urban green spaces in Dutch lowland cities are shaped by the specific abiotic and biotic conditions of lowland landscapes, and by planning and design practices responding to ongoing developments in the technological, environmental and societal realm. Rapid developments in these realms however, are expected to radically impact on the agency of urban forestry, with both positive and negative consequences. An adequate overview of these developments is needed to frame future directions of the discipline, in relation to the existing body of knowledge and directions for future research. In the context of Dutch lowland cities, extensive impacts are expected from climate adaptation, the transition to sustainable energy and a circular economy, the anticipated revolution in mobility and transportation, and patterns of agglomeration. The current body of knowledge on urban forestry in the Netherlands is currently insufficiently elaborated to deal with these developments in a proactive way, such that it is unlikely that the full potential of trees and woodlands will be realized during the anticipated transformation of urban territories catalyzed by these developments.

Working together: Experiences from an interdisciplinary urban forest research project in Bolzano, Italy (Poster)

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Keywords: *Interdisciplinary, Thermal Comfort, Tree Shade, Social Science, Stakeholders, Greenspace Management, Best Practice*

The multiple ecosystem services and disservices of urban forests are receiving much attention from researchers and practitioners worldwide. In particular, the positive and negative impacts of urban green on human health is rapidly gaining importance. At the Free University of Bozen-Bolzano (N Italy, Southern Alps), a collaborative research group of the greenCITIES project has been set up to investigate urban forests from an interdisciplinary perspective. The group comprises landscape ecologists, physical geographers, economists, sociologists and anthropologists. The objectives are to address the impact of trees on the city's climate and the thermal comfort of inhabitants, quantify the impact of trees on house prices, assess the historical greenspace practices, and reveal the present-day perceptions and use of greenspace by tourists and residents. In addition, the experiences, methodologies, and expertise of the different group members will feed into interesting interdisciplinary outputs. A key aspect of the project is the involvement of multiple stakeholders from the city – architects, activists, greenspace managers, artists and council representatives - via a workshop. Here we present our experiences so far, including the results of the stakeholder workshop, the different methodologies used to research the urban forest including the use of a smartphone app, archival photo elicitation, and participatory mapping. We also present some preliminary results regarding the cooling effects of tree shade.

Exploring, quantifying and mapping cultural ecosystem services of urban green infastructure – case study city of Zagreb, Croatia (Poster)

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Keywords: *Cultural Ecosystem Services, Disservices, Urban Green Infrastructure, Perceptions, Focus Groups, Participatory Mapping, City of Zagreb*

Growing body of evidence links urban green infrastructure (GI) and quality of life of residents. With prevalence of cultural landscapes in Europe, demand for cultural ecosystem services increases as well. Cultural ecosystem services are defined as "the nonmaterial benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences". There is also increasing demand for including public in decision making related to planning and management of urban GI. Participatory mapping of cultural ecosystem services aims to collect information on how people perceive these services and disservices from urban GI in a way that it can be linked to specific location and assessed. This exercise helps identifying and quantifying cultural ecosystem services linked to particular type of GI that later serves as an input for planning and management. In this particular study mixed methodology is used to identify, quantify and map cultural ES and disservices from urban GI based on public perception, explore what affects the perception, and to give recommendation on how to include results of participatory mapping in current planning and management of urban GI. The study will be conducted in the city of Zagreb, the largest city in Croatia with a three-quarter million population. First phase includes series of focus groups with residents in each city district that would serve as orientation and input for the second phase, a webGIS/PPGIS survey. Since we are still in the first phase of the study, we will show results of several focus groups with residents. The benefit of the study is that it aims to grasp various cultural ecosystem services and disservices of urban GI and it is focused on entire city area, not only one particular park or forest. It includes and goes beyond recreational services, as the most studied cultural ecosystem service, and focuses as well on those that are not often used in similar studies.

Smarter trees for smarter cities? Exploring cases of "smart" urban forest management from Europe and Canada (Poster)

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Keywords: *Smart Cities, Smart Forests, Sustainability, Urban Technology, Ecological Engineering*

There is no doubt that people in cities connect with trees, and it is now time to consider how trees might connect - literally - to people. Evidence has repeatedly shown the importance of green infrastructure for urban livability and resilience. “Smart cities” are also increasingly part of urban sustainability discourses, and have been touted as a promising, albeit still relatively unknown, model for enhancing municipal services and assets. Novel financing mechanisms, technological innovation, and unconventional governance schemes are disrupting business as usual, and the long-term repercussions for public green space management remain to be seen. As “smart city” and green infrastructure planning can be mutually beneficial, it is timely to consider whether and to what extent urban forests can become "smarter" as we look to maximize green benefits in our cities.

We outline how smart city trends and related technologies have been and can be applied to urban forestry and green space planning, and propose novel definitions for "smart" urban forests and "smart" urban forest management. Current case studies and "smart" projects from Europe and Canada reveal a focus on open data and citizen engagement, particularly through the use of mobile devices, applications (“apps”), and open-source mapping platforms. There is also growing interest in data loggers and sensor networks, big data analytics, and civic innovation spaces. We posit that a promising approach to “smart” urban forest management focuses on both the potential of digital infrastructure to enhance forest benefits and the facilitation of citizen stewardship and empowerment in green space planning.

Smart Urban Forest (Poster)

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Keywords: *Ecosystem Services, Benefits of Trees, Urban Forest Management, Business Model, Internet of Things, Blockchain*

More than 30 years of reasearch has given us lots of insights in the beneftis of trees. The range of benefits and the effects of these benefits are huge. And so is the value of these benefits. Tools such as I-tree give insight in the value of the benefits. With these insights in the value of the urban forest most project end. For the Smart Urban Forest this is the startingpoint. The first part of Smart Urban Forest is harvesting the benefits of trees. With traditional and new business models we harvest the benefits. By doing so we want to expand urban forests, raise awareness and create new relations between the urban forest and its inhabitants. New technologies such as IoT and blockchain will be an enabler for the businessmodels.

The second part of the Smart Urban Forest is about esthetics. Most trees in the urban environment are planted for esthetical reasons. Trees are planted following a landscape design or civil engineering project. Because of esthetics most trees are in places were growing conditions are not optimal. What if we would focus on the benefits of trees instead of esthetics only? Could we optimize the benefits with urban forestry design? By doing so, we could be making the best of green spaces in cities and at the same time reduce costs for planting and maintenance.

Smart Urban Forest is a joint effort of Willem de Feijter – owner of Stadsboswachter (Urban Forester) and Mark Bode – business partner of Wolfpack, Lab for the Next Economy. Both companies are based in Rotte

Session 4.2

The Co-designed Forest Management

Sampling method affects the applicability of i-Tree results for communicating the ecosystem services of planted and maintained urban trees

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***Keywords**: Tree Inventory, Carbon Storage, Carbon Sequestration, Stormwater, Air Pollution, Tree Cover, Tree Species Diversity*

Urban trees provide several ecosystem services that improve the health and well-being of inhabitants, support the biodiversity of other species groups and increase the resilience of urban environment.

In Finland, ecosystem services of urban trees are being studied in Helsinki, Turku, Tampere and Pori. We focus on carbon sequestration and storage, air pollution removal and avoided stormwater runoff and model their amount and value by using i-Tree software and inventory data of city trees. We will also describe the structure of urban tree population, like tree cover, species composition and their relative importance.

Our goals are to communicate the environmental benefits of urban trees to decision-makers, planners and inhabitants and to increase the general understanding of the effects of trees on the health and well-being in a built environment. Specifically, the effects of tree species diversity on the resistance and resilience of city tree population to abiotic and biotic disturbances will be studied, and related to the long-term ability of urban trees to provide ecosystem services. The structure and amount of urban tree population will be studied as well and considered which kind of indicators would be applicable to set targets for the amount of trees in a city, e.g. tree cover percentage.

In the four Finnish cities, existing city tree databases will be used as data sets for modelling. In addition to that, additional tree inventories will be done. In Helsinki, a plot inventory according to the i-Tree method was performed in 2018, with 200 research plots. In Turku, a large and old park in the Finnish scale was selected as a case study and tree inventory was done in 2018. In Pori and Tampere, additional inventories will be performed in 2019.

In the cities, the special need is to communicate the benefits of urban trees growing on public land in densely built areas, as those trees need the highest input for maintenance, are most threatened when the space gets limited and on the other hand, are essential for well-being of the habitants living in city centers. These needs have to be considered when sampling for i-Tree modelling, as the sampling method affects the applicability of results for communicating.

The role of cemetery management in maintaining the urban forest of Halifax, Canada

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***Keywords**: Management, Cemetery, Urban Forest, Canada, Greenspace*

The disposal of human remains is both a sanitary and spiritual concern. The Canadian approach to the interment of remains has historically relied on burial in government, private, family, and religiously-affiliated cemeteries. Demand for burial plots has increased despite the growing trend of cremation, and cemeteries across the world are running out of room (McManus 2015). The shortage of burial space has led to questions about the financial viability and environmental sustainability of Canadian cemeteries.

However, cemeteries can play a role in their community beyond interment. Of particular interest is the role of urban cemeteries as “green space” to support biodiversity, recreation, and restoration. However, cemeteries are not necessarily managed to provide these additional functions.

This study examined ten cemeteries in Halifax, Nova Scotia, Canada to determine the contribution they make to the urban forest through a complete inventory of their trees. Determination of the potential future of the cemeteries was done through an inventory of the spots where trees could theoretically be planted, as well as by examining size-class data from the tree inventory. The role of cemetery management in the maintenance/planning of their trees was assessed, along with determining whether tree planting had recently occurred, using interviews.

The ten cemeteries had relatively high species richness and percent canopy cover, suggesting they make an important contribution to the Halifax urban forest. However, few had recently planted trees. Regenerating growth was mainly found in small, unmaintained, dense areas, suggesting little potential for the natural maintenance of cemetery tree cover. Over 2000 spots were found in which new trees could be planted, indicating potential for cemeteries to maintain and even expand their tree cover. The interviews identified key issues such as limited financing, short-term planning, and a lack of consideration given to cemetery trees.

The data indicate that cemeteries in Halifax currently make an important contribution to the city’s urban forest. However, this contribution is threatened by the older age of many cemetery trees, the lack of new tree planting or regenerative growth, and the lack of attention given to this issue by cemetery management. Given the wide range of benefits provided by trees in urban settings, steps should be taken now to ensure that urban cemetery tree populations are maintained into the future.

Making regulating ecosystem services visible - a GIS-based analysis of Cologne's Urban Forests

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***Keywords**: Ecosystem Services, Climate Change, Cologne, Mapping, GIS, Urban Forest Management*

The worldwide process of urbanization leads to rapid climate and environmental changes in cities as well as on a global scale. Thus, it is important to not only take action in climate protection but also make climate adaption a priority in cities, to ensure the quality of life of citizens.

In this study the regulating ecosystem services (ES) of urban forests are analyzed, based on the forest owned by the city of Cologne, Germany. A GIS analysis of the forest stands within the city's boundaries was performed, using action guidelines established by the state of North Rhine-Westphalia, thereby testing their practicability.

The main objective of the study was to simplify the process of ecosystem service evaluation, making it a tool that cities can realistically apply. ES are therefore analyzed using a system of indicators that does provide less accuracy than local data collections but is more cost-effective and requires fewer expert personnel when performing the analyses. The results can then be used by the city council to communicate the importance of the city's forests and can offer guidance on methods of management for the forestry department.

The resulting maps visualize the ecosystem services of air particle filtration, temperature regulation and water regulation. The findings show that the city's afforestation efforts in the last century are fulfilling their intended purpose and are benefitting the population greatly. The outer green belt on the western side of the river Rhine is of particular importance as it provides all analyzed ecosystem services at the same time.

LIFE URBANGREEN - an innovative technological platform to improve management of green areas for better climate adaptation

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***Keywords**: UF, ES, Lidar, Satellite Monitoring, Adaptation to Climate Change*

Almost 80% of European citizens live in cities, which are particularly sensitive and vulnerable to climate change impacts, such as heatwaves (urban heat island; UHI), air pollution, droughts and flooding as well. Specific urban adaptation strategies are therefore needed to make cities more resilient to climate change. In this context, urban forests (UF; parks, forest, etc.) and infrastructures are seen as among the most widely applicable, economically viable and effective tools for combating the impacts of climate change and for help people adapt to or mitigate its adverse effects. Furthermore, the ecosystem services (ES) of UF improved air quality, cooling the air reduced UHI, help rainfall retention, increase the biodiversity etc. – are often not quantified easily, nor communicated to the citizens using these areas. The aim of LIFE URBANGREEN (LIFE17 CCA/IT/000079) project is optimising an innovative technological platform to monitoring the ecosystem services of UF and demonstrating its use in real scenarios. The aim is to improve UF management in Rimini (IT) and Krakow (PL). The platform will be based on GIS technologies and will include an assessment of the ES provided by green infrastructure, a smart management of water needs of trees and their irrigation, the use of airborne and satellite remote sensing data (multispectral imageries and LiDAR 3D point clouds), meteorological and an environmental monitoring system, and public participation tools (smart city). Specifically, the project aims to manage trees and green urban areas more efficiently, reducing water consumption and maximising their benefits in reducing storm water runoff. The expected results of the LIFE URBANGREEN project is e.g. to reduce up to 83% in overall GHG emissions from urban green maintenance operations (10% from road transport of vehicles used for maintenance activities) and 30-50% increase of carbon stocked in urban trees (pilot area). The LIFE URBANGREEN project (2018-2021) is leading by R3GIS company (IT) coordinating the partners: ZZM Kraków (PL), Anthea Srl (Rimini, IT), Italy Università degli Studi di Milano (IT), Italy ProGea 4D (PL).

Woodlands spatial arrangement and different degree of urbanization (Lithuania case study)

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***Keywords**: Forest Accessibility, Population Density, Forest Structure*

Since joining European Union (2004) number of Lithuanian citizens decreased by more than 15%. The urban dwellers decreased also drastically during this period in most cities. But the trend of urban sprawl is observed by development of hollow cities. The green spaces accessibility could be one of the reasons of such urban development pattern in contexts of biophilia and attachment theories. The distance from living place, attractive forest structure relates to more frequent use of green infrastructure service as well the quality of urban dwellers life. The research is based on:

- the Geospatial grid data of the 2011 population and housing census and degree of urbanization in context of green spaces accessibility (distance from living place);
- forest structure comparison in local administrative units with different degree of urbanization (densely populated areas, intermediate density areas, thinly-populated areas described by DEGURBA).

It is observed that in cities the urban woodlands are accessible by ~ 600 m, but woodlands of more attractive structure for recreation is allocated in more than 1 km from living places in areas of population density higher than 1500 persons/ha. There is big variation of accessibility in suburb areas of cities with better accessibility in areas of lower population density. The ratio of younger generation and elderly population (indicator for territory development perspective) is better in closer distance to the woodland in cities. Proportion of citizens with higher education increases with the better accessibility of woodland (relates to awareness of green infrastructure benefits for urban society).

Forest structure also shows resilience to urban pressure and ecosystem services continuity. Forest stands in cities woodlands stand out by wider tree stem diameter, elder stands that makes them more attractive for urban dwellers recreation than in other local administrative units of lower degree of urbanization. From other hand, the large proportion of pure stands (more than 85% of one specie in stand species composition) makes concerns about the forest resilience to urban pressure

Characteristics and changes of rural residential forest in LingHe, middle south of Shandong province (Poster)

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Keywords: *Residential Forest, Canopy Cover Rate, Plant Landscape, Human Characteristics*

To research the characteristics and its changes of rural residential forest of LingHe town, the typical rural area in middle south of Shandong, this paper selected 13 new villages and 11 old villages as research samples. Firstly, plant investigation and plant culture interview were carried on. Secondly, the canopy coverage rate, plant landscape and human characteristics were analyzed. Finally these characteristics were compared between new villages and old villages. The results showed that: (1) the overall canopy coverage of LingHe town is 1213875.7 square meters and canopy coverage rate reach 10.05% in 2016, which is lower than that in 2012. Besides this rate of new villages decreased more (from 17.25% in 2012 to 10.63% in 2016) comparing with old villages (declined from 16.64% in 2012 to 11.45% in 2016); (2) *Populus* makes the main contribution to overall rural landscape, and *Salix babylonica*, *Robinia pseudoacacia*, *Broussonetia papyrifera* combining with it dominated the riparian view in both new and old villages. Moreover, *Malus, Chaenomeles* and *Magnolia grandifora* are specific to new villages' courtyard and road landscape respectively. Besides *Sophora japonica* and *Salix babylonica* are specific to new villages' courtyard and road landscape respectively; (3) human characteristics of rural residential forest include three types, they are aesthetic appreciation, food supplement and emotional implication. Among them aesthetic appreciation and food supplement are the primary needs of new and old village courtyard forest, and emotional implication needs are gradually reduced in courtyard plants, road forests and riparian.

Industrial Forest Project – A synthesis after 24 years of accompanying ecological research on industrial brownfields (Poster)

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Keywords: *Industrial Brownfields, Succession, Biodiversity, Ruhr Metropolian Area, Tipping Point*

The overall aim of the interdisciplinary basic research project is the investigation and documentation of processes of plant succession on industrial sites of the Ruhr metropolitan area as well as a prognosis of a prospective climax community.

The most comprehensive and most rapid change in the composition of species occurs at the end of the pioneering stage. However, early succession stages had been relatively stable over long period. Once the succession progress reaches a considerable speed, it will soon lead to the stage of primary forest. During the sequence of succession stages, as postulated in the classical succession doctrine, the stage of persistent grass or herbaceous vegetation following the pioneering stage, can be skipped and trees may settle directly on the open industrial soil. There seems to be a tipping point in species richness at the end of the pioneer settlement, which defines the further direction of the succession process. This unexpected transition is of special interest for biodiversity research, because it is particularly rich in species but at the same time particularly unstable. Not even the oldest, most mature industrial forests reached anything similar to a climax stage yet.

One crucial factor for the direction and speed of succession is the physical and chemical character of the raw substrate and its exposure. The diaspore supply of the neighborhood or surrounding areas strongly influence or determine potential species combinations. In addition, there are countless other factors that can influence the direction and speed of succession, like weather (consider the dry summer of 2018) and natural risks, like the two storm events "Ela" or "Kyrill”.

The basic research presented here does not only apply the field of succession research but also aspects of urban forest biodiversity as well as processes of speciation (e. g. neogenic taxa). Applications in practice relate to the maintenance of industrial brownfields where pioneer vegetation should be preserved. The spontaneous vegetation of industrial forests can be a role model for climate adaptation on urban sites (resilience). The overall topics can also be found in social science and environmental educational.

Change detection of city high vegetation using 3D LiDAR point clouds and its impact on ecosystem services provided by trees in Raciborz, Poland (Poster)

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Keywords: *ALS, Height Models, Change Detection, Urban Forests*

Urban trees and forests contribute to making cities environmentally more sustainable serving lot of ecosystem services (ES) like air colling, filtering pollutants etc. In Poland, the cutting down of trees in cities is governed by the law specifying the procedures and conditions necessary to obtaining specific permits. Development of technologies like LiDAR (Light Detection and Ranging) and digital photogrammetry (eg SfM) increase the usage of 3D point cloud data in inventory and monitoring processes of city greenery.We used two Canopy Height Models (CHM; GSD 1.0 m) generated on the basis of ALS point clouds acquired in Jun. 11, 2011 and March 5, 2017. We found that in 2011 approximately 1 082 ha of the Raciborz city was covered by the high vegetation (14.5 % of the entire city). In 2017 the area of high vegetation class decreased by approx. 43 ha to 1 039 ha (13.9 % of Racibórz). Such kind of simple comparison indicates that the tree cover of the city decreases slightly by 0.6%. The analysis showed that the loos of trees amounted to 16.9% while the gain amounted to 12.9% at the same time. So when comparing to the tree cover in 2011, the decrease of about 4% was observed. Based on the existing GIS vector layers we also calculated the decrease of the tree cover within residential areas, which is crucial when considering ES of high vegetation for city dwellers. It turned out that the loos within residential areas was much bigger and amounted to -10.3%.

Temperature mitigation by urban trees: Modelling the cooling effect of transpiration and shading on a single tree basis (Poster)

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Keywords: *High Temperatures, Urban Trees, Cooling, Shading, Model Implementation, Tree Physiology, Munich, Englischer Garten*

Extremely high temperatures are getting more frequent in cities and their potential impacts on human health and plant performance are increasingly worrying. Implementing urban green infrastructure, particularly trees, can mitigate this development due to cooling from evapotranspiration and shading. However, the effect is not linearly scaling with tree density and temperature/radiation due to feedbacks between climate, water supply and plant physiology (in particular stomatal conductance). Therefore, it is necessary to consider not only the position and individual dimension but also the species-specific physiological responses in dynamic relation to their environment. Commonly used climatological models usually assume tree properties as static, either neglecting or over-expressing evapotranspiration (by assuming unlimited water supply), and are often not considering individual tree sizes to determine the pattern of shading. In order to overcome these limitations, a model has been developed and implemented that is based on tree physiological processes and can be run with simple tree inventory data. With this model cooling effects can be assessed in dependence on climate as well as tree properties, enabling scenario analysis for different structures and densities of urban green spaces. The model is evaluated with sap flow measurements of single trees at two different urban places. The impact of tree distribution and different weather conditions is shown for the largest park in the city of Munich, Germany, indicating that the water supply from the soil has a major impact on the cooling capacity. Finally, the potential applications and limits of the model are discussed, highlighting specifically the importance for air quality studies since deposition as well as emission of volatile compounds are related to transpiration.

Assessment of urban forest hydrological ecosystem services for an reserve drinking water source in the City of Ljubljana (Poster)

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Keywords: *Urban Forest, Drinking Water, Ecosystem Services*

In recent years there has been an increasing focus on urban forest ecosystem services, related to regulation of water flow, water purification and air pollution reduction (Pearlmutter et al. 2017). However, information about the extent of how urban ecosystems fulfil their services, that could be used by decisionmakers in urban watershed management and water resources planning, is limited (Vilhar and Simončič 2012).

This study presents quantitative and qualitative indicators for selected ecosystem services in the pilot area Dravlje, a location for potential water well field, which is at the moment a reserved area in the spatial plan of the City of Ljubljana, Slovenia. Rainfall interception and soil water holding capacity were selected indicators for regulation of water flow; nitrate concentrations in the groundwater of Ljubljana aquifer, soil bulk density and C/N ratio for water purification and annual concentration of NO2, PM10 and number of days with exceeded PM10 concentration threshold 50 µg/m^3 were selected indicators for air pollution. We standardized the obtained values on a relative scale (0 – 100) to assess possible contribution of land cover class to provision of an ecosystem service (Koschke et al. 2012).

The highest capacity to provide water flow regulation ecosystem services was shown for wetlands (55 scores) and mixed forests (52 scores). The lowest capacity was indicated for urban areas (0 scores). The highest capacity to provide water purification ecosystem services was shown for cropland (89 scores) and mixed forests (83 scores), compared to urban areas with lowest capacity (0 scores). The lowest capacity for the air pollution reduction was indicated for urban areas (15 scores), followed by cropland (52 scores), whereas other land classes had scores higher than 80. The highest capacity to provide air pollution reduction was shown for forests with 97 scores, followed by grass and rangelands (67 scores) and cropland (48 scores). Urban fabric reached 0 scores.

Using hydrologically oriented urban forestry management measures to improve ecosystem services in urbanized watershed represents a nature-based solution. Results of this study could help to link decision making of the public water supply service with the relevant environmental information, models and data, e.g. water protection zones, human health exposure and risk by air pollutants, ecosystem exposure to exceedance of critical levels and loads, etc.

Urban Trees, Property Prices and Associated Environmental-Economic Benefits – Dublin, Ireland

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Keywords*: urban trees, property prices, environmental-economic benefits, ecosystem, socio-economic, i-Tree Tools, Dublin*

Urban trees are gaining increasing attention for their myriad of (environmental, social, economic, health) benefits and services to society, particularly in urbanized areas. Urban areas comprise some of the main sources of air pollution from anthropogenic activities. The versatile and multifunctional benefits of urban trees are attracting interests globally and authorities such as the EU have implemented European-wide forest inventories and issued directives for member states to incorporate urban trees in their national plans. In Ireland, an example is the Dublin City Tree Strategy 2016-2020. Given the known benefits of trees and green infrastructure in cities, gathering data on urban trees into a database system and turning them into useful information for stakeholders is critical. The advances in remote sensing and GIS technologies in collating such data have greatly improved. Due to the harsh conditions in urban environments (restrictions in space, light, water), species selection and their management require careful attention and investment.

To this end, studies on Dublin's urban trees reveal a divide when it comes to the geography of urban trees. The density and spatial distribution of trees correspond with land use planning and policies by local authorities. There is a general sense that affluent areas and suburbs that are relatively wealthy are endowed with luxuriant vegetation compared to non-affluent areas. Studies confirm that the presence of trees increases property values. Using GIS and remote sensing data on Dublin's urban trees and data from the property register, the correlation between canopy cover and property prices will be computed. The data on trees will then be used with i-Tree tools to assess the environmental and economic benefits of Dublin's trees. The outcome will be twofold; first to establish if there is a correlation between tree canopy and affluence across Dublin, and second, to quantify the ecosystem and socio-economic benefits provided by Dublin's tree using i-Tree and associated tools. This work falls within the Dublin's 2016-2020 Tree Strategic Plan and the outcome will provide valuable information for multiple stakeholders from local authorities and city planners to property developers, landscape architects, researchers, and the wider public.

Session 4.3

The Co-designed Forest

Planning

Nature Based Planning model in the Barcelona metropolitan area

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***Keywords**: Nature Based Planning, Barcelona Metropolitan Area, Water, Agro-Forest Mosaic, Green Network, Pilot Test, Coordination, Participation*

Introduction

The Barcelona metropolitan area is a region with 36 municipalities and 3.2M inhabitants. It is a metabolically open system which depends on external regions for its water, energy and materials supplies, and it faces pollution problems in its urban centers. Moreover, its location makes it extremely vulnerable to the effects of climate change. For this reason, the future Barcelona Metropolitan Masterplan of the AMB (public metropolitan administration) bank on a Nature Based Planning model which seeks to transfer the philosophy of Nature Based Solutions to urban planning.

Three strategies and a pilot test

The renaturalisation of this territory enables the ecological functions and ecosystemic services of the entire system to be preserved and improved. Also, that guarantees more circular and resilient urban systems.

The goal is to achieve this model via 3 strategies:

- Water, a vector of regeneration of the metropolitan area. By fostering the improvement in ecological connectivity and enhancing water's function of hydric and thermal regulation in urban settings.
- The agro-forest mosaic, a model to manage open spaces. By recovering farmlands allowing for production in urban or marginal spaces as well, and fostering the management of the agro-forest lands.
- A green exchange network. By fostering a functional ecological network which should lead the urban edges viewed as marginal spaces to disappear.

There are plans to hold pilot tests in the area between the Collserola mountain and the lower Llobregat River valley to validate the proposed model. They include two studies: one of the structuring elements that should need intervention and regeneration to complete the ecological and social connections and another of all the agro-forest spaces and their conditions of use to foster their multifunctionality and overcome their marginality as border spaces.

To carry out these actions, the AMB should spearhead the coordination among the municipalities and the administrations with powers on this matter and articulate a participation strategy of the population.

Conclusion

NBplanning incorporates natural resources into urban planning, and it will incorporate innovation in the everyday tasks of public administrations, such as urban planning and fostering cooperation among the different regional agents, city councils and their inhabitants.

References

Web Barcelona Metropolitan Masterplan: http://urbanisme.amb.cat/pdu-metropolita

Wild woodlands across Italian cities: their potential role in urban regeneration

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Keywords*: Wild Urban Woodlands, Urban Planning, Green Infrastructures, Ecosystem Services, Urban Regeneration*

Wild urban woodlands are the result of spontaneous recolonization by plants of abandoned areas within urban and peri-urban areas. Compared to some European metropolitan areas, in Italy this “unconventional” nature is usually not considered in urban plans as part of the green infrastructure. We use several case studies spread throughout Italian cities to describe the variability of wild urban woodlands. We analyse, through the use of historical images and comparing results from urban planning tools, their evolution within the urban matrix. We couple this analysis with that of the structural features of these woodlands to outline their potential role in urban plans and regeneration process. Regardless of their consideration in the planning process, wild urban woodlands enhance cities’ capacity of providing complementary ecosystem services and support a variety of flora and fauna that have been disappearing in urban environments. Furthermore, these areas have an overlooked potential as new spaces for educational and artistic activities, as well as for providing climate change adaptation opportunities. Therefore, one urgent challenge for city planning, in Italy as well as in many other countries, is to consider these areas as integral parts of the urban green infrastructure. Indeed, urban regeneration approaches should take into account the intrinsic dynamic conditions and the range of ecosystem services provided to citizens by these woodlands. Consequently different forest management approaches should be developed to promote a variety of outcomes in terms of ecosystem services and to guarantee the sustainability of maintaining these areas over a medium and long term.

To each their own kind of WILD: the Gentbrugse Meersen, Ghent (Belgium)

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***Keywords**: Green Pole, Peace Forests, Forest for the New-borns, Natural Cemetery, Mosaic Landscape, Participation, Accessibility*

The city of Ghent (Belgium) has set itself an ambitious goal to ensure that each inhabitant has an area of more than 100 ha within 5 km from his or her doorstep. These large areas are called green poles and the Gentbrugse Meersen is one of the four green poles in Ghent. Once completed, the Gentbrugse Meersen will approximately be 240 ha in size, 170 ha of which has already been established. We foresee at least 70 ha of forest, combining mostly newly created forest, along with forested patches present prior to our developments.
The density of a city such as Ghent, with 1.600 inhabitants/km², leads to the need for quiet and green areas where one can escape the hectic city life. At the same time, we are challenged to incorporate the interests of a highly divergent public and ensure their return to the green pole. The Gentbrugse Meersen accommodates areas for nature conservation; community-gardening; protected heritage; people relaxing or walking their dog but also areas where small and large children can play surrounded by a green environment; infrastructure for guiding people through the area; safe and environmentally incorporated constructions for children to play; areas for bio-farming (where city-kids can come into close contact with cattle).

Here, I show how we shape the newly created forests in such a way that we increase the biological value of the green pole but at the same time provide an answer to the different social demands and needs of urban green areas. By spontaneous forestation, creating a mosaic landscape managed by grazing cattle, organizing orchestrated forestation events (leading to our forest of the new-borns), emphasizing the need for global peace with a peace-monument in our peace-forest or by designing the forest in such a way that we create a calm and serene location where people can say their last goodbyes while they burying the ashes of the recently deceased among the trees, we try to provide a place for everyone, which can be used by everyone. By increasing participation, emotional affinity and physical connectivity with the city centre for low-impact modes of transportation, we aim at encouraging citizens to return and enjoy their piece of nature.

While we are approaching the third and final phase of the entire project (creating the most northern part), we hope to create an urban jungle in the long run, hence we advertise the Gentbrugse Meersen as “To each their own kind of WILD”.

Combining forest planning and ecosystem services provision: the experience of Monte Morello peri-urban forest (Italy)

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***Keywords**: Forest Planning, Peri-Urban Forests, Ecosystem Services, Forests Visitors, Monte Morello – Italy*

In Central-Southern Italy, the traditional strategy for reforesting degraded lands was first to plant fast-growing pioneer species assuming that these species would facilitate the introduction of late-successional broadleaved species. In many cases, this strategy has failed and these stands can be considered simplified and fragile ecosystems characterized by a low level of biodiversity.

In the light of SFM, new forest planning processes and silvicultural treatments must be defined to guide natural evolution to more complex and stable forests incorporating forest ecosystem services (FES) assessment.

In post-modern society, people perceive forests as resources capable of providing clear air, leisure facilities, recreational and sports opportunities and decision-makers are becoming aware of the value of FES for the well-being of the residents.

In this framework, the present study is aimed to increase citizens' awareness of the value of FES; to elicit visitors' expectations about the forest ecosystem services provided by artificial black pine forests, and to gather suggestions toward the future forest planning strategies and their effects on FES provision.

The study area is the peri-urban forest of Monte Morello located near the urban area of Florence. This forest is the result of the reforestations activities realized in early decades of the twentieth century. Currently it is a simplified, unstable and fragile ecosystem, characterized by poor regeneration, huge quantity of deadwood and a high degree of flammability. On the other hand, the forest represents the green lung of the town and an important resource for recreational activities.

In 2016, 201 visitors of the forest have been involved in a survey aimed to investigate their preferences and opinions with a questions-information approach. While explaining the planning strategies and silvicultural interventions realized in the forest, respondents were asked to assign their aesthetic-visual preferences to the forest stands after different silvicultural treatments using a set of photos. Furthermore, visitors assessed the importance of seven different FES provided by Monte Morello using a 5-point Likert scale format.

Results show that recreational activities and air quality are considered the most important FES provided by Monte Morello forest. Furthermore people appreciate the forest managed through silvicultural treatments aimed to increase forest stability and natural regeneration processes.

The Landscape Green Network: a new deal for planning in Lombardy

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***Keywords**: Multifunctionality, Green Infrastructure, Integrated Planning, Multiscalar Planning, Landscape Integrated Planning*

The Regional Green Network (RGN) is one of the main innovations of the Regional Landscape Plan being drawn up in Lombardy to deal with cultural landscape and environmental protection. The RGN is based on the Regional Ecological Network (REN), with adding further components such as agriculture, culture, historic and leisure sites. It is designed assuming the landscape and environmental asset of the region (eg.: agriculture, lakeshores, peri-urban agriculture, forests, historical and irrigation canals, historical paths, tranquil areas, spring water, etc.), finding out the main focal points where green network and landscape cornerstone elements converge, aiming to integrate the diverse components of the system in a multifunctional perspective. The RGN designed at regional level has to be exploited at different territorial scale, according to local authorities planning competences, having them in charge to detail and implement the green network in their own land use plans. The RGN is the main structured frame to sketch the detailed design of the local urban and peri-urban forestry with an integrated, interdisciplinary, participatory and strategic approach in planning and managing tree resources for their economic, environmental and sociocultural benefits. It is ensured the promotion of a comprehensive and integrated planning approach to the elements of the natural, cultural and rural systems favouring the access and use of RGN by soft mobility network such as pedestrian, cycle paths and public transport and ensuring the ecological continuity at territorial scale. The RGN concretizes both the approach stated in the European Union's "Green infrastructures strategy" and the European Landscape Convention principles, which recognizes the importance of the environmental elements in landscape planning, improving the integration between cultural and ecological aspects in a comprehensive approach. The RGN includes urban forestry as a fundamental component of an integrated spatial design in which networks or systems including woodlands, parks, open spaces located in urban and peri-urban areas and derelict sites are components of the green infrastructure backbone. This allows bridging rural and urban areas, improving a city's environmental, biodiversity, climate quality and citizens' sense of place. This is particularly important in the metropolitan region of Milan, where live 35% of the regional population and is affected by the presence of seven million people daily

Optimizing ecosystem services provision using suitable tree species and open space design

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***Keywords**: Urban Greenspace, Ecosystem Services, Species Characteristics, Cooling Effect, Runoff Reduction*

Greenspaces can moderate the effects of ongoing climate change and urbanization through the provision of ecosystem services (ES). However, due to high heterogeneity at micro-scales, there is still uncertainty concerning the magnitude, pattern and the process of mitigation. Over the last four years we continuously measured eco-physiological, dendrochronological, meteorological, edaphic variables and the heat fluxes below and above canopy of contrasting tree species planted in different street and canyon conditions in Munich as well as in the comparatively drier city of Würzburg in Germany. Species characteristics leading to different growth patterns showed influences on both shading and transpirational cooling with a decrease in air temperature up to 2 ºC in the centre of the crown and around 1 ºC at 1.5 m height from the ground. Among the species characteristics, leaf area index was the central criterion which caused surface temperature differences of up to 24 °C over asphalt and up to 9 °C over grass surfaces. Even during the hot and dry summer of 2018, tree shade provided physiologically equivalent temperature reductions of around 4 °C in Würzburg. In case of transpirational air cooling, the size of the trees, wood anatomy, climate zones and water use efficiency showed the greatest effect. Trees with higher above and below ground growth also linearly increased the soil infiltration potential. Largely, ES were also dependent on various meteorological variables and below-canopy surfaces. Trees grown over paved surfaces and within narrow-street canyons provided lower boundary layer cooling and also hindered the wind flow, therefore, only lawns within the wind channels were more efficient. Conversely, on wider street canyons, trees in combination with grasses were more efficient. Overall, trees with less water demand and lower canopy density showed higher cooling potential and runoff reduction when they were planted over grass surface than over built surfaces through the evapotranspiration of grass and an extended fine rooting system. Where larger areas of lawn are not practical, higher root biomass and infiltration at around 3 m away from the tree trunk suggested a need for larger tree planting pits to optimize the ES provision. However, there were trade-offs between different indicators for ES such as carbon gain and transpiration; number of trees and wind flow. Thus the study provided new insights on designing urban greenspaces and choice of species.

The spatio-temporal dynamics of urban greenspace during the last three decades in four typical cities, China (Poster)

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Keywords: *Greenspace Patterns, Urban-To-Rural Gradient, Spatio-Temporal Dynamics, Impact Factors*

Changsha, Dalian, Nanchang and Shenzhen which contain both coastal and inland, southern, central and northern cities were selected to detect the spatio-temporal dynamics of greenspace patterns from 1984 to 2012. We also tried to exploratory analyze the main impact factors for the changes of greenspace patterns. This study aims to provide new spatial data for future urban greenspace research and planning. First, we collected time-series Landsat composites and applied NDVI-thresholding technique to reclassify greenspace into four classes and used landscape indices to quantify the greenspace patterns features. Then, we assessed temporal dynamics of greenspace by using the Mann-Kendall trend test. We also calculated the normalized distance index to measure the urban-to-rural gradients. Next, dynamic time warping was applied to detect the dissimilarity of long-term trends trajectories of landscape indices in four cities. Finally, maximum information-based non-parametric exploration method was used to detect the pairwise relationship between the changes in greenspace patterns and main impact factors. Our results show that the dense vegetation in Changsha, Dalian and Shenzhen had an average increase of 0.26 per cent and the mean patch size of dense vegetation increased 0.11 hectares from 1984 to 2012. The medium-dense vegetation in these three cities had an average increase of 0.40 per cent, the mean patch size in Nanchang and Shenzhen increased 0.15, 0.04 hectares respectively, however, Changsha and Dalian decreased 0.01, 0.08 hectares respectively. The urban-to-rural gradients of dense vegetation in inland cities had a ∩-shaped trajectory. Sparse vegetation in Changsha and Shenzhen had a monotonic decreasing trajectory, while Dalian and Nanchang had a ∪-shaped trajectory. The changes in greenspace patterns had a strong non-linear relationship with income, gross domestic product per person, the proportion of urban population and proportion of city area. Contrary to medium-dense vegetation, the dense vegetation in Changsha, Dalian and Shenzhen increased and the patches became more connected from 1984 to 2012. Contrary to coastal cities, the sparse vegetation increased in inland cities and the patterns became less fragmented. The urban greenspace showed three trajectories of urban-to-rural gradients, the first one is parabola-shaped trajectory ("∩ or ∪"), second is constant trajectory ("-"), third is monotonic increasing or decreasing trajectory.

Reintegrating an Emblematic Landscape of Bucharest: the Surrounding Green Areas of the Parliament Palace (Poster)

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Keywords: *Urban Green Infrastructure, Green Space System, Dendrological Vegetation*

The studied area is located in the center of Bucharest, replacing the former Uranus-Izvor neighborhood, and is one of the most significantly transformed historical areas of the capital city of Romania, during the last years of the communist regime. Today, the landscape is dominated by the monumental building of the Parliament Palace, surrounded by large green areas with dense mixed dendrological vegetation which are mostly unused and inaccessible for the public.

The study includes a synthesis regarding the evolution of the urban landscape and the surrounding green spaces over the last century, an analysis of the current situation and several future scenarios for the Parliament Palace Area, which is considered one of the most controversial contemporary urban projects in Bucharest.

Historical research reveals the key moments of the urban transformations in the Uranus-Izvor Area: the proposals for systematization dating from 1935, the radical demolition process in the late 1980s, followed by the construction of the Civic Center, including the People's House (currently the Parliament Palace, the largest building in Europe) and the initiatives to reintegrate the area in the urban context after 1990.

The analysis of the current situation is focused on assessing the potential for integration of the unused green infrastructure resources. Recent initiatives of the Chamber of Deputies and the local public authorities to reconnect the urban area within the green spaces system of Bucharest are also presented. In the last part, a number of scenarios for the possible evolution of the Parliament Palace Area are presented. The visions range from a strong densification of the built urban tissue to a large green spaces network in the center of the city.

The research highlights the importance of reintegrating atypical built structures and highly vegetated green areas in terms of environmental, functional and aesthetic issues, by understanding the history of the place and by identifying future development scenarios for the studied area.

BaumAdapt: Optimization of eco-system services of urban forests in compliance with the resilience of critical infrastructures in regard to convective events and adaptation to climate change

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Keywords*: Baumadapt, Climatic Change, Convecting Event, Ecosystem Services, City Tree Management, Urban Forest Management*

Optimization of eco-system services of urban forests in compliance with the resilience of critical infrastructures in regard to convective events and adaptation to climate change

The project aim is to generate precise cluster recommendations for the development of an urban forest / city tree population, under consideration of vulnerability of critical infrastructure in context to the city tree management, in order to increase resilience to the highest riskless level of relevant ecosystem services.

With “ELA”-summer storm in June 2014 the City of Essen suffered the most severe storm event since the beginning of records. At least since this major catastrophic event it has become clear that the vulnerability of urban tree population is able to disrupt the complete city infrastructure with substantial risks for urban citizens with dimensions of a civil catastrophic event. Adding up to the short- and medium-term Impacts on critical infrastructure and transport safety, large parts of the urban tree population were damaged in urban forests (1.750 ha) as well as in the city tree population (230.000 trees). Within the context of the already occurring climatic change, accumulation and repetition of comparable intensity with less or even greater spatial extent can be anticipated. The impact of climate change is expected to lead to significant changes in ecosystem services.

The planned project is thus of considerable relevance to urban-, landscape- and forestry planning as well as for the preventive disaster protection of the city administration of Essen. The project thus plays an essential part in the climate adaptation strategy of the city of Essen. The project results are expected to provide important recommendations for a substantial optimisation of the forest and city tree population with regard to its risk reduction in regard to critical infrastructure and traffic safety as well as its resilience and sustainable optimization of its ecosystem services.

Session 4.4

Outdoor demonstration

Advanced Tree Assessment

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Keywords: *Tree Assessment, Tomography, Ground-Penetrating Radar, Static Load Tests*

Methods and devices for the non-destructive assessment of urban trees have developed rapidly in recent years. I am proposing a practical, hands-on session with static load tests, sonic and electrical resistivity tomography and geo-radar on the site of the conference.

Comparison of two methods to assess the vitality of old trees - a test on beech and sycamore maple

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Keywords: *Vitality Assessment, Old Trees, Tree Inventory*

Vitality assessment is a key element of urban tree management. However, it is less well understood than often assumed. After a review of current research, two controversial methods are compared in an experiment.

Vitality of trees is often defined in relation to survival, growth, or response to stress. A wide range of methods is used to assess vitality, often based on crown architecture, crown condition, or epicormic growth. This study applies two methods to assess old Fagus sylvatica and Acer pseudoplatanus and compares the results quantitatively. One method is based on the architecture of the upper part of the crown, the other uses a wide range of parameters, most of them related to the trunk. Both use an ordinal scale ranging from 0 (best) to 3 (worst).

Both methods were applied equally fast, and their results were statistically highly significantly correlated, albeit with large scatter. Vitality based on crown architecture was on average 1.5 grades worse and explained a third of the variation of the other method.

Crown architecture should remain the basis of vitality assessment, because it is easy to learn, repeatable and based on a physiological model. In old trees, where the growth of crown and trunk can be de-coupled, a low vitality score should be adjusted when the trunk shows signs of vigorous growth.

Use of VTA in Celtis, Fraxinus, Platanus and Tilia trees in Portuguese cities (Poster)

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Keywords: *Tree Risk Assessment, Structural Defects, Decay, Failure Pattern, Urban Trees*

In Portuguese cities *Celtis australis*, *Fraxinus* spp., *Platanus* spp. and *Tilia* spp. are the most common tree species. Nowadays, Municipalities have demanding objectives concerning the protection of urban trees and look for the early detection of structural defects and adverse conditions that can help establishing programs of tree risk management. Visual Tree Assessment (VTA) is a method used to evaluate the likelihood of failure for a given tree in a given moment. Advanced risk assessments might include the use of devices for decay detection namely resistance drilling records (ex. Resistograph) and sonic tomography (ex. Arbotom). With this work, we intended to identify structural defects associated with risk of failure of the most common urban tree species evaluated since 2015. Park and street trees were examined by VTA, using drilling tests and tomographic analysis whenever needed. Finally, each tree was rated with a risk rating value (RRV). So far, the most frequent structural defect found was dead branches (55% in 215 trees evaluated), even if in *Tilia* spp. co-dominant branches with included bark were most frequently observed. In general, *C. australis* and *Platanus* spp. had a failure pattern mainly related with the presence of dead branches, cavities and decays caused by wood rots fungi on branches and on trunks. In mature individuals of *Fraxinus* spp. the rupture of limbs happens quite often. On the other hand, *Platanus* spp. and *Tilia* spp. rarely fail, but in the case of strong winds or storms frequently lose branches. Under the present scenarios of climate changing and the emergence of new pests and diseases, tree risk assessment is a fundamental tool for the protection of trees and for the planning of future Urban Green Infrastructures.

LiveTreeLab as approach for raising knowledge on tree health in Ljubljana city (Poster)

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Keywords: *Insects, Fungi, Urban Heat Islands, Mortality of Trees, Saproxylic Habitats*

The City of Ljubljana has 290,000 inhabitants and covers 275 km^2. The characteristics of the city lies in its extensive greenery including 110.8 km^2 of forests and the fact that the forest cover penetrates the city centre from two sides. Nevertheless, Ljubljana area is classified as urban heat islands of the 2nd level, their intensity reaching up to 1.8 °C and on average 0.58 ± 0.10 °C warmer than the surrounding area. A number of thermophilic or thermotolerant pathogenic fungi, as well as insect pests are causing extensive damages, weakening or mortality to trees in urban green areas. In the city we are developing forest laboratory named LiveTreeLab for the research, inventory and public co-monitoring of harmful biotic factors that influence the health of woody plants, their impact on the stability and structure of trees and the development of new saproxylic habitats. According to the pilot study made in the years 2010-2018 numerous harmful native and introduced alien species have been detected. The most important among native pests are *Thaumetopoea procesionea*, *Ips typographus*, *Pityogenes chalcographus*, but invasive alien species from ordo Heteroptera, Homoptera and Lepidoptera are more numerous. Some new pathogens have been detected: *Pseudomonas syringae* pv. *aesculi*, *Erysiphe arcuata*, *E. elevata*, *E. flexuosa*. The main factor of physical destabilization of weakened trees are wood degrading fungi (*Ganoderma* spp., *Armillaria* spp., *Schizophyllum commune*, *Fomes fomentarius*, *Laetiporus sulphureus*, *Kretzschmaria deusta* and many others). Activities to undestand harmful factors is only the first step towards developing efficient methods for the preservation of urban trees and forest health by involving volunteers and interested public. Together we work on preserving old decaying trees, if they neither pose a threat to the spread of harmful organisms nor pose a risk for visitors, as they represent important habitats of evolving saproxylic organisms.

Basidiomycetes common to standing urban trees (Poster)

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Keywords: *wood-rot fungi, functional richness, diagnosis, diversity, tree risk assessment*

Street trees and safety are side-by-side when it comes to managing Urban Green Infrastructures. Basidiomycetes are known for causing wood decay, changing the mechanical structure of wood and increasing the risk of failure of trees.

This study aimed at making an inventory of basidiomycetes detected during risk assessment inspections of urban trees, carried out in Portugal since 2015. The objective was to understand the existing fungal biodiversity and functional richness of the main communities encountered (most representative genus). When possible, fruit bodies were collected and morphologically identified; in some cases, molecular identification was also performed to confirm the taxa at the species level.

Up until now 183 basidiomes were sampled, among which Inonotus, Ganoderma and Phellinus were the three most representative genus. The lowest functional richness (of two) belongs to the genus Inonotus despite being the one with more basidiomes seen throughout the study (24% of all observations in seven different hosts). The genus Ganoderma has a functional richness of three (21% of the basidiomes), with G. australe being the most common species.

The highest functional richness (of six) belonged to the Phellinus genus (20% of the fruit bodies observed), with the following species identified: P. igniarius, P. pini, P. pomaceus, P. punctatus, P. torulosus and P. tuberculosus. Furthermore, the species Abortiporus biennis, Perenniporia fraxinea and Rigidoporus ulmarius were often found contrarily to what commonly used to be perceived. The last two species are commonly misidentified due to morphological similarities; same happens with A. biennis and Meripilus giganteus.

The presence of fruit bodies of wood-rotting basidiomycetes is an indicator of advance wood decay in standing trees. The ability to reliably identify these fungi can be an important tool for field diagnosis and tree hazard assessment, besides being useful to support ecological studies in Urban Forest environments.

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