ABSTRACTS

EUROPEAN FORUM ON URBAN FORESTRY 2018 – EFUF 2018

Increasing cities, decreasing green areas – Challenge to Urban Green Professionals

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Abstract ID: 1

Whose Forest is it anyway

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The City of Sheffield has come under intense scrutiny over the last year as a consequence of corporate decisions that has resulted in the potential removal of thousands of mature trees from the city's extensive urban forest. The result of the decision has been to mobilize significant public opposition. The 'fall out' has had severe consequences for the city's international reputation, not least because it had hitherto enjoyed very favorable reportage due to its historical efforts in urban forestry and countryside management. In respect of governance this has brought into sharp focus the question of 'whose forest is it anyway' - the 'municipality' or the 'citizens of the city'. The presentation will provide an overview of the development of the conflict and a current appraisal together with possible future scenarios. The presentation will also focus on how a good story can turn bad and offer a cautionary tale to other cities across Europe and beyond.

Abstract ID: 2

Urban Forest Plan Phase I: Street Trees & Street Tree Inventory

Jon Swae, City Planning, San Francisco Planning Department, San Francisco, USA

Anne Brask, San Francisco Planning Department, San Francisco, USA

The City of San Francisco has developed the first phase of its Urban Forest Master Plan – a 20-year vision and strategy for greening the city's streets, parks and private properties. The Plan's first phase focuses on utilizing street trees to address San Francisco's shrinking canopy cover, climatic resilience and declining forestry budget. It makes bold recommendations for the creation of a new Citywide Street Tree Maintenance Program, planting 50,000 new street trees and managing trees through their entire life-cycle by developing a Street Tree Nursery and Urban Wood Re-Use Program. The Plan celebrates the social, economic and environmental benefits of trees as a way to build political and public support for the urban forest. The roles of community-based organizations, public agencies and private property are all recognized for their unique roles in managing and growing San Francisco's trees. An accompanying finance study includes recommendations for a voter-initiated parcel tax to fund tree maintenance which is currently under consideration. The panel presentation will focus on the challenges and lessons learned during the development this groundbreaking vision for San Francisco's "living" infrastructure within a very constrained public finance environment.

Abstract ID: 3

Health benefits of urban forests and green – a Finnish perspective

Liisa Tyrväinen, Natural Resources Institute Finland, Helsinki.

Research linked to health and well-being benefits of urban forests nature has been conducted in Finland almost for two decades, and these benefits are increasingly recognized by the Finnish society. The national research has explored the associations of use and availability of nature with health using different research methodologies such as population surveys and on-site field experiments. More recently, also epidemiological studies investigating long term health benefits of living in green environments have been conducted. This presentation sums up research results from this multidisciplinary research work.

One of the first research areas has been the restorative effects of nature using various psychological indices. These studies have demonstrated that forests and other nature areas are important in reducing stress and help in recovery from work for Finns. Moreover, field experiments have contributed to understanding the multiple mechanisms that are connected to the delivery of health and well-being effects. Studies suggest, for example, suggest that physical activity has a key mediating role in health benefits, particularly among suburban residents. A recent national critical review targeted to health care professionals concluded that although overall research evidence of health benefits of nature with healthy adults is relatively strong, little research is available on nature's effects on recovery from sicknesses. More studies are needed regarding dose-response relationship, individual differences in perceived benefits, long-term health effects as well as effects of nature in rehabilitation and recovery from sicknesses.

Forests and other nature areas are suggested to have considerable potential in public health promotion and disease prevention. The presentation also explores recent national policy-science discussions on how the research knowledge can be implemented within various sectors such as public health and land-use planning and resource management. These discussions have contributed to a series of practical experiments and pilots that are also briefly presented.

Participatory Urban Forest Management: FOR People, OF People, BY People

Naomi Zürcher, Consulting, Arbor Aegis, Luzern, SWITZERLAND

The Urban Forest, consisting of forest trees and their urban associates - flora, fauna, soil, water, humans and the surrounding abiotic environment – is, in total, an urban ecosystem. The inclusion of this word "urban", denoting the human factor and all its contributory "stuff", is an aspect of this ecosystem that cannot be set aside or denied – a factor in which the speed of development combined with our population demands, imposes a dynamic on our urban trees that challenges the planning for and management of this vital resource. Surely, a planning and management quandary. How to accommodate the needs of one along with the demands of the other.

The fact that our urban trees have found ways to deal with everything the impermeable urban hardscape and dynamic humans inflict on them, speaks volumes to their resilience and tenacity. But, they are not invincible. Trees never forget what one does to them – they wear their history for all who care to observe and evaluate. What we have learned from those observations and evaluations is that our dynamism requires a much more inclusive participation at the planning/management table – a collaborative effort between interdisciplinary professionals and informed citizens - to accommodate our urban trees' needs and thus realize the essential ecosystem services benefits viable urban trees can provide.

In the four decades that urban forestry has existed as a philosophy, an area of study and a profession, we have amassed many examples of informed, participatory management strategies and approaches to the stated quandary - not just what's on paper in the form of guidelines and theoretical programs but strategies that have been put to the real world test and have translated into positive outcomes for all concerned – trees, managers and citizens alike.

Based on more than two decades with a professional focus on developing, coauthoring and implementing citizen-oriented Urban & Community Forestry educational programs, this Urban Forester / Consulting Arborist will explore the concept of informed, participatory Urban Forest Management: For, Of and By people. This presentation will offer analyses of what works and why from a management and arboricultural perspective, including examples of programs that not only provide documented beneficial outcomes for our urban trees but facilitate community empowerment, cross cultural collaboration and informed advocacy, resulting in a cost-effective contribution to a more sustainable urban ecosystem and a healthier, more connected human population.

Abstract ID: 5

Urban ecosystem services: habitat provision

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This paper employs an ecosystem services analysis methodology as a way to understand and evaluate how cities could support, or generate ecosystem services. Ecosystem services analysis can provide quantifiable goals for urban ecological regeneration that are determined by the site specific ecology and climate of an urban area. The role of urban green space, and urban forests is crucial within this. This is important given the large negative environmental impact that most cities currently have on ecosystems and therefore ecosystem service provision, and because healthier ecosystems enable humans to better adapt to climate change through creating potentials for increased resilience.

A comparative case study analyzing the ecosystem service of habitat provision in two existing urban environments with similar climates (Cfb according to the Köppen Climate Classification System) but on different continents, namely Wellington, New Zealand and Curitiba, Brazil was conducted to examine how the ecosystem services analysis concept can used to devise urban forest regeneration goals that support human wellbeing.

The paper concludes that although achieving habitat provision goals derived from ecosystem services analysis in urban areas is likely to be difficult, determining site and climate specific staged goals that are both quantitate and spatially explicit could enable urban design professionals to increase the effectiveness of conservation, regeneration, and creation efforts in terms of urban green space in relation to increasing the provision of ecosystem services.

Abstract ID: 6

Swiss strategy for recreation in forest

Clémence Dirac, Forest Division, FOEN, Bern, SWITZERLAND

The Swiss strategy for recreation in forest aims to promote a high quality ecosystem service of recreation. It makes a direct contribution to the implementation of the Forest Policy 2020 and links to various federal strategies and policies dedicated to health, sport, tourism, biodiversity and spatial planning. Placed under the aegis of the Federal Office for the Environment (FOEN), it was developed in consultation with external stakeholders.

The strategy outlines a vision that forests providing recreation are managed in a sustainable and holistic manner, promoting public health and physical activities, respecting the forest ecosystem and integrating an economic valorization of the forest ecosystem service (FES) of recreation. It includes six objectives and sixteen measures with recommendations dedicated to the different stakeholders.

For the realization of the strategy, the FOEN will implement the measures under the responsibility of the federal government. However, the roles of other stakeholders will be central. On the one hand, they can support the implementation of these federal measures, for example by interpreting the results at regional and local level and by implementing the findings and results within their sphere of influence. On the other hand, the strategy with its vision and objectives will form a thematically coordinated framework for additional, regionally differentiated measures of the stakeholders, which these can implement at their own discretion.

Abstract ID: 7

Speaking 'green': Finding a common language among stakeholders in urban park design and management

Francesca Ugolini, Istituto di Biometeorologia, Consiglio Nazionale delle Ricerche, Firenze, ITALY

David Pearlmutter, Ben-Gurion University, Midreshet Ben Gurion, ISRAEL
Giovanni Sanesi, Università degli Studi di Bari Aldo Moro, Bari, ITALY
Anna Steidle, World Urban Parks Association, München, GERMANY

Urban parks offer city dwellers a range of tangible benefits, and also provide essential ecosystem services. The management of these green amenities is often the responsibility of local authorities or other government agencies, and in order to be successful these public sector employees must cultivate interaction with other stakeholders – such as academic researchers and private practitioners – for the specialized knowledge they can offer. In this study, we examine the attitudes of these different actors toward professional collaboration and look for ways in which the transfer of knowledge can be made more effective. To this end, a worldwide survey was conducted among public and private-sector actors, with the survey sample based largely on the membership of the World Urban Parks (WUP) association. Our findings indicate that representatives of public agencies, due to a lower overall level of up-to-date knowledge, do indeed have a pressing need for productive collaboration with those in private practice, academic research institutions and community advocacy groups. The most highly valued mode of communication was found to be face-to-face learning, especially if it is interactive and imparts practical as well as theoretical knowledge. The most important factor noted by respondents for initiating new collaborations is personal contacts, which are considered more important than affiliation in particular professional or other organizational frameworks. Numerous respondents prioritized the possibilities for joint creativity as the most important benefits of collaboration. A number of obstacles to successful collaboration were also emphasized by the survey respondents, and these include cumbersome 'bureaucracy' and a 'divergence of interests or approaches among stakeholders.' The latter signals a crucial need for finding and developing a "common language" among different types of stakeholders, which can accommodate their divergent priorities and concerns. To accomplish this, a special role is envisioned for international professional associations – which can help build bridges not only between actors from different professions, but also from different countries and cultures.

Encompassing both benefits and trade-offs in the assessment of urban green infrastructure

Maria Beatrice Andreucci, Planning Design Technology of Architecture, Sapienza Università di Roma, Rome, ITALY

The capabilities of various stakeholders, in terms of being able to provide and communicate evidence of the multiple benefits produced by the urban green infrastructure (UGI) are increasingly of capital importance. This position critically considers various approaches, peculiarities and limits met by the diffusion of methods and tools aimed at assessing and prioritizing often only the economic costs of the urban design project. Among the objectives of the conducted research, the production and communication of evidence of the contribution of UGI to the creation of biodiversity, recreational, scenic and economic values in the transformation processes of the built environment, in terms of socio-ecological benefits, and more in general terms sustainability. The common concept of sustainability assessment has been considering extensively in the various definitions the three benefits categories environmental, social and economic, while the benefit interactions and trade-offs, implicit in decision making and design practice, are rarely tackled. In assessing 25 international UGI case studies, special attention has consequently been devoted not only to providing evidence of the various benefit categories, but also to the positive or negative co-relations and trade-offs among 557 environmental, social and economic landscape performances registered through the research.

The opportunities that come from framing UGI as a multifunctional network that forms an essential vital part of the city are immense. This require more than simply caring for the aesthetics of existing and future urban and peri-urban green spaces. Combining recreation with flood risk management, heritage with urban cooling, health promotion with economic growth and social inclusion imply re-consider the structural configuration of our natural capital, in terms of specific socio-ecological functions of our urban green spaces, just as we upgrade and adapt other forms of infrastructure. We also need to contemplate how to incorporate 'appropriate' nature into buildings and districts, and to define how the quality of the grey infrastructure of our streets and public realm could be improved through nature-based technologies and solutions.

We need to fundamentally rethink the way we plan, design, implement, and manage the city's green infrastructure. Particularly relevant in that direction is the adoption of holistic methods, tools and approaches enabling all stakeholders to establish - through appropriate science-policy-practice interfaces - comprehensive evaluation frameworks clearly indicating how best to progress towards balanced, inclusive and resilient urban ecosystems.

Abstract ID: 9

Comparing convenience and probability sampling for urban forest ecology applications

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Urban forests confer multiple ecosystem services within cities globally. There is thus a need to quantify this resource in terms of community structure and tree characteristics so that its benefits can be better understood in ecosystem service models, and to enable efficient monitoring and maintenance by municipalities. Full tree inventories are scarce due to time and financial constraints, thus a variety of sampling methods exist. Modern vegetation surveys increasingly use stratified-random plot-based sampling to reduce the bias associated with convenience sampling, even though the latter can save time and increase species richness scores. The urban landscape, with a high degree of conspecific clustering and high species diversity, provides a unique biogeographical case for comparing these two methodological approaches. We use two spatially extensive convenience samples of the urban forest of Meran in northern Italy and compare the community structure, tree characteristics and ecosystem service provision with 200 random circular plots. The convenience sampling resulted in a higher species diversity, incorporating more rare species, whilst taking relatively less time. Pseudorandom sub-plots were compared to the random plots revealing similar Shannon diversity and sampling comparability indices. Measured tree variables were also similar between the two methods but only when considering smaller pooled sample sizes, when the statistical power of the test is lowered. Ecosystem service model outputs were also comparable. The results suggest that convenience sampling may be a time and money saving alternative to random sampling as long as stratification by land type is incorporated into the design. The higher species richness can potentially improve the accuracy of urban ecological models which rely on species specific traits.

Abstract ID: 10

Producing tree maps for the park areas of Helsinki

Topi Tanhuanpää, Department of Forest Sciences, University of Helsinki, FINLAND

Ville Luoma and Markus Holopainen, Department of Forest Sciences, University of Helsinki, FINLAND and Juha Raisio, Urban Environment Division, City of Helsinki, FINLAND

Efficient maintenance of urban forests requires detailed an up-to-date information on the attributes of trees. Typically, the tree-level data have been collected manually. High costs often force the campaigns to focus on the most significant urban trees (i.e., roadside trees and trees in significant parks) and limit the possibilities in repeating the measurements. Large tree registers are expensive to set up but also to maintain. In terms of costs, remote sensing is the only viable option for producing tree-level information over large areas. In Helsinki, airborne laser scanning (ALS) has been utilized operatively in updating an existing tree register. Now, the ALS-

based individual tree detection (ITD) methodology was transferred from the roadsides to urban parks. In this study, we created an adaptive tree detection method for mapping trees from 2000 hectares of highly diverse park areas.

The study area was first divided into three strata according to ALS-derived canopy cover and mean height. 38 field plots were distributed between the three strata with respect to their prevalence. All plots were scanned with terrestrial laser scanner (TLS) and tree maps were created from the georeferenced TLS point clouds. The tree maps were field-checked and any missing trees were added manually to the final maps. Reference tree diameters at breast height (DBH) were measured from 925 trees using steel caliper. The field data were used in three ways. First, tree maps were used in finding the optimal ITD method for each stratum. Second, the measurements were used as training data for non-parametric estimation of DBH. Third, plot-level mean values of stem count, mean, minimum, and maximum DBH were used in evaluating the quality of the overall procedure.

In total, 350.000 tree crowns were detected. The root mean square error (RMSE) of plot-level stem count was 12.7 (52.2%) and bias 2.1 (8.6%). The tree-level RMSE of DBH was 10.0 cm (36.0%) and bias 0.17 cm (1.0%). In addition to the previous, also tree height, crown area, and crown volume were determined from the point clouds for all trees. Tree-level estimates on crown volume and area were transformed into area-level estimates, describing the amount of green foliage provided by the park trees. The estimates on canopy height and volume can be utilized in, e.g., biomass mapping. The accuracy of all tested ITD methods varied considerably between different types of park areas. Hence, the possibilities of pre-stratifying urban areas prior to ITD should be studied further.

Abstract ID: 11

Urban forestry: The Canadian way

Cecil Konijnendijk, Forest Resources Management, University of British Columbia, Vancouver, CANADA

Canada is the world's second-largest country and has vast forest and other natural resources. However, over 80% of the Canadians lives in cities and towns, and the country has several large urban agglomerations, such as the Greater Toronto Area and Metro Vancouver. Canada's urban populations are culturally diverse, and rapidly changing due to immigration.

This presentation looks at the current state-of-art of urban forestry in Canada. The concept of urban forestry was originally coined by Professor Erik Jorgensen at the University of Toronto. However, urban forestry activities have been limited for quite some time, especially in terms of a national-level approach, joint standards for urban tree management, legislation, etc. Recent years have seen a change in this, for example through the work of the Canadian Urban Forest Network and urban forestry programs at universities like the University of British Columbia.

Current policies, plans, networks and other initiatives in Canadian urban forestry will be presented. Leading urban forestry programs in selected cities will be discussed. Moreover, the ongoing efforts to enhance education, training and recognition of urban foresters in Canada are highlighted.

Abstract ID: 12

Greener, healthier and happier cities for all: an international perspective on urban forestry

Simone Borelli, Agroforestry and Urban/Peri-urban Forestry Officer, Forestry Department, FAO

According to recent estimates, 70% of the global population will live in cities by 2050, with most of the growth occurring in less developed countries. In fact, it is estimated that 90% of new urbanization will occur in Africa and Asia. While urban forests and green infrastructure are increasingly becoming a standard component of urban planning in developed countries this is not yet the case in many less developed countries, where income is highly diversified and social equity has glaring discrepancies. Urban development often results in the depletion and degradation of natural ecosystems in and around urban areas, the drastic loss of vital ecosystem services and, potentially, little resilience to disturbances, such as those caused by climate change. As the world continues to urbanize, sustainable development challenges will increasingly concentrate in urban areas, particularly in lower- and middle-income countries, where urbanization has often taken place rapidly, spontaneously and with insufficient strategic planning, resulting in unsustainable patterns of land use.

Boosting urban and peri-urban forestry implementation requires efforts to raise awareness of decision takers at all levels on the benefits of UPF and to transfer lessons and expertise to less developed countries, where the predicted increase in urban population will have more severe socio-economic and environmental impacts. The FAO *Guidelines on Urban and Peri-urban Forestry* are a first step in this direction. It is now essential to provide adequate follow-up and to transfer lessons learned through research and practice to the fast-growing cities of the developing world. Building on the lessons from EFUF and other networks such as the Silva Mediterranea Working Group on Urban Forests, FAO has supported the organization of regional meetings in Asia (China 2016, Korea 2017) and in Latin America (Peru 2017).

The encouraging results of these regional initiatives had led FAO to join forces with a number of partners to organize the Mantova World Forum on Forum on Urban Forests, which will bring together local authorities, urban foresters, arborists, landscape architects, urban planners and many other stakeholders to discuss multidisciplinary solutions for greener, healthier and happier cities. The aim of this first Forum is to highlight positive examples of planning, design and management approaches of cities with diverse cultures, forms, structures and histories, which have used urban forestry and green infrastructure to develop economic and environmental services and to strengthen social cohesion and public involvement.

Abstract ID: 14

Tree Officers: Custodians of the urban forest

John Parker, N/A, London Tree Officers Association, London, UNITED KINGDOM

This presentation will look at the role of the tree officer in urban forestry in the UK. It will explore the importance of local authority tree officers, their roles and responsibilities and their place in the structure of local government. Tree officers are a critical part of UK urban forestry across all areas of planning, participation and management. They have responsibility for planning and implementing arboricultural and urban forestry

practices in order to maximize ecosystem services delivery whilst also balancing the safety requirements of trees in public spaces. They are often the first, or only, point of contact between the general public and the arboricultural industry.

The presentation will address the changing nature of the position of a tree officer and the multi-skilled nature of a vocation which is often underappreciated by politicians, residents and even some within our own industry. It will describe some of the challenges currently faced by tree officers; including reduced budgets and staffing levels, increased workloads and the threats posed by pests and diseases, development, highway works and other pressures. It will also explore the opportunities of tree officer work and some of the positive elements of this fantastic profession.
It will focus to a large extent on collaboration; this will include the importance and role of tree officer groups and describe the significance of the annual National Tree Officer Conference. It will describe the value of technology in bringing tree officers together, as illustrated by national tree officer group conference calls. This presentation will also highlight some of the success stories of tree officer work, including valuable tree officer contributions to biosecurity, policy, contracts and the political sphere. It will be a celebration of – and showcase for – the tree officer profession and an example of the determination of tree officers to feature on the international stage.

Abstract ID: 15

Oak decline: diagnosing and managing a complex of disease, insect, and environmental factors.

Chelsi Abbott, Davey Institute, Davey Tree Expert Company, Chicago, USA

Symbolizing strength and vitality, oaks are incredibly desirable trees in urban landscapes. However, in recent years many oak trees have been in decline. In general decline is the loss of vigor in trees overtime due to stress and typically can be managed by addressing the negative cultural conditions that come with being planted in the urban landscape. But with oak decline it is a complex of insects, fungi, and environmental factors that interact to bring about severe damage and eventual death of the tree. Since oak decline can be caused by any combination of biotic and abiotic factors, proper diagnosis before management is key.

This talk will aim to cover the diagnostics of key oak problems, such as two-line chestnut borer, wood decay fungi, foliar pathogens, and cultural conditions to understand how these problems interact and attribute to oak decline. Furthermore, management practices discussed will be focused on a holistic approach using traditional and experimental methods. The use of pesticides alone when dealing with oak decline is often inadequate, and further measures that address abiotic issues need to be taken. Some of these methods can be the integration of soil amendments, applying plant host defense activators, or plant growth modifiers. The presenter will aim to discuss all these tactics using observations of oak decline management collected from the Midwestern and great lakes region of the United States.

Turning grey into green: urban regeneration to surge soil ecosystem services

Francesca Ugolini, Institute of Biometeorology, National Research Council, Firenze, ITALY

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Urban sprawl and soil sealing are among the main causes of soil degradation and loss (Urban Sprawl in Europe, the ignored challenge, 2006; The European environment – State and Outlook, 2010 and 2015). In Italy, 5-6 hectares of soil per second in the last decade have been lost for urbanization (ISPRA, 2017), diminishing the capacity to provide essential ecosystem services. Indeed, soil provides food, allows the growth of trees that in turn provide further services. Soil is important for regulating water and energy fluxes, and thanks to the vegetation, serves to ameliorate urban microclimate and generating wellbeing. For all these reasons, also in urban contexts soil protection is dramatically important. In order to reach this objective, different actors including policy and decision makers, scientists and no profit organizations are involved in SOS4LIFE project, funded under the Life+ Programme [LIFE15 ENV/IT/000225]. The main aims of the project are:
• demonstration of the effectiveness of an innovative system of "surface credits" as compensative measure to soil loss: new building sites in the municipality are allowed only if the excavated topsoil can be reused, generating new urban green areas;
• assessment of soil ecosystem services (e.g. carbon storage, water storage and percolation), in an urban area (specifically, the town of Carpi) (results not ready yet).

De-sealing and regeneration actions are carried out in three municipalities of Emilia Romagna Region, in which three 'grey' sites are transformed into green areas, reusing agricultural topsoil dug in the suburban area. The conference work describes the results of the topsoil assessment as substrate for ornamental plants, compared to the technosol extracted from underneath built surfaces (e.g. asphalt), because roots of the new planting, will likely explore both soils at different depths.

In the de-sealing site of each town, topsoil and technosol were tested in two plots with two species (*Viburnum tinus* and *Eleagnus x ebbingei*) in three replicates. Monitoring of soil characteristics and plant growth and leaf gas exchange, is carried out regularly. The preliminary results show that despite the two species are low demanding, plant performance on technosols shows better trends. This suggests that the technical guidelines for the regeneration of grey urban sites, should take into consideration the topsoil characteristics for undertaking concrete decisions such as irrigation and selection of most suitable species. In addition, the results show that, under certain circumstances, also the technosol, if free of contaminants, may be a valuable substrate for plants.

Steps towards the resilient city: DeepGreen – a new way of combining SUDS and urban trees. The first lessons from Copenhagen.

Wyatt Harding, Milford, Værløse, DENMARK

Healthy trees within our cities contribute in many different and unique ways. They have a huge potential to provide essential ecosystem services in the urban areas, as well as supporting our need to continuously adapt to a changing climate. By integrating urban trees and SUDS, allowing the trees and tree pit to be an essential part of creating a resilient city. By combining trees and water retention we have taken one step further towards sustainable green streets, retaining and holding back stormwater to reduce the volume that enters the storm sewers.

This paper presents preliminary findings and lessons aimed at transferring and developing existing knowledge and practices on urban trees and SUDS into DeepGreen, based on a Scandinavian context. The findings are based on different Copenhagen case studies. These projects were designed to illustrate how the combination of urban trees, planted in a suspended pavement system, and SUDS work together to form a storm water management system suited to densely populated areas, and its integration in a cloudburst management plan. The paper includes aspects in relation to improving future tree vitality by increasing tree pit size, providing sufficient and uncompacted soil for root growth, and meeting the needs for sufficient irrigation, as well as the challenges with surface runoff containing sodium chloride used on roads and sidewalks during winter. Copenhagen city, SWECO, Opland Landskabsarkitekter and Milford collaborated to design a tree pit that handles the water from a road in Copenhagen. Using this research, we have adapted the design of tree pit and inlet to improve water flow, control sodium chloride levels and tree health. Tree pits (tree trenches) perform in a similar way to other infiltrations elements, ego. basins or vegetated swales, regarding infiltration, biofiltration and storage. By handling the water locally, we can maximize the benefits of urban trees, as well as improving quality of life in the city.

The recent installation in Copenhagen has demonstrated the practicality of an integrated design to improve the city with healthy trees and improved rainwater management. It has also resulted in more resources being allocated to trees.

The conclusion is that urban trees integrated into SUDs practices have great potential to be widely integrated into climate adaption projects. It has the potential to improve future tree vitality, sustaining better root development as well as offering sufficient storage and adequate biofiltration of storm water.

Abstract ID: 18

Where are the hotspots and coldspots of visitor use, social values and biodiversity in an urban forest?

Silviya Korpilo, Department of Environmental Sciences, University of Helsinki, Helsinki, FINLAND

Joel Jalkanen, University of Helsinki, Helsinki, FINLAND; Tiina Saukkonen, City of Helsinki, Helsinki, FINLAND; Tarmo Virtanen and Susanna Lehvävirta, University of Helsinki, Helsinki, FINLAND

In this presentation, I will discuss the scientific knowledge and practical experiences gained from a four-year collaborative study in Helsinki's Central Park. I will present the use of a web-based public participation GIS (PPGIS) data collection method combining smartphone GPS tracking, drawing of routes and a questionnaire that gathered useful and up-to-date citizen data on the density, distribution and motivations of visitor use. The results provided enhanced understanding of the general and group specific patterns in spatial behavior for the new management plan of the area. In addition, the visitor use data was integrated with other spatially-explicit social and ecological information in order to investigate the guidance that the different types of data, and their integration, can provide for landscape planning. More specifically, we examined the relationship and spatial concurrence between actual use and perceived social values of local citizens, and urban biodiversity (assessed using forest inventories and expert elicitation). We found weak correlations and low mean spatial overlap between the social and ecological data, indicating high complementary importance to multi-criteria spatial decision-making. Further, there was a moderate level of spatial agreement between the ecological datasets, while the social datasets were negatively correlated and showed very limited overlap. The latter indicates a potential 'value-action' gap in the everyday public use of urban green spaces and the necessity of including visitor movement as an equally powerful complementary variable for informing forest planning and management. The resulting hot/coldspot maps were used to inform planners on overall social and environmental quality of the landscape, and point out potential threats to specific areas due to intensive recreational use. Such co-produced knowledge is crucial in order to maintain and protect forest natural resources, while catering for visitor activities and needs.

Abstract ID: 19

Integrating multiple societal demands in the management of urban proximate woodlands - a summary of the Munich "Urban Forests 2050 Project"

Gerd Lupp, Strategic Landscape Planning & Management, Freelancer/Technical University of Munich, Denzlingen, GERMANY

Stephan Pauleit, Strategic Landscape Planning & Management, Technical University of Munich, Freising, GERMANY

Forests and woodland fulfill numerous ecological, social and economic functions in densely populated urban areas. A core challenge for forest management in urban areas is to respond to increasing demands of society like recreation and to safeguard other goods and services. Between 2013 and 2017, the Urban Forest 2050 project assessed how the various demands and needs of society can be better integrated in multifunctional forest management. Forests in the greater Munich area, but also urban proximate woodlands in Gerolzhofen and Augsburg served as case study areas.

First, it was analyzed how different societal groups use urban proximate woodlands for recreation and how these groups perceive the forests and their management. Both quantitative (e.g. visitor counting using camera traps, monetary value of recreation) and qualitative methods (such as Photovoice) were used. Also owners of urban proximate woodlands were interviewed about their demands and management goals. Finally, participatory scenario techniques were used to develop management scenarios for urban proximate woodlands. Based on public opinions and wishes of stakeholders, one-sided forest treatment concepts were developed and modeled using the forest growth simulator SILVA 2.2. Impacts of these different forest management programs on selected ecosystem services were assessed.

It could be shown that recreation numbers were highly frequented also during the evenings and even at nighttime and there is a significant share of joggers and walkers and calculated economical values for recreation outscores other goods and services for larger forest complexes. Although interviewees express preferences for "wild" forests even next to the city, all forest types are liked for recreation. Forest management activities are often perceived as threat to the forests and associated with giving way for new construction. Interestingly, provision of timber is of rather little importance for owners of urban proximate woodlands. Own recreation and enhancing regulating services are considered most important.

Assessing the communication of a forest authority, a good position can be reached proactive communication seeking for support of relevant groups instead of reacting to negative press and better involvement of the society in decision processes. A tool for participatory approaches can be participatory scenario work and serve as eye-opener especially for one-sided demands of different interest groups. Weighting goals and objectives, offsets, tradeoffs and their consequences can be described and discussed to gain broad acceptance for management concepts this way.

Urban Tree Policy

Minna Terho, Urban Environment Division, City of Helsinki, City of Helsinki, FINLAND

Trees are a living asset in the built urban environment that should be taken into consideration in all actions throughout the long life span of the trees. In Helsinki the need for an Urban Tree Policy has arisen for many different reasons. A major inventory of Helsinki's street trees in 2010-2011 highlighted the need for better planning and predicting for maintaining and regenerating the rows of street trees and tree-lined alleys in the city. With the increase in subcontracting, Helsinki's trees will most likely be tended to by subcontractors, who may change frequently. For such contractors, clear contract documents and guidelines for maintaining urban trees must be drawn up. In addition, the threats and opportunities of climate change should also be considered when selecting tree species. Efforts must also be made to help residents understand the needs of urban trees. In recent decades, e.g. the regeneration of certain tree-lined alleys in Helsinki that are important for both the cityscape and for residents has become topical. The regeneration of these alleys has created a lot of feedback, and these projects have taken a long time and a lot of work.

The Urban Tree Policy is a declaration of intent regarding urban trees. The main objective of the policy is to secure the vitality of Helsinki's urban trees, the values attached to them, and the ecosystem services provided by them through co-operation between the services within the Urban Environment Division of Helsinki. The policy consists of eight strategies to fulfil the main objective. A long-term vision has been defined for each of the eight strategies. In connection with these visions, a list of methods is presented by which, if systematically followed, the vision can be achieved or maintained.

The Urban Tree Policy applies to trees planted in the built environment that are owned by the City of Helsinki i.e. street trees and park trees. Trees growing in forest areas are not included in the policy. The administration of urban trees has been divided into eight sub-sections within this policy: 1) awareness and appreciation, 2) cultural heritage and cityscape, 3) biodiversity, 4) the selection of tree species, 5) planning and design, construction and permits, 6) maintenance of the trees, 7) tree rows and alleys and 8) asset management. A strategy has been defined for each of these sub-sections to help achieve the main objective. Key words: urban trees, asset management, tree policy, park trees, street trees

Abstract ID: 21

Recreation infrastructure and urban forests attractiveness on the example of Mazowiecki Landscape Park

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Recent years in Poland rapid development of tourism and recreation in the forests could be observed. This process is directly related to the growing importance of social functions of forests, including recreational functions. The role of forests in creation favorable health and recreation conditions for society, especially in the vicinity of large cities is clearly increasing. At the same time, due to the fact that tourism and recreation may pose a threat to the forests, it is necessary to properly channel the tourist traffic in the forest. The basis of such action is the identification of the needs and expectations of the society. Social expectations are changing under the influence of many factors, one of them may be the development of specific types of recreational infrastructure. The aim of this paper is to present the changes in the preferences of people vacationing in the forests of Mazowiecki Landscape Park (MPK) in the years 2000 - 2012.

Mazowiecki Landscape Park in one part is located in the borders of Warsaw- capital city of Poland. The study covered the preferences for the frequency and duration of rest in the forest and the places and forms of recreation, carried out in the MPK forests. These preferences were established on the basis of surveys conducted in the field. In 2000, a questionnaire was sent to 755 people vacationing in the MPK forests. In 2012, the survey covered 390 people vacationing within MPK. The survey involved people over 18 years of age. Preferences of respondents in both studies were compared using the test of chi-square Independence. The results showed that within twelve years the preferences of respondents in the frequency range of leisure, choose the place and forms of recreation have changed significantly. There was an increase in the number of respondents frequently consuming MPK forests for recreation and leisure interested in areas equipped with appropriate recreational infrastructure. The share of respondents making such recreational activities in forests as horse riding, cycling and observing nature has significantly increased. While the preferences for the duration of rest in the forest have not changed. Still MPK forests are primarily a place of weekend rest. The results indicate that the preferences of recreational users of the forest are largely related to the scope of access to and management of the forest.

Key words: tourism and recreation management, forest utilization, social preferences, leisure in forest

Abstract ID: 22

Disentangling the connections: a network analysis of approaches on urban green infrastructures

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During the last two decades, a mounting body of research has emerged on the value, use and overall importance of urban green infrastructures. From the contribution to human well-being and sustainable development, urban green infrastructure places itself as a relevant concept within ecosystem services and nature based solutions.

Our research objective is to identify the main approaches on urban green infrastructure, while accounting for different comparative criteria such as subject of analysis, location or scale. We used a meta-analysis of scientific literature in order to identify trends on urban green infrastructure research. We designed a study consisting of peer-reviewed articles and conference proceeding, published between 2005 and 2017 and listed in Science Direct database. We checked the database by topic (in abstracts, title, keywords) using urban green infrastructure as a search term and we identified 497 peer-reviewed articles and conference proceeding that fit the criteria, of which we validated 490 papers that included keywords and focused their analysis on urban green spaces. We used social network analysis to identify significant patterns on the frequency of keywords used in the literature. We used UCINET 6.631 to calculate the centrality metrics and Netdraw 2.161 to map the network of keywords. Our main results identified the most used, powerful or influential keywords, while comparing the European network with the rest of the world. We found that green infrastructure, ecosystem services, urban forestry, green roofs, green spaces and urban green spaces are the most used keywords in the ongoing body of literature.

Our study tries to better understand the directions used so far to analyze urban green infrastructure and the differences that occur between areas or the scale of analysis. Main findings suggested by our results could anticipate shortcomings or future research, while better establishing the importance of urban green infrastructures as nature based solutions.

Abstract ID: 23

The Redevelopment on Aucklands Waterfront, has seen the implementation of innovative green technology to show case how plantings of native trees and shrubs can help with storm water management.

Howell Davies, Parks, Sport, Recreation, Auckland Council, Auckland, New Zealand

The aim of the master landscape plan for the Wynyard quarter, on the waterfront in Auckland, New Zealand; was to establish native endemic plantings along each street to form green bio diverse linkages across an industrial area that is being converted to intensive apartment and high rise developments. The planting of the contaminated land on Auckland's waterfront has proven to be a major challenge and an opportunity. The

project has included the relocation of mature trees weighting up to 18 tones. The development area had seen the use of 5 star energy rated technology in new buildings, alongside refurbishment of some of Auckland's early maritime history. The use of soil vaults, and structural cells has enabled tree and shrub plantings to be used to assist in storm water management. The rain gardens in Wynyard Quarter provide a range of environmental services. The study has been developed over a 7-year period and is ongoing. The work involves tracking the growth and development of a range of native trees over 5 major streets. The data being collected on native tree growth rates in the urban redevelopment will help inform future tree planting programs. The study has included the measurement of the soil hydrology in the rain gardens, and planter chambers to provide an analysis of the soil biology, its porosity, and ability to cope with storm water inundation. The presentation gives an overview of the areas redevelopment, the design of large liner planting areas for trees, the relocation of large semi mature trees to preserve canopy cover and landscape values, along with the challenges of designing planting chambers to sustain trees in heavily contaminated soils, on reclaimed land. The study is ongoing and aims to help provide the data to show the value of greenery in urban spaces; and how it can help to promote and provide biodiversity, amenity and environmental services.

Abstract ID: 24

Planning the green and blue network city - Green Areas Strategy for Helsinki

Maria Jaakkola, Urban Environment, Helsinki City, Helsinki, FINLAND

The recent citywide Master Plan for Helsinki aims at an increase of 40% in population by the year 2050. Following a climate smart urban ideology, the city grows inwards along the network-like rail traffic connections. Green areas offer recreational possibilities, foster biodiversity and sustain cultural heritage. The closer green areas are to citizens, the more they are used, and the more health benefits they can provide. Recognition of the values of urban green landscape ensure livability and is essential for successful city planning. Green network of a growing compact city must be proactively planned for better accessibility, diversity and quality - ecological, functional and experiential. Green areas planning must be integrated with land use and traffic planning in order to achieve its full potential.

Helsinki's Green Areas Strategy (VISTRA) envisions a resilient future city with equal access to recreation and historically layered landscape creating identity. Abundant green infrastructure for storm water management, natural shoreline and versatile urban nature help to respond to climate change challenges. Forested areas sustain the natural cycle, as does the network of rivers, streams and creeks. Park hierarchy articulates prioritization and successful programming.

In the consequent Open Space Plan, the Green Fingers - green wedges extending from seashore to forest and on to the neighboring cities, together with the Blue Palm - seascape with coastline and islands, form the backbone of the green areas system. Complemented by neighborhood parks, green connections and local parks they form an integrated network. Each of the six Green Fingers is developed according to their character. For instance, the Central Park as the forested spine of the city, extending from the city core to the forest, and Helsinki Park as an overview of original Helsinki landscapes, merge to form an inner blue-green belt of the city. Increasing population increases the pressure on green areas, and a denser city requires increased economical assets for their management. Quality replaces quantity, but as urban woodland offers diverse recreational possibilities with low cost, it must have a role also in the future city. The contact with living things in a particular Helsinki way must be cherished in the city's future to fully benefit from the healing capacity of urban nature.

Abstract ID: 25

Nature management policy - Increasing urban biodiversity and recreational values in Helsinki

Tiina Saukkonen, Urban Environment Division, City of Helsinki, HELSINKI, FINLAND

Helsinki is a growing city with very rich nature elements. This presentation introduces the ecosystem services in Helsinki area and the planning and management methods that are used to maintain them. The biodiversity of the urban green areas of Helsinki has increased during the last couple of decades. The Nature Management Policy and the Nature biodiversity program, which were made 10 years ago, have successfully improved the quality of nature values and rare habitat sites. Same time the urban forests and the other natural green areas of Helsinki have been managed for recreation.

In Helsinki the nature is close to citizens. Literally it opens on their doorway. The most popular outdoor recreational sites are the nature areas either in the forests or on the sea shore. The most important mission in nature management policy is to maintain recreational areas for people to use. The main ideas and processes of the planning and management of nature green areas are shown in the presentation. The public involvement plays an important part in the policy. Digital map based internet surveys are an effective and popular tool used in Helsinki. During last decade this tool has been continuously developed. Discussion with the people is also important either in the meetings or on the forest trails.

Forest network has risen up as an important green element in the city structure of Helsinki. But how can we conserve it at the same time when the city is constructed? As one answer to this question we have developed a new tool in city planning to evaluate and develop the forest connections.

At the end of the presentation there is a short introduction of Uutela's Landscape management and development plan 2017-2026. Uutela recreation area is a place, which we are going to visit on Friday morning.

Abstract ID: 26

Developing a pragmatic approach for selecting trees to counter the urban heat-island effect

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Currently, around half of the world's population live in urban environments; a figure that may double by 2030. Urbanization poses serious challenges to human health and well-being, including air pollution, separation from the natural environment, and increased average air temperatures relative to rural settings due to the urban heat-island effect.
Large conurbations are particularly vulnerable to the urban heat-island effect. The effect is exaggerated during heat-wave conditions and may be amplified with climate change. Elevated temperatures pose health risks, especially to the very young, the very old, and those with existing cardio-respiratory health problems.

Increasing the extent of vegetation and – especially – tree canopy cover is widely regarded as one of the most cost-effective ways of moderating urban temperatures. Trees cool their surroundings by casting shade, reflecting solar radiation, transpiring, and intercepting rainfall that subsequently evaporates. However, trees' potential to reduce the urban heat-island effect is underutilized. This may be, in part, due to a lack of understanding of which tree species should be selected for planting in order to provide greatest potential cooling.

This study aims to synthesize understanding of the relative abilities of different tree species to provide urban cooling in temperate regions. Based upon the literature and interviews with leading experts, a series of scenarios are developed to illustrate the impacts of cooling mechanisms provided by trees and tree species' attributes on urban temperatures. The scenarios are used to propose simple equations for comparing the relative abilities of tree species in relation to three of the cooling mechanisms: transpiration, reflection and shading. Evaporation was not considered, as it is unlikely to significantly impact on the urban heat-island effect in temperate regions.

The simple equations utilize the common parameters of: tree height, crown diameter, canopy aspect ratio, leaf area index (LAI), growth rate and albedo. Where data exists, empirical values can be inserted in the equation or, where they do not, relative values can be estimated. The latter ensures that the approach is pragmatic and accessible to all users who wish to choose those trees with the greatest cooling potential. Development of the approach has highlighted that leaf area (based on crown diameter and LAI) is important for all three cooling mechanisms, so its use may encourage planting of large trees that also deliver a wide range of other ecosystem services contributing to people's well-being in urban areas.

Abstract ID: 28

A new northern forest - an engine for the unification and regeneration of the poly-centric regions of the North of England.

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The north of England is changing fast, and the need to respond quickly to this has been acknowledged by HM Government. Significant growth, investment and infrastructure is planned for the Northern Regions, and the Northern Forest is a major 25-year project that has been launched to compliment this growth, and deliver major environmental, social and health benefits, both to the existing 13 million population and the expected 650,000 additional homes that are planned for the regions. The Northern Forest has been endorsed in the media by the UK's Prime Minister, and has been included in the recently published (January 2018) HM Government's 25-Year Environment Plan.

The Northern Forest will extend from the Liverpool Region in the west across to the region of Kingston upon Hull in the east. A wide range of partners are already involved in the project, but the core partners are the Mersey Forest, City of Trees (Manchester); the White Rose Forest, the South Yorkshire Forest, HEYwoods (Hull) and the Woodland Trust, the UK's leading woodland charity. England's Community Forests have been successfully delivering new woodland in and around some of the UK's major towns and cities for many years, and the Northern Forest will build upon this provision by engaging with and applying more resent research to the planning and design of the forest.

This new Northern Forest will engage with the creation of badly-needed new urban forestry, peri-urban forestry and woodlands, as well as supporting the sustainable management of existing areas of woodland. The project will deliver a better environment for all - it will improve the quality of the urban air in the towns and cities; reconnect people with nature; help to deliver improvements to health and well-being by providing welcoming

and accessible local green space; help to mitigate flood risk in key catchment areas and support the rural economy through tourism, recreation and timber production.

This paper will enlarge upon the thinking and research behind the concept of the Northern Forest in general, but will concentrate specifically upon the work of the White Rose Forest, the community forest that covers the Leeds City region. The City Region Authority already acknowledges that the Northern Forest has huge potential to be one of the City Region's defining characteristics, which will help the economy to prosper, enable people to enjoy a greater quality of life, and further enhance and utilize the natural capital of the region.

Abstract ID: 29

Analysis of factors determining the accessibility of Warsaw's urban forests for people with disabilities

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In Poland in 2011, the number of disabled people amounted to 4697.5 thousand (12.2% of the total population). For this social group, being in the natural environment helps to recover physical and mental fitness. It is believed that being in the forest area for people with disabilities is a part of their rehabilitation.
Majority of people with disabilities live in cities, as it is associated with better access to health centers, rehabilitation centers and educational centers. The research shows that people with disabilities as well as caregivers most often rest on green areas situated close to the place of residence. That is why it is so important to take into account the needs of disabled people in the development of urban forests. It should be emphasized that the adaptation of recreation infrastructure to the requirements of people in wheelchairs means also taking into account the needs of other groups such as elderly people, or caregivers with prams.
Forests in Warsaw occupy nearly 8,000. ha, which is about 15% of the city's area. Warsaw city council manages 17 forest complexes, the vast majority of which are made available to residents of the capital. On the basis of research carried out among disabled people and their carers, a list of factors conditioning the adaptation of forests to the needs of disabled people was drawn up. Then four complexes were selected at random - two entirely located in the city (Bielanski Forest, Forest on Kolo) and two located on the border of Warsaw (Kabacki Forest, Bemowo Forest), the degree of adaptation to a relevant social group was analyzed, as well as the possibilities of making an adaptation.
Important factors for people with disabilities include good communication of the forest, good technical condition of walking paths, appropriate technical parameters of paths, location of many recreational facilities near the entrance and adapted equipment such as tables, sheds, and playground equipment for children.
Unfortunately, none of the analyzed forest complexes fully meet the expectations of disabled people or their carers. Parking lots are not available in all complexes, there is also no possibility of locating various recreational facilities in close proximity to one another. There is no adapted recreational equipment.
1. As part of recreational development of urban forests, the needs of disabled persons should be taken into account.
2. Not all expectations of disabled people are possible today.

Abstract ID: 30

Habitat restoration using defragmentation techniques in the Sonian forest (Brussels)

Andreas Baele, Agency for Nature and Forests, Flemish Government, Hoeilaart, BELGIUM

Close to Brussels the Sonian forest stretches out over an area of around 5000ha. Since the forest is so close to the capital of Europe/Belgium, there are a lot of conflicts between the forest, transport infrastructure and recreation pressure. Despite its big natural structure, the habitat Sonian forest is divided in several smaller entities. These entities are separated by harsh barriers like motorways (more than 30kms) and railways, which are insurmountable for most animals and therefore they live in separate populations that can be threatened.

One of the challenges in the Sonian forest is that the forest is situated in separate jurisdictions: Brussels (38%), Flanders (56%) and Wallonia (6%). Therefore, an interdisciplinary partnership across these jurisdictions was set up between the Agency for Nature and Forests, the Agency for Roads and Traffic, the Brussels Institute for Environmental Management, the Department of Environment and the municipalities of Overijse, Tervuren and Hoeilaart.

The Life+OZON-project wanted to create a structural approach to defragment the Sonian Forest. To reconnect the ecological hotspots not only by means of ecological infrastructures, but nature-friendly and adapted forest management (restoring forest edges, creation of open areas, ...) is also important. Next to this the project also aimed to redirect the recreation to less sensitive areas. These measures and the maintenance of them will be included into the forest management plan. Apart from all the measures taken, the monitoring of these ecological infrastructures was also included in the project.

The project includes the construction of an ecoduct, 24kms of ecofence, a tree bridge and three ecotunnels and the restoration and ecological adaptation of 18 existing tunnels. Apart from defragmentation measures around the highways, a study was made to defragment secondary roads. The railroad running through the Sonian Forest has already been defragmented by means of tunnels, an ecofence and an ecoduct.

The results of the impacts are clearly visible in the monitoring of the ecological infrastructures and eco-profiles and their evolution within the forest. Furthermore, the socio-economic impact was monitored. When planning urban forests, a structural approach to fragmentation problems is highly important. A defragmentation project should definitely include: ecological infrastructure, adapted forest management, recreation guidance and monitoring.

Keywords: Defragmentation, ecological infrastructure, Sonian forest, ecoduct, recreation guidance

Abstract ID: 31

The occurrence and detection of de-icing salt damage in Helsinki street trees

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De-icing salt (NaCl) used in cities in wintertime may spread to urban green and cause stress and damage to vegetation mainly through Na and Cl toxicity. In 2013-2014, the City and the University of Helsinki Forest Sciences dept. together investigated de-icing salt damage in *Tilia* street tree plantings, aiming to identify the most problematic areas and understand how site factors affect the severity of symptoms.

In 2017, optical detection of de-icing salt was tested on one of the previously identified sites exposed to medium level of salt damage, with the eventual aim to pinpoint salt stressed trees from remote sensing data. Optical indices such as photochemical reflectance index (PRI) and ratios between fluorescence at different wavelengths (e.g. red to far-red F ratio) can be used to indicate stress levels experienced by plants and measured at different scales from leaves to aerial surveys and remote sensing.

In 2013-2014, soil and leaf samples were collected from 15 sites with varying de-icing salt exposure in May, June, August and November. Soil samples were analyzed for Na, Cl, organic matter content, EC and CEC. Trees on these sites were visually assessed for damage and leaf samples were analyzed for K, Na and Cl concentrations. Trees on five sites had severe de-icing salt damage based on leaf Na analysis and soil Na levels were high on eight sites. In leaf analysis, Na concentrations over ca. 2 mg g-1 d.m. were related to low K levels. Tree salt damage and soil Na levels were concentrated on high traffic areas, such as city entry roads. Trees in connected, open planting strips tolerated high soil salinity better than trees in individual planting areas surrounded by sealed surfaces.

The optical detection of de-icing salt in *Tilia* on leaf level was tested in June and August 2017. Based on the previous investigation, three trees representing three different exposure levels were selected from one site. Leaves were collected from sample trees and measured for optical variables: chlorophyll fluorescence, reflectance spectra, absorbance and transmittance. Optical indices were calculated from the measurements. Leaf chlorophyll, Na, K, and N contents were also measured and compared to the optical indices. A fair Spearman correlation (June: -0.78, August: -0.80) was found between PRI and Na level, indicating PRI could be used to identify salt damaged trees. We aim to measure PRI from a drone and relate attained data to leaf Na levels in summer 2018.

Evaluating the impact of i-Tree Eco on urban forest management in the UK

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The benefits that urban forests provide to society – also known as ecosystem services - are increasingly being assessed and valued. The common aim of ecosystem service valuations is to improve management of environments. By providing information on the quantity and value of ecosystem services, these benefits can be incorporated into decision-making and justify greater protection and enhancement of environments. Despite the growth in environmental valuation, there has been little evaluation of whether projects that value ecosystem services achieve their aims and objectives and lead to improved management. This study sought to address this gap for urban forest valuation based upon use of i-Tree Eco in the UK. i-Tree Eco is a tool used worldwide to assess the composition, structure and value of urban forests and has been applied in over 20 locations in the UK, since its first use in 2008.

This study aimed to explore the type and extent of impact generated from i-Tree Eco projects associated with attitudes, policies and management of the urban forest, and further identify what factors either inhibited or supported achievement of impact. The study focused on six UK i-Tree Eco projects and used an impact evaluation framework to examine impacts across five impact areas. Evidence of impact was gathered from a literature review, 27 one-to-one interviews with stakeholders, and 40 responses to an online questionnaire.

The study found that i-Tree Eco projects differed in the range and extent of impact achieved. Some projects achieved the aim of supporting improved management by feeding into new policies and strategies and securing investment for the urban forest. Others saw little impact on urban forest management. A range of factors were identified which constrained impact generation, including limited planning for the use of the project results, limited communication of findings, and lack of political support and resources. However, a number of good practices which supported impact were identified, along with recommendations for future projects.

This research represents the first known multi-project evaluation of the i-Tree Eco tool. Our findings provide important insights into how project design and delivery can affect impact generation and can be used to improve future environmental valuation studies to achieve greater impact.

Urban forests –biodiversity hotspots for wood-decay fungi

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Urban forests are conventionally considered as deteriorated habitats with low biodiversity value while, on the other hand, they are usually less intensively managed than commercial forests. Hence, urban forests represent areas outside of the protected forest network where improvements in habitat quality for deadwood dependent organisms could be easily achieved. In Finland, the lack of dead wood is considered a threat for 530 threatened and near threatened species, and wood-decaying polypore fungi are among the most threatened species groups. The amount and diversity of dead wood in urban forests suggest that there is huge potential to provide habitat for threatened and rare deadwood dependent species, and surveys and reports on polypore fungi in the greater Helsinki area support this view. However, these species data have not been explicitly related to the composition of living stands and dead trees. Knowledge on mechanisms between forest structure and the occurrence of polypore species provides a means to assess if and how urban forests serve or could be developed as biodiversity hotspot areas for deadwood dependent organisms.

The aims of this research initiative are 1) to assess the value of urban forests for the diversity of wood-decay fungi, 2) to identify the features in urban forests that are important for that diversity, and 3) to formulate management recommendations for promoting diversity of wood-decay fungi in urban forests.

In order to take the multi-purpose aspects of urban forests into consideration, the recommendations will be prepared together with city green departments. Mature spruce dominated stands in urban, managed and natural-like forests in southern Finland will be investigated in regard to the structure and compositional diversity of living and dead trees, and the diversity of polypore fungi. Managed and natural-like forests are used as a reference to place the urban forests along the naturalness gradient. In order to resolve the habitat requirements of rare and threatened polypore species more specifically, existing data from previous polypore inventories in the greater Helsinki area will be used to trace hotspot areas of red-listed species to measure their stand characteristics.

Abstract ID: 34

Indicators for managing and planning urban green spaces: a case study in Padova (Northern Italy)

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Sustainable and integrated management of urban green spaces is fundamental for the planning of our cities and towns. Therefore, understanding current conditions and informing citizens on urban green spaces is critical for such sustainable and integrated view. Furthermore, this knowledge is essential to appreciate existing and potential ecosystem services and disservices derived from urban trees. Here we present the usage of simple indicators to analyze and present current conditions of urban green spaces and their management. The final aim is to highlight possible scenarios and models for future planning and management. A subarea of Padova (Northern Italy), the basso Isonzo, was used as a test area and as part of the Urban Green Belts (UGB), an Interreg Central Europe project aiming to "smart integrated models for sustainable management of urban green spaces for creating healthier and liveable urban environments". A number of indicators have been used, among which the share of green space, number of public trees per inhabitant, number of tree species, and age distribution of trees. Results enabled to represent GIS based solutions with reference to inventory information, types of urban green spaces, and supply of different functions. Richness and composition in tree species in different urban areas highlighted diverse conditions and can be used to detect possible different influences on related ecosystem services or disservices. Future management and planning options are proposed aiming to sustainable and integrated green spaces. For example, management efforts should be concentrated on those urban areas with un-balanced diameter distributions with a particular attention towards lack of small diameters, indicating a need of increasing tree planting, or large diameter, indicating a difficulty in growing trees to maturity.

Abstract ID: 35

One of the key management tools of urban forestry in Turkey: Protection forests

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Are the ecosystem services provided by the protection forests for urban forestry sufficient? In 2003, "urban forests" have started to be established with the aim to strengthen the relationship between Turkey's rapidly growing urban population and the forests, by providing a variety of benefits to the people in the cities. In fact, the beginning of the urban forestry efforts in the country is dated earlier: protection forests are one of the protected areas in the forestry regime, serving the urban forestry since 1950. Protection forests do not correspond to any classification of protected areas listed by IUCN. However, it can be said that, they carry similar properties to Group III "Areas managed for protection purposes, such as, soil and

water protection and protection against natural disasters-risks" of "The Ministerial Conference on the Protection of Forests in Europe (Forest Europe) Protected Forest Areas Classification System". Ten (10) out a total of 55 protection forests have been selected as the sample after considering different criteria. In order evaluate the protection forests selected as the sample, a 36-item table called "Protection Forest Variables and Definitions" was created, in light of the literature review, interviews with experts and academics, and the information retrieved from the General Directorate of Forestry, regarding the protection forests. The establishment purposes of examined protected forest and the ecosystem services they provide are:

- Positively affecting the health of cities and the environment,
- Serving the development of the area in terms of tourism through protection of natural of life,
- Keeping the housing development and industrialization under control,
- Protecting the forests more effectively and preventing the environmental pollution,
- Contributing to the protection of water basins by preventing the pollution and clogging of lakes,
  which are the source of drinking water for the cities,
- Offering the public recreation service,
- Being an area for research and training for the Faculty of Forestry,
- Preventing the clogging of beaches, rivers, railways, and highways by erosion.

According to the study, utilizations - even occupations- outside the scope of their protection purposes have been determined in most of the protection forests for non-forestry purposes. Out-of-scope uses have been: Quarries or mines, river-type hydroelectric power plants, power transmission lines or telephone poles, water distribution ducts, roads, settlements, hunting activities, special uses such as gardens or farmlands, tourism facilities and trash storage areas.

Abstract ID: 36

A Multicriteria Tool for the strategic planning, management and monitoring of the Collserola Park

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This paper is based on the future Urban Plan for the Collserola Range Natural Park, an example of a dynamic approach in the planning and management of green infrastructure. It focuses on a central strategy regarding adaptability and change: the Multicriteria Tool [EMC]. The main topic is how to improve the current zoning to address potential new social demands, ever changing ecological conditions and climate change.

Collserola is located amid the Barcelona metropolitan area. It is a well preserved, 8.000-hectare urban forest, surrounded by a large population. Therefore, beyond its environmental values, its importance lies on the wide range of ecosystem services that provides to the metropolitan population.
The Multicriteria Tool or EMC is an instrument based on Geographic Information Systems (GIS) to assess the current state of the territory as well as the ecological and environmental effects of the existing and future uses within the Park. The tool consists of three up to date maps:

- The Map of Complexity and Ecological Functionality points at areas where ecosystems show more complexity and have more interaction with elements of functional relevance. Key aspects are the hydrographic system and the ecological connectivity networks together with the protected spaces and the carbon forest sinks.
- The Map of Vulnerability and Singularity analyzes the vulnerability, fragility and sensitivity of a territory, including the presence of species and groups that are threatened and / or sensitive to changes or imbalances. The final map detects several areas of high vulnerability in the Park, especially in Barcelona and El Papiol.
- The Map of Anthropic Disturbances identifies the spatial concentration of disturbances of human origin, mainly associated to public use and frequentation. The most disturbed areas are the outer edges. On the other hand, the interior of this urban forest is mainly fragmented by the presence of paths created by pedestrians and bicycles.

The tool has been designed to perform at three different stages or scales: structural scale, project scale and monitoring scale. These three scales are related to the design of the new master plan, the implementation of the activities allowed in the new plan and the evaluation of the dynamics of the Park, respectively. Only the second and the third respond to the need of adjusting the planning and management of urban forests to changing conditions.

The main challenge of the implementation of such a dynamic approach lies on the project scale, the one that is more critical to the improving of the static zoning of the current master plan. In order to achieve the desired flexibility it has been necessary to design a set of rules to guide the adaptive management of the Park. Other challenges have been the information available to define the three maps and the framework to set the upgrade and improvement of the beta version.

Abstract ID: 38

Comparing the cooling and runoff reduction potential of two contrasting urban tree species in Munich, Germany

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Urbanization is strongly changing our landscapes and altering the ecological processes to make our cities warmer and greater rainfall runoff. Greening cities and particularly planting trees seems to be one of the most effective options to mitigate those problems. However, due to the high heterogeneity of the urban environment, considerable uncertainty still exists at microscales concerning the magnitude, pattern and the process of mitigation by urban greening.

We continuously measured within and outside canopy air and surface temperature, sap flow of two contrasting tree species: *Robinia pseudoacacia* L. and *Tilia cordata* Mill. at different street canyons in Munich, Germany along with the bio-meteorological and edaphic variables over the summers of 2015 and 2016. Moreover, we measured the soil infiltration potential under the canopies of those species and at open sites.

Results showed that within canopy air temperature reduction can be up to 2 ºC compared to the reference point and around 1 ºC at 1.5 m height from the ground. However, the effect differs significantly depending on

tree species and on the paving of surfaces. Anisohydric diffuse porous species – T. cordata showed almost three times the transpiration compared to an isohydric ring porous species – R. pseudoacacia, correspondingly the air temperature within the canopy boundary layer. With higher leaf area index (LAI) T. cordata also showed significantly higher potential for surface cooling when the below-canopy surfaces are built. However, in case of grass surfaces; R. pseudoacacia with lower LAI and water uptake allowed higher soil evaporation consequently higher air temperature reduction at 1.5 m height compared to T. cordata. Moreover, with 50% higher annual stem growth and fine root biomass, R. pseudoacacia also showed significant influence on soil infiltration potential compared to T. cordata.

Our study indicated that the success of the urban green infrastructure in thermal regulation and surface runoff reduction is very much species and site specific. Species with higher LAI and transpiration rate might have higher potential for capturing the rain water (interception) and cooling the boundary layer and built surface temperature. Conversely species with lower LAI and more conservative water use might have higher potentials for human thermal comfort if planted on grass surfaces. The study greatly improved our knowledge of the biophysical control of the whole tree water use hence cooling and surface runoff management in the urban environment to be used in climate and hydrological models.

Abstract ID: 39

Preliminary experience with tree injection of horse-chestnuts against Horse-chestnut leaf miner (Cameraria ohridella) in Slovakia

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Horse-chestnut leaf miner (Cameraria ohridella), is a moth species, regarded as invasive pest, causing aesthetic damage to horse-chestnut (*Aesculus hippocastanum*), widely planted ornamental tree in Europe. For the first time, the species was reported in Slovakia in 1994 and it rapidly spread in the next few years. In Slovakia, no other tree species has been reported as a host for C. ohridella. Impact of C. ohridella leads to early defoliation which is connected with tree weakening and vulnerability to other pests and pathogens. Despite a low risk for the survival of infested trees, the aesthetic damages are severe.

Our aim was to evaluate efficacy of tree injection application of TreeAzin® in the control of C. ohridella. TreeAzin is registered systemic insecticide in Canada and USA where is used against Emerald ash borer, Gypsy moth, European elm scale and some other insect pests. Formulation is injected under a tree's bark, directly into the conductive tissues with Ecoject injection technology.

For evaluation, two doses of TreeAzin were used, 3 ml/cm DBH (16 trees) and 5 ml/cm DBH (17 trees) dose. Treatments were compared to the control (18 untreated trees). Trees were controlled every 3 weeks' post-treatment, starting in the third week of May, through to the end of September.

We found a statistically significant difference in the mortality of C. ohridella larvae and the leaf and crown damage on the treated trees compare to the control. Significant difference between the 3 ml and 5 ml treatments was not recorded. High biological efficacy of the product TreeAzin in the control of C. ohridella was

confirmed in this evaluation but some potentially harmful aspects of the application method used (injection) were not evaluated in this study. For further tests we are preparing another 3 localities in Slovakia in 2018. We also plan to investigate plots from 2017 to evaluate the effectivity of TreeAzin in a time scale.

Abstract ID: 40

Perception and use of various urban green spaces in Padova (Northern Italy)

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Urban green spaces are a focal area for the daily life of citizens. Therefore, deep knowledge of citizens' perceptions and uses of green infrastructures is crucial in urban planning and design. Green spaces can have several different features ranging from intensively managed urban parks to abandoned areas with spontaneous vegetation. Indeed, the type of green space and its specific features result in different types of ecosystem services and urban dwellers can have various and contrasting perceptions of these spaces and their ecosystem services. Therefore, different tools and approaches should be applied to gain a broad picture of citizens' needs for urban green space types. Here we introduce a project, carried out by a multi-disciplinary team represented by urban foresters, recreation planers, statisticians, and economists, engaging with citizens of Padova (Northern Italy) using urban green spaces and their facilities.
Our aim was to show the large variety of recreational activities carried out by visitors and their usages of designed and non-designed urban green spaces. A specific aim of the project was to analyze the influence of different features of managed green spaces on users' preferences for stress relief and safety. In 2017, face-to-face interviews with about 300 citizens were performed, collecting information on socio-demographic characteristics as well as on access to and use of green spaces. Furthermore, choice sets based on systematically modified images of different green spaces scenarios were used to test users' preferences in terms of stress relief and safety perception. The integrated analysis provides an overview of the users of different urban green spaces, their recreation behavior and green space preferences.

Abstract ID: 41

Introduction of a novel and singular master programme "Urban Arboriculture and Forest Management" in Germany

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The management of Urban Forests / Urban Green in Germany is an increasingly challenging task: Manifold and competing demands between various stakeholders as well the difficulty of measuring and mitigating economic, ecological and social values restrict common forests management practices with their focus on timber production and harvesting. Management operations like silvicultural treatments, harvesting or felling of roadside trees are often not in line with changing ecological conditions and changing societal demands and can rapidly trigger serious conflicts between forestry and other stakeholders.

Classical trained foresters find themselves increasingly often not sufficiently prepared for the management of forests in urban areas: managers of urban green and forests do not only need specific arboricultural and silvicultural knowledge but also the capacity to mitigate competing or even conflicting interests centered around the planning and management of urban greens and forests. Urban foresters have had to develop their social skills, they need communication and conflict management capacities combined with the willingness to make the planning of urban green a participatory process.

The University of Applied Sciences and Arts Hildesheim/Holzminden/Goettingen (HAWK) takes these latest environmental and social developments into account by creating a novel and innovative master programme named "Urban Arboriculture and Forest Management". The course addresses graduates of arboriculture and forestry alike and offers specific science-oriented courses broadened by courses on the development of interdisciplinary and transdisciplinary competences as well as personal and social skills (communication and conflict management, leadership and teamwork, change management, planning of participation processes, environmental education, etc.) that are indispensable for the planning and managing of a multifunctional green infrastructure in complex urban settings and in future developments.

The presentation wants to introduce this novel curriculum and aims at the building of networks and cooperation.

Abstract ID: 42

Managing Cultural Ecosystem Services

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Cultural ecosystem services (CES) have been explored in a large number of studies (e.g. Fish et al 2016, O'Brien et al 2017, Pearlmutter et al 2017). Yet there is a gap between the importance shown in case studies and research on one hand and the everyday practice of managing CES of forests. The ability of forests to provide ecosystem services depends on local conditions as well as the impact of silvicultural treatment. Different management treatments provoke different outcomes of eco-system services (see for example Knoke 2017). The forest management regime is often based on traditional silvicultural concepts and the CES benefits therefore seen as co-products of this regime.

In two case studies the consequences for forest management is explored, the core CES qualities are described

and the improvement and amendment of forest values is analyzed. On which specific elements do the indicated CES benefits rely? How are these CES affected by forest management decisions? What are the impacts on silviculture and governance? How does the silvicultural regime adapt to the CES requirements? How do CES requirements impact the forest regime?

The description of the two case studies is based on an analysis framework with ten criteria. The two cases are chosen because of their different settings and different needs: (a) the Forest lab experiment with children (Waldexperiment 2018) and (b) a funeral forest. While the first case reflects a rather short term benefit, the second case has long term implications. In each case different types of forests are compared and their CES-profile in relation to the expected use is shown. One case study is part of SINCERE (2018), an ongoing Horizon 2020 programme.

The focus of this presentation will address (1) the importance of specific CES for the values and activities of the specific case, (2) the silvicultural consequences and treatment and (3) managerial consequences including solving conflicts of interests and conflicts with Sustainable Forest Management SFM. A special emphasis is placed on environmental spaces, cultural practices, specific cultural benefits and cultural goods. Intangible benefits such as sense of place and the symbolic importance of trees and forest structure is exemplified.

Literature
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Abstract ID: 43

Tree failure after windstorm in Zagreb mature urban forests

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Urban forests and trees provide many benefits and contribute to the quality of life and well-being of urban dwellers. However, trees can also pose serious risk of physical injury, property damage and disruption of activities due to failure of its parts. In order to minimize the risk of such events, regular tree risk assessments are recommended as part of the risk management process. Climate change has significantly increased the severity and frequency of disturbance events to forest ecosystems and this upward trend is expected to

continue in the future. Wind is the most severe disturbance agent in forests. Windstorms can incur severe damage to urban areas due to the proximity of urban forests and the presence of many targets.

The aim of this research was to compare tree risk assessment results before a major windstorm, as well as wind damage that occurred in mature urban forests after the mentioned single extreme weather event. Tree risk assessment using visual methods was performed over 14,2 ha of four mature (age > 140 years) urban forests dominated by sessile oak in the City of Zagreb. Several months later, on 11th November 2013, a windstorm that hit the broader Zagreb caused considerable damage to forests and the city infrastructure was severely affected by tree failures. After this extreme weather event, a post-storm assessment re-survey of tree failures was conducted in the previously assessed forests. The presence of dead branches and the restricted root area were major defects that contributed the most to pre storm tree risk assessment rating in all the assessed locations.

According to the post-storm survey, only a small percentage of trees in mature urban forests failed. The dominant tree failure mode was due to branch failure or severe crown damage, with uprooting also accounting for high percentage of tree failures. Uprooting was often related to conditions that restricted root development. The findings related to the mentioned windstorm event may be helpful for future tree risk assessment activities and may improve mature urban forests management by reducing the possibility of damage occurrence.

Abstract ID: 44

Using i-Tree to Inform a Strategic Approach for Future Management of Ealing's Urban Forest

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Kenton Rogers, Treeconomics, Exeter, UNITED KINGDOM, Doick Kieron, Forest Research, Surrey, UNITED KINGDOM and James Watson, Treeconomics, Exeter, UNITED KINGDOM

Using i-Tree to Inform a Strategic Approach for Future Management of Ealing's Urban Forest by Treeconomics and Trees for Cities (https://www.ealingitree.online/)

Trees for Cities and Treeconomics have partnered with Ealing Council, Forest Research, the Greater London Authority, Forestry Commission and Arup to plan and deliver a robust, holistic i-Tree project model that will inform the tree management and planting objectives in Ealing's next strategy. The steering group has developed a three-tiered approach to gather data of sufficient detail to inform future urban forest management plans and ensure that project outcomes are useful for Ealing Council. The project blends three data collection methods to quantify the structure and ecosystem services, and calculate the value of all public and privately-owned trees in the borough:

1. i-Tree Eco Assessment informed using Random Sample Plot Inventory and CAVAT
2. i-Tree Eco Assessment informed using Local Authority Tree Database and CAVAT
3. i-Tree Canopy Cover Assessment

There are an estimated 234,400 trees in Ealing, with a CAVAT value of £3.4billion. The top 3 most common species are *Quercus robur*, *Fraxinus excelsior*, *Ulmus minor angustifolia*. Ealing's urban forest removes 33 tonnes of air pollution and 2,250 tonnes of carbon from the atmosphere every year, and diverts 74,400m3 from entering the sewerage system. The annual ecosystem services provided by Ealing's tree stock are valued at an estimated £1.6 million. The borough's canopy cover is below the recommended target (17.2%) however there is a large variation between wards from 6% to 26% canopy cover. To download the full technical report or

explore the results interactively visit the project microsite: https://www.ealingitree.online/. This is the first time a tri-method approach has been applied to a London borough, which has presented both benefits and limitations, which together are being used to inform and substantiate the Council's future strategic approaches to tree protection, resilience, biosecurity, maintenance and planting through an Urban Forest Management Plan.

The plan will have three key target areas: Trees and Forest Structure, Community Framework, and an approach to Sustainable Resource Management. It will provide a detailed framework for the proactive management, protection, and growth of Ealing's urban forest and will describe a shared vision for the future of our urban forest to inspire and engage residents, business owners, elected officials, and community organizations. It is envisaged that the project outcomes and management plan will be widely disseminated to inform and develop further understanding of urban forest management in the UK and overseas.

Abstract ID: 45

A case study showing the application of modern urban forestry principles and thinking in research leading to the preparation of an urban tree strategy.

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The aim was to provide research for the preparation of a tree strategy for a London Borough, applying modern principles and thinking in urban forestry and urban greening practice. The Borough proved an interesting study due to significant differences in architecture, development and demographic patterns between the northern and southern sections, which are divided by a major strategic road.

The exercise was approached so as to persuade decision makers of the absolute necessity of maintaining and improving urban forest coverage at a time of economic stricture. The study addressed problems posed by highway management issues and by the Authority's ownership of trees on land within the control of other actors. The holistic approach to tree management and the identification of eco-system benefits and likely contributions to public health indicated that co-operation between allied departments within the Authority was essential. In addressing species for new planting, emphasis was placed on the selection of species known to contribute environmental and eco-system benefits, particularly in combating pollution.

Data on health and income assessed showed wide variations within the geographical area. Reference to surveys of environmental (principally traffic) pollution identified areas of particular health concern, including the urban 'heat island effect'. The Borough is a designated Air Quality Action Area (UK). Data were compared with geographically referenced tree population data to identify weaknesses within the urban forest structure and to suggest areas for regeneration and enhancement.

The case for trees was strengthened by reference to empirically-defined data arising from the considerable amount of research both by workers in the urban greening field, but in other relevant fields, in particular, that of medicine (both physical and psychological), which has taken place in recent years.

Keywords: urban, strategy, forestry, trees, health

Abstract ID: 46

Influence of park stand structure on ecosystem services modeling

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Parks provide important ecosystem services for the city environment and people as for example the improvement of air quality or opportunity for recreation. Environmental benefits are strongly related to the species physiological properties, which however depend on the individual dimension and competition situation of a plant, in particular for a tree. We developed algorithms to estimate tree competition for the light, which are based on data from tree inventories that can easily be derived from ground-based observations as well as remote sensing information. This new method has been used to initialize the ecosystem service model i-Tree Eco that estimates the properties of a tree in order to determine its ecosystem service value. In this study, we tested this method and assessed how sensitive the calculation of tree properties and air quality related ecosystem services is to the uncertainty of competition determination.

Our results show that the different method used to define competition strongly affects the determination of leaf area and related ecosystem services such as air pollution removal as well as carbon sequestration. Finally, we related the degree of competition between trees with recreational activities using the InVEST model. This shows that open spaces between trees not only increase the individual value regarding pollution removal but also provide more value with respect to recreational activities.

Abstract ID: 47

The challenge of 3D modeling and visualization of Leipzig's urban floodplain forest stands.

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At the EFUF 2017 Conference in Barcelona, Spain, we presented how forest inventory data of 60 randomly selected monitoring plots, established for the river revitalization project "Lebendige Luppe" in Leipzig, Germany, can be analyzed and displayed in a 3D-like representation in combination with selected indices of species and structural diversity. The result of this approach showed the shapes of the tree trunks and tree crowns in a static perspective view. However, this kind of visualization capability is limited with respect to the

challenges of representation, interpretation and decision-support. The challenge is to model tree trunks and crowns as 3D-objects that allow interactive representations of the stand from different viewpoints and with representative rendering and grouping individual trees with similar characteristics. Furthermore, it should be possible to use these 3D objects in GIS-based scenery including terrain data with hydrological features. This requires software interoperability between data processing, 3D object management and georeferenced 3D representation of important landscape features.

In this presentation we demonstrate how forest stand level data of more than 7000 trees and shrubs, like species, breast height diameter, crown base height, tree height, crown diameter, precise x,y,z-coordinates and additional parameter relating to tree dominance, health conditions are used as input parameters to produce virtual 3D forest stand models of individual plots with advanced representation, evaluation and decision-support capabilities. This can be done with SketchUp, a 3D sketching, modeling and rendering tool, developed by startup company @Last Software of Boulder, Colorado and now owned by Trimble Inc., a mapping, surveying and navigation equipment company. The data processing is supported by the object-oriented programming language Ruby, which allows writing scripts that perform repetitive operations. This is a precondition to produce thousands of individual tree shapes with individual characteristics in a productive manner. Furthermore, we will present an example of the work flow from data to 3D objects to 3D landscape visualizations of the project area.

The status of the work shows that the combination of 3D visualization and analysis of key features of urban forest landscapes is useful to get a better understanding of the current ecological status of Leipzig's urban floodplain forest based on measured field data and other existing digital data. It offers new opportunities for multiple visualization applications like rendered still images, 3D animations, and real-time models.

Abstract ID: 48

How does forest management influence people's perceptions of the restorative value of forests?

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In recent years there has been increasing interest and information about the positive effects of nature on human well-being. Even a short visit to a nature environment has been found to have positive effects on psychological well-being, such as increased feelings of restoration and decreased of rumination. As the world's population becomes increasingly urbanized and detached from the natural world, understanding the potential health benefits of accessing natural areas – such as forest – in or near urban areas is increasingly important. However, despite the increase in research recognizing the importance of nature for human health, it remains unclear if, the restorative effects are influenced by factors such as forest management.

We investigated whether peoples´ perceived psychological restorativeness varies in four differently managed forests and how people rate the forests according to their own preferences. Four spruce-dominated forests - without any major water elements or height differences - were selected: i) an urban recreation forest that is managed for recreational use, ii) a mature commercial forest, iii) a young commercial forest, and iv) an old-growth forest in a natural state. A total of sixty-six volunteers - 39 women and 27 men from the Helsinki metropolitan area participated in the study, with each participant making one short-term visits to each forest. All participants visited the forests at the end of their workday. The visits were made during spring, summer and autumn of 2016 and 2017 in small groups, under the direction of the lead researcher. Each visit included 15 minutes of observation, followed by 30 minutes of slow walking inside the forest. Participants' perceptions of

restorativeness were measured after each visit using the Perceived Restorativeness Scale (PRS). The scale is based on four restorative components defined by the Attention Restoration Theory (ART). Participants also evaluated the forests with different adjectives in semantic differential scale and open questions.

The repeated-measures analyses of variance (ANOVA) was used to calculate the outcomes in four different forests. Preliminary results reveal that people felt less restored in young forest compared to all other three forests. The most restorative forests were the old-growth forest and the mature commercial forest. According to our preliminary results, it seems that forest management has an influence to the perceived restoration and the effects should be taken into account when managing the forests close to residential areas.

Keywords: Restoration, Forest management, Old-growth forest, Field experiment, Well-being

Abstract ID: 49

Historic Urban Groves of Istanbul: A way to Construct Green Infrastructure

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The main purpose of this paper is to discuss the potentials of historic groves of Istanbul to contribute to the green infrastructure planning of the metropolitan city. Istanbul with its more than 15 million inhabitants has been facing urbanization problems since 1960's. While the city expands toward the periphery, the historic core become more intense. One of the direct outcome of this process is fragmentation of natural reserves and loss of urban green areas. Within the city center, elements of historic landscape remain important patches with their scale, location, mature vegetation components and historical value. But the lack of holistic view on green system planning and systematic approach, the potentials of those site couldn't be utilized.

There are 58 groves in Istanbul. In this paper, these groves were analyzed according to parameters defined by Derek 1997; size, diversity, naturalness, rarity, representations, fragility, typicalness, recorded history, landscape position, potential values and intrinsic appeal to specify the capacity of groves to contribute to the green infrastructure development. The analysis reveals that most of the urban groves have a manipulated landscape character and some groves are owned by private bodies. The sizes of the groves changes from few hectares to 50 ha. Most of them are used for active recreation and includes landscape elements such as patio, water structure, plant beds, historic building etc. Most of these historic groves are located along the Bosporus and have a high scene quality. Lack of maintenance and land ownership appeared as one of the biggest obstacle to evaluate those green areas as part of urban green infrastructure.

In the paper, the potentials of the urban groves were discussed and design strategies to integrate those green areas into urban green network was proposed under 11 topics such as; ecological stations, informality, integration, inclusiveness, landscape identity, process, social context, connectedness, integrated management and history.

Case study to examine city dwellers' participation in a monitoring method considering the extension of three insect species

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It is the trees in the urban forest area (in parks, streets and woods around the cities) that city dwellers usually see. They care about them, save them and have an opinion about them. So if they observe a sort of change in their quality first of all, they instantly inform the authorities. Nowadays plenty of alien species endanger the trees, especially urban trees, particularly because an urban forest area is exposed to several sources of damage due to the intensive human presence. So all these provide the right conditions for the alien species to settle, multiply and spread.

Two invasive and one native species have been investigated in order to observe their presence and their spreading characteristics and to find out how ordinary citizens can get involved in the detection of an insect. What influences their reactions?

Both of the invasive harmful pests (*Cydalima perspectalis* and *Rhagoletis complete*) were detected in Hungary in October 2011. The third species is a common well-known insect in central Europe (*Melolontha melolontha*). Spreading data have been collected with the EDDMapS system since March 2012. We kept the population informed about the life cycle and the looks of these insects as well as about the symptoms caused by the pests, just like the ways of controlling them.

More than 500 reports have been gathered since 2012. 98% of the data senders identified the insects correctly. Young people sent photos and located the coordinates on the maps using their modern technology devices. The elderly were not frightened away of using their gadgets either, however, they sent a little bit chaotic materials in. Our findings show that the new species raised people's interest, unlike the ones they are familiar with. More reports have been received about insects with frequent hosts in public places than about insects with hosts frequent in the backyard.

A faster spread of a pest makes city dwellers cooperate well and efficiently. In our experience, senders tend to remain active, though constant motivation is definitely needed. We have also received a lot of useful information about predators, not only about the insects.

Keywords: invasive pest, new species, motivation, early detection

"Pink trees": biomonitoring experience to investigate the impact of industrial plants on urban settlement. A case study in Southern Italy.

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Atmospheric pollution of industrial areas near to urban centre play a crucial role in contamination and degradation of the urban health and safety. This study analyzed the chemical composition of tree –rings to investigate: 1. the ranging impact of pollutant on tree growth according to the distance from pollutant sources; 2. the spatial and temporal variability of pollutants in relation with the sprawling and transformation of industrial activities; 3. the potential use of trees as passive samplers in biomonitoring of the urban environment.
The study area consists of an industrial area with different pollutants sources (steel factory, oil refinery, cement and chemical plants) close to the city centre of Taranto (South of Italy). The city is mentioned among the Italian national sites with documented contamination and associated potential health impacts (National Priority Contaminated Sites-NPCSs). Several epidemiological studies showed very high risks of death for cancers, cardiovascular and respiratory diseases. A stronger impact has been observed in the infant mortality and early ages diffusion of cancer.

Field data collection was performed in a 36 km circular buffer with 8 concentric areas assuming the industrial site as the centre of the study area. Were sampled 42 sites with 5 Aleppo pines per area. Tree cores were analyzed to detect trace element index (Cr, Be, As, Cd, Pb, Hg, Sn, Ni, V, and Zn) that was determined mainly using inductively coupled plasma mass spectrometry (ICP-MS). The initial hypothesis focused on the spatial variation of the impact of the pollutants on the tree growing rates, and in particular in the proximity of the industrial plants. Moreover, chemical patterns were detected to assess the suitability of results in reflecting the variations of industrial activities over time. Preliminary results of the study showed that the dendrochemical analysis could be considered a suitable methodology to investigate past and recent diffusion of pollutants and to support the management of such areas.

Using city tree inventory data as a tool of planning, management and economic valuation of ecosystem services provided by urban trees

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Along with increasing urbanization, urban forests and city trees need more careful attention in city planning to ensure the ecosystem services provided by them for health and well-being of inhabitants. For strategic planning of city trees, knowledge about the species diversity and distribution of urban trees is needed. Inventories of public trees in the cities of Turku and Helsinki provide a tool for management and planning. For decision-making, economic valuation of ecosystem services provided by urban trees is needed for reasoning the investments in the maintenance of public tree property.

i-Tree is a peer-reviewed software based on public-domain, developed by USDA Forest Service, which provides a tool to estimate the monetary value of certain ecosystem services provided by urban trees. In Finland, a project was recently started by Luke, the cities of Turku and Helsinki and University of Helsinki aiming at valuing of some ecosystem services (eg. dust and air pollutant binding, stormwater binding) by applying the i-Tree software, data of existing city tree inventories and of plot inventories in these towns. The study is a part of the Scandinavian i-Tree project coordinated by SLU, with Swedish, Norwegian and Danish research and city partners. In 2018, the plot inventories will be carried out in Helsinki and Turku, and the first modellings with i-Tree will be executed.

The goals are to study the amount and monetary values of ecosystem services, to communicate the environmental benefits to decision-makers and inhabitants and to increase the general undestanding of the effects of trees and other vegetation on the health and well-being of people 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. Finally, the aim is to test the existing practices and models in the planning of urban tree species diversity (e.g. Santamour's model) and test their applicability in the view of ecosystem services and biodiversity of other species groups. In this presentation, the main methods, collaboration and the aims of the study are presented.

Abstract ID: 53

Children building a connection to nature through affordances

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Nature contact has been acknowledged as beneficial for children's development and wellbeing, as it is for all humans. At the same time, children's free play in nature and independent mobility, 'free-ranging,' has been declining in Western societies in recent decades. Modern society has created circumstances in which self-initiated play in nearby nature has become increasingly unusual due to factors such as a hectic lifestyle, screen time, mobile phones and digital entertainment or more time spent in organized hobbies. Parental concerns for safety are claimed to have had a notable influence on the decline of outdoor play. Offering one solution for this dilemma, nature clubs and camps with the agenda of introducing and promoting children's nature contact, are increasingly becoming available.

Nature programs aim to re-connect children and nature through educational goals. Orientation for completing tasks or themed learning sessions can be restrictive for the children. By understanding how children in middle childhood (6-10 years old) establish their connection with nature, adults can better support beneficial contact with the natural world. Gardens are becoming increasingly recognized as important sites for learning and bringing children closer to nature. Despite the known educational and health benefits of gardening, children's interactions with the actual physical elements of a place, called affordances, are less understood and examined. Approaching the phenomenon of children's way of making a connection with the natural place this study applied grounded theory methodology with the triangulation of research strategies. With a child-centred approach, focusing on inexperienced children (~40 participants for each year of the study), the long-term ethnographic work captured children's connecting process with outstanding data: field reports and notes, audio recordings, photographs and drawings. In the first part of the study, a comparison of rural/urban and different gendered children's attitudes and knowledge about plants and favorite places was conducted with a survey of 76 children using mixed methods. Secondly, during 2008-2010, a qualitative field study was carried out in a garden day camp, in the Kumpula School Garden in Helsinki. To elaborate the phenomenon, both participant and non-participant observation strategies were applied.

According to the results, firstly, the relationship between nature and greenery differs according to residence and gender. Girls in the study group were more interested in plants than were boys, and rural children reported more natural places as favorites than did their suburban counterparts. Second, results from the garden camp context showed that the versatility of affordances offered numerous opportunities for building the nature-child relationship. Scaffolding – learning together and from peers – was noteworthy in learning new skills that the garden environment supported with versatile affordances. The essential factors that had a contributory role in the process of becoming empowered players within the setting were: sufficient time, the possibility of child-directed play and a space with a versatility of affordances available for use. Trees were the most important/significant nature-relationship building elements of the research site. They answered children's situational and individual needs by offering ideas, materials, and space for play.

Using a place-based perspective, the process of connecting with the place was captured with the concept of behavioral insideness, unravelling the actual phases of how children's connectedness to place evolved from their initial status as outsiders to searchers, to initiative insiders. After identifying children's interests and preferences, the theoretical framework of 'Affordances for connectedness to place' was formulated.
In order to promote children's connectedness to nature, a child-centred method called PIT for conducting place-based, situational-sensitive nature activities for children is provided to help adults in planning and conducting nature programs that are attuned to children's needs. With these concluding guidelines, three

principles that will help children to build a meaningful place and likely, in the long run, nature connection is emphasized: place-based, intention and time (PIT).

Abstract ID: 54

Urban green infrastructure: connecting people and nature for sustainable cities

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Urban green infrastructure (UGI) plays an important role in the many urban challenges of the 21st century. UGI can positively contribute to the environmental quality and liveability of cities and provide important economic benefits by enhancing biodiversity and delivering a broad range of ecosystem services. However, to fully realise these benefits in urbanisation processes requires development of appropriate conceptual framings, a sound evidence base, and tools and instruments for valuation, planning and governance of UGI.

GREEN SURGE has been a EU FP7 framework project from 2013-2017 with 24 partners in 15 countries, coordinated by the University of Copenhagen. Its objectives were to:

- Develop urban green infrastructure as a planning concept for both integration and promotion of biodiversity and ecosystem services, and adapt it to local contexts.
- Apply an innovative biocultural diversity perspective to develop successful governance arrangements facilitating socio-ecological integration and local engagement in planning of urban green spaces.
- Explore how valuation and real market integration of biodiversity and ecosystem services can facilitate choices in favour of the development of multifunctional green spaces in urban areas.

Central to the project was a „double helix" approach for close interaction between science and practice. The approach was implemented on three tiers of comparative European cases, synthesis of good practices, and establishment of five Urban Learning Labs (ULL), strategically selected to represent different urban situations in Europe. The latter provided a common platform for the project while „Focal learning alliances" were designed to collaborate in depth on a specific topic of particular relevance in the respective ULL.

The project resulted in a rich output of products, including handbooks for UGI valuation, planning and governance. In my talk I will build on the project's results to reflect on the status quo of UGI, its perspectives, but also the potentials of the chosen research approach and where to go next.