1ST EUROPEAN URBAN GREEN INFRASTRUCTURE CONFERENCE 2015 VIENNA NOV. 23|24

Conference
Programme
Speakers
Awards
Papers

www.urbangreeninfrastructure.org

Karmenu Vella

CELEBRATING NATURE-BASED SOLUTIONS FOR CITIES

The urban environment is a constant challenge. So many marvels to preserve, yet so many pressures and so much that needs to change. For the European cities of 2015 the challenges are not those of the past; we need sustainable solutions that will fit the Europe of tomorrow. Solutions which provide multiple benefits to citizens and society, providing economic growth and job opportunities, whilst ensuring better air and water quality, and also meeting citizens' demands for recreational spaces that can reinforce social bonds.

Green Infrastructure has shown it can deliver such solutions, and such investments are often the best economic choice, particularly in the longer term. Using nature to help solve problems like drainage and poor air quality is not only cheaper than grey infrastructure: it can make cities more resilient to natural disasters like storms and floods. It is no accident that this sort of thinking is becoming the logical choice for forward-thinking urban centres. Many cities whose investments improved their green credentials are now thriving in terms of jobs and growth.

Europe too is playing its part. The European Union's Biodiversity Strategy has long recognised the value of Green Infrastructure and the European Commission's new strategy to promote the use of Green Infrastructure across Europe is providing an enabling framework to facilitate related projects. The Commission is also supporting Member States' efforts by helping them develop knowledge and skills, raise awareness, and by providing financial support for Green Infrastructure through EU funds.

It's a solid start, but I look forward to more. I look forward to a future where Green Infrastructure has become the norm. Conferences like this Vienna meeting can help move us in that direction, spreading the word about sustainable natural solutions to our 21st-century urban challenges. Let's make the most of the opportunity.

Karmenu Vella

European Commissioner for the Environment, Maritime Affairs & Fisheries

DEAR PARTICIPANTS,

The City of Vienna is delighted to be hosting the 1st European Urban Green Infrastructure Conference.

Active and forward looking environmental protection has been a key task for the City of Vienna for many years, to improve the quality of the local environment as well as the general quality of life for people in Vienna.

We set ourselves challenges on many levels - the successes are already clear for all to see but we still have a lot to do.

One important goal for the Environmental Department - MA 22 is to develop and implement precautionary and integrated activities and strategies to improve environmental standards. More than 10 years ago, the department started strategic work on greening buildings for benefits such as rainwater management, and making these issues part of the policy, planning, training and professional discourse.

Climate Change will drive future city development and Green Infrastructure will play an important role in tackling urban challenges in a multifunctional way, while significantly enhancing quality of life.

Working on the sustainability and resilience of the city does not only mean developing specialist knowledge. It is important to disseminate, network and communicate this knowledge as the basis for activities in the best way possible.

Therefore this conference is an excellent platform to highlight the importance of Green Infrastructure and drive enhanced activities in the future.

The City of Vienna contributes to setting standards on how to integrate Green Infrastructure issues in development, planning and policy, at a local and a European wide level.

Thus we are happy to host the 1st European Urban Green Infrastructure Conference.

We would like to express special thanks to the organizers of the event, the EUGIC Team and to everyone who joins us today, exchanging experiences and carrying knowledge on a path of active environmental policy.

City of Vienna

MA 22, Environmental Department

Dusty Gedge

PUTTING NATURE-BASED SOLUTIONS AT THE HEART OF THE CITY

The vision of EUGIC is to tell the story of Urban Green Infrastructure in Europe each year. This first conference in Vienna is the prologue to further discussion over the years to come. There are already many professionals, cities and regions that have been engaged in Green Infrastructure and ecosystem services activities over the last thirty years. However, these have been generally confined to specific cities or countries.

With the creation of a pan-European Green Infrastructure and Ecosystem Services Strategy, many cities and urban areas will be starting to engage in this kind of approach to urban infrastructure. So this first conference is in a city Vienna that has been leading the way, and brings together specific keynote speakers who have been implementing projects in cities across Europe. For implementation is key.

Much research has been done over the years and we need to move beyond the laboratory to delivering Green Infrastructure both in new urban development that is planned but also on the existing urban fabric. This conference however also celebrates the research that is still being undertaken to refine our approaches to landscape opportunities on buildings and at ground level in the urban realm.

We are also keen to engage the citizen of Europe. Green Infrastructure can seem far removed from the average urban dweller. Yet small Green Infrastructure projects – whether on housing, on the street or in parks – can make a huge difference to people's lives. Green Infrastructure is trans-disciplinary but also needs to include everyone in this story.

We hope you enjoy this conference – the first chapter in an ongoing story and discussion to make Europe's cities the urban Green Infrastructure stories of the future.

Best regards

Dusty Gedge

President of the European Federation of Green Roof Associations (EFB)

Conference Programme

DAY 1

1ST EUROPEAN URBAN GREEN INFRASTRUCTURE CONFERENCE 2015 VIENNA NOV. 23|24

MONDAY 23RD NOVEMBER

RAISING AWARENESS • CREATING A COMMON GROUND • CONNECTING

08:00 REGISTRATION AND TEA/COFFEE

09:00 SESSION 1 **WELCOME TO VIENNA**

Welcome
EUGIC Hosting Team

Welcome to Vienna
Erich Valentin, State Parliament of Austria (SPÖ) and Vienna City Councillor

Conference video address from the European Commission
Karmenu Vella, European Commissioner for Environment, Maritime Affairs & Fisheries

Overview of the programme
Host of the Day

09:30 SESSION 2 **CLIMATE CHANGE, CITIES AND GREEN INFRASTRUCTURE**

Intro by Session Chair: Vera Enzi, Green4Cities, Austria

Climate change, cities and Green Infrastructure
Dr. Michael Bruse, Director of Innovations and Development, ENVI-MET, Germany

Nature is not a place to visit – it's where we live
Dusty Gedge, President of the European Federation of Green Roof and Green Wall Associations (EFB) United Kingdom

Working with Green Infrastructure assessment and valuation
Sandra Naumann, Ecologic Institute, Germany

The Bosco Verticale, Milan
Laura Gatti, Studio Laura Gatti, Italy

10:30 SESSION 3 **REFLECTION TABLES**

Moderated by the EUGIC Hosting Team

Introduction to the reflection round // Essential insights and open questions // Popcorn harvest

11:10 BREAK

11:40 SESSION 4 **THE BENEFITS OF GREEN INFRASTRUCTURE**

Intro by Session Chair: Dusty Gedge, President of the EFB, United Kingdom

Ecosystem Services Come to Town
Gary Grant, Green Infrastructure Consultancy, United Kingdom

Baubotanik – Building architecture with Nature
Dr. Ferdinand Ludwig, Baubotanik, Faculty of Architecture, University of Stuttgart, Germany

Nature-based solutions in Cities, connecting urban and peri-urban Green Infrastructure and rural in Germany
Dr. Horst Korn, Federal Agency for Nature Conservation, Germany

The EU B@B Platform and the NCFF
Strahil Christov, Policy Officer, The Economics of Ecosysems and Biodiversity, EU B@B Platform, European Commission

12:15 SESSION 5 **REFLECTION AND PANEL DISCUSSION**

Moderated by the EUGIC Hosting Team

13:00 **ANNOUNCEMENT OF AFTERNOON SETTING**

13:10 LUNCH

14:30 SESSION 6 **WORKING GROUPS**

Introduction by the EUGIC Hosting Team

15:00 **WORKING GROUPS ROUND 1**

Cities from the East and their development towards Urban Green Infrastructure
Chaired by ICLEI and CEEWeb, Germany

Financing Green Infrastructure in Liverpool UK: Difficult choices for city-scale management in an era of austerity
Dr. Ian Mell, University of Liverpool, United Kingdom

Working with Green Infrastructure Assessment & Evaluation
Sandra Naumann, Ecologic Institute, Germany

Baubotanik: climate active design with living architecture. Concepts and techniques to integrate trees in architecture and urbanism
Dr. Ferdinand Ludwig, Baubotanik, Faculty of Architecture, University of Stuttgart, Germany

breathe.austria: the Austrian Pavillion at Expo 2015 Milan combining building and environment for a futuristic network of people, environment and climate
Bernhard König, team.breathe.austria, Austria

Green City Movement: Community greening in Munich (German speaking table)
Wolfgang Heidenreich, Director, GreenCity, Germany

15:35 BREAK

16:05 **WORKING GROUPS ROUND 2**

Green Roofs and Walls across Europe: the EFB Vision. How can Europe achieve that vision?
Chairs: Paulo Palha – Portugal, Maurizio Crasso – Italy, Pavel Dostal – Czech Republic, Gerold Steinbauer – Austria, Francois Lassalle – France

Restoration for economic benefits - an illusion? Learning from a habitat restoration project in East Hungary and its potential for the urban environment
Péter Dezsényi, Managing Director of Deep Forest and Vegdesign, Budapest, Hungary

Creating nature based solutions for southern Europe: How to host annual Mediterranean dry grassland on Green Roofs
Chiara Catalano, Palermo University Italy, and Urban Ecology Research Group, Institute of Natural Resources, Zurich University of Applied Science Switzerland

Native Green Roofs for stormwater management in southern Europe
Carolina Brandão, Biosystems Engineering, High Institute of Agronomy, University of Lisbon, Portugal

The EU B@B Platform and the NCFF
Strahil Christov, Policy Officer, The Economics of Ecosysems and Biodiversity, EU B@B Platform, European Commission

The links between CCA, UHI and reduced energy demand via Green Infrastructure
Teresa Zölch, Research Assistant, Centre for Urban Ecology & Climate Adaptation, Technical University Munich, Germany

City spatial strategies and Green Infrastructure: a case study from Vienna, focussing on compromises and synergies, quality and enhancing functionality
Antonija Bogadi, Faculty of Architecture and Spatial Planning, Technical University of Vienna Austria

16:40 ALL REJOIN IN CONFERENCE HALL 17:00

17:00 SESSION 7 **GREEN INFRASTRUCTURE GRAFFITTI WALL**

Wrap up of Day 1, announcement for Day 2, intro to the Graffitti Wall

18:00 END OF DAY 1

DAY 2

1ST EUROPEAN URBAN GREEN INFRASTRUCTURE CONFERENCE 2015 VIENNA NOV. 23|24

TUESDAY 24TH NOVEMBER

VISUALIZE GOOD PRACTICE • TOOLS & TECHNOLOGIES • COMMUNITY BUILDING • EMPOWERING PARTICIPANTS TO GET ACTIVE

09:00	SESSION 8	**WELCOME**
		INTRODUCTION // RECAP OF DAY 1, WELCOME TO DAY 2
09:20	SESSION 9	**KEYNOTES AND PLENARY DISCUSSION: CITIES, WHERE ARE THEY AND WHERE DO THEY WANT TO BE?**
		Session Chair: Dr. Helga Fassbinder, BiotopeCity and University of Technology Eindhoven, Netherlands
		Malmö: How working with planning got me into plumbing Juliet Lidgren, Architecture Team, City of Malmö, Sweden
		London: Where are we and where do we want to be? Peter Massini, Urban Greening Team Leader, Greater London Authority, United Kingdom
		Vienna: Perspectives for nature in relation to a compact urban development strategy Jürgen Preiss, City of Vienna, Environmental Department, Austria
		Budapest: Where are we and where do we want to be? Andrea Sipos, Landscape Architect and Ágnes Koller-Posztós Architect and Urbanist, City Architecture Office, Budapest, Hungary
		Cities of the Future: Approaches to urban development, Graz Reininghaus Thomas Pucher, Thomas Pucher Architects, Austria
10:00		**PLENARY DISCUSSION**
		Session Chair: Dr. Helga Fassbinder, BiotopeCity and University of Technology Eindhoven
10:40	BREAK	
11:10	SESSION 10	**STORY CORNERS: MAPPING & MONITORING TECHNIQUES**
11:30		DISCUSSIONS IN STORY CORNERS WITH SPEAKERS
		Mapping cities in Europe for their green roof potential Wolfgang Ansel, Director, International Green Roof Association, Germany
		Green Pass: Simulation, optimisation and certification for urban Green Infrastructure investment Bernhard Scharf, BOKU and Green4Cities, Austria
		Mapping Warsaw for green roofs: existing and potential Marta Żaryn, Landscape Architect, Polish Green Roof Association, Warsaw, Poland with Dusty Gedge, President of the EFB, United Kingdom
		Supporting decisionmaking through benefits in Green Infrastructure in the Czech Republic Maria Kazmukova, Department of Strategic Planning, Prague Institute of Planning & Development, Czech Republic
		How to successfully combine biodiversity and wellbeing in Green Infrastructure: a map for Gloucester Jaqueline Jobes, Health & Life Sciences, Oxford Brookes University, United Kingdom
		Monitoring Green Roof related Ecosystem Services in Geneva: from theory to practice Dr. Sophie Rochefort, Department of Life & Sciences, University of Applied Sciences and Arts, Western Switzerland Geneva
		Capitalizing Green Infrastructure in real estate property values in Vienna: GI-Index as new planning instrument including economic benefits Dr. Ulrich Morawetz, Senior Scientist, Department of Economics & Social Sciences, BOKU Vienna Austria
		The Urban Heat Island Strategy Plan for Vienna Jürgen Preiss, City of Vienna, and Dr Doris Damyanovic, University of Natural Resources and Life Sciences BOKU Vienna, Austria
		Retrofitting urban drainage in Carmarthen, Wales Richard Brown, Arup and DCWW Rainscape, United Kingdom
12:05		HARVESTING IN THE PLENARY
12:30	LUNCH	
13:30	SESSION 11	**GREEN INFRASTRUCTURE & NEIGHBOURHOODS**
		Session Chair: Gary Grant, Green Infrastructure Consultancy, United Kingdom
		Inner city estate management for people and Green Infrastructure John Little, Manager Clapton Park Estate London and Director, Grass Roof Company & Green Roof Shelters United Kingdom
		Eco sustainability: a holistic structure, showing ample opportunities to achieve sustainable human development Prof Dr. Tony Pereira, Climate Reality Project Leader UCLA and Visiting Professor at the Institute for Sustainable Engineering, University of Palermo Italy
		Climate proofing of social housing estates in London using urban Green Infrastructure Mark Bentley, Groundwork London, United Kingdom
		Participation 2.0 Project: Barriers and drivers for urban gardening in Vienna Dr Bente Knoll, Consultancy for Sustainable Competence, University of Technology Vienna, Austria
14:00	SESSION 12	**STORY CORNERS: GREEN INFRASTRUCTURE & NEIGHBOURHOODS**
		Participation 2.0 Project: Barriers and drivers for urban gardening in Vienna Dr. Bente Knoll, Consultancy for Sustainable Competence, University of Technology Vienna, Austria
		Inner city estate management for people and Green Infrastructure John Little, Manager Clapton Park Estate London and Director, Grass Roof Company & Green Roof Shelters United Kingdom
		Climate proofing of social housing estates in London using urban Green Infrastructure Mark Bentley, Groundwork London, United Kingdom
		Green Ribbon as a vision, a strategy and a project: Creating a green identity for Ostend Mark Wilschut, Designer, Landscape Architect, Smart & Sustainable Infrastructure, Technum Ghent, Belgium
		Eco sustainability: a holistic structure, showing ample opportunities to achieve sustainable human development Prof Dr. Tony Pereira, UCLA Los Angeles USA and Visiting Professor, Institute of Engineering, University of Palermo, with Chiara Catalano, University of Palermo, Italy
		Retrofitting neighbourhood housing from the 1950s and 1960s with Green Infrastructure for green and liveable cities Dr Stefan Becsei, Landscape Designer & Urban Planner, b-a-e-r Environmental Research Frankfurt am Main, Germany
14:50		HARVESTING
15:00	BREAK	
15:30	SESSION 13	**SYNTHESIS**
		WORLD CAFÉ
		FINAL HARVEST
16:45		**VISION AND CONFERENCE CLOSING WORDS BY THE EUGIC HOSTING TEAM**
17:00		END OF CONFERENCE

Moderation: Pamina Haussecker, Holger Heller, Karin Kübböck, Ines Oman

EUGIC 2015 Team

Green4Cities. The voice for Green Infrastructure in every city

Green4Cities is a young company which was founded by four experienced personalities in Green Infrastructure to give a platform, a think-tank, a voice for green facades, green roofs and Green Infrastructure in every city.

Green4Cities offers a variety of technical concepts in vegetation technology and an active network to support the implementation of Green Infrastructure solutions.

With great experience from numerous research, development, education and consultancy projects, we create signposts to guide cities towards resilience to climate change.

www.green4cities.com

4 persons 4 greener cities: Vera Enzi, Ulrike Pitha, Doris Schnepf, Bernhard Scharf, the founders of Green4Cities GmbH.

GREEN 4 CITIES

LivingRoofs Enterprises. Bringing nature into cities

Livingroofs Enterprises is an organisation based in the UK which over the last eleven years has promoted urban Green Infrastructure, especially green roofs and walls.

Its founder Dusty Gedge is internationally recognised for his work as an activist, campaigner and advocate, as well as being a knowledgeable consultant on urban Green Infrastructure.

Livingroofs Enterprises is the UK representative of the European Federation of Green Roofs and Walls Association and represents the Federation on the EU Ecosystem Services and Green Infrastructure Working Group in Brussels.

www.livingroofs.org

PHOTO: DUSTY GEDGE

A London living roof

LivingRoofs

The Keynote Speakers

Wolfgang Ansel

Mapping Cities in Europe for green roof potential

Wolfgang Ansel is a biologist and Director of the International Green Roof Association (IGRA). He is co-author of various books on Green Roofs, and has been a frequent speaker at congresses in Europe, North America and Asia over recent years. IGRA's targets include the worldwide promotion of the ecological Green Roof idea, international knowledge transfer in the field of Green Roofs and the stimulation of international standards for good practice and reliable Green Roof technology.

One of IGRA's main areas of work is implementing Green Roof policies at an international level. Together with the City of Portland (Environmental Services) and the International Federation of Landscape Architects (IFLA), IGRA has created a platform to facilitate the application of Green Roof policies, the "International Green Roof City Network".

Company:
International Green Roof Association IGRA
Country:
Germany
Office:
72610 Nürtingen
Website:
igra-world.com

Richard Brown

Retrofitting urban drainage

Richard is a civil engineer, an expert on hydraulic modelling and an industry expert on retrofit Sustainable Drainage (rSuDS). Richard Brown has broad experience of projects across the water cycle in the UK and abroad.

Company:
Arup & DCWW Rainscape
COUNTRY:
Bristol, United Kingdom
Publications:
Green Infrastructure Retrofit in High Density Urban Environments: Mechanisms for delivery
Website:
http://www.dwrcymru.com/en/My-Wastewater/RainScape/RainScape-Llanelli.aspx
Office:
Richardc.brown@arup.com

Dr. Michael Bruse

Climate change, cities and Green Infrastructure

Director of Innovations and Products with ENVI-MET, Dr. Bruse has been principal designer of the ENVI-met Software since 1993 and is Professor of Geography at the University of Mainz. Michael Bruse has over 20 years of executive level experience in simulating outdoor microclimates. As co-founder, partner and Director of Innovations and Products of ENVI-MET he oversees the technical output of the company whilst also taking creative lead. He incorporates innovative simulation solutions into projects, creating the best solutions for innovative architectural designs and landscape visions. Since 2007, he has also been Partner of Werner Sobek, Green Technologies, delivering major projects in sustainable design worldwide.

Main Projects Include
Dubai Crystal: Microclimate simulations // Heart of Europe: Microclimate simulations // West Kowloon Cultural District: Thermal comfort of outdoor spaces // Sydney CBD: Microclimate and thermal comfort assessment.
Company:
ENVI-MET Country:
Germany
Website: ENVI-MET.com
Publications:
ENVI-met System: A three-dimensional microclimate model

Strahil Christov

The EU B@B Platform and the NCFF

Strahil Christov is a Policy Officer in the European Commission, DG Environment, Unit Biodiversity, working on TEEB (The Economics of Ecosystems and Biodiversity) and Business and Biodiversity.
Strahil is the Commission contact point for Phase 2 of the European Business and Biodiversity Platform. He is also part of the TEEB Coordination Group.

Vera Enzi

Session Chair and EUGIC 2015 Co-organiser

Vera Enzi has been working in Urban Green Infrastructure Research and Training at the University of Life Sciences Vienna (BOKU) since 2010. Vera cofounded Green4Cities, the Urban Green Infrastructure Competence Center Startup in 2014, currently growing in the areas of R&D, Networks and Consulting.
Vera supports Green Infrastructure by contributing to networks like the European Federation of Green Roofs and Walls Associations or the EU Biodiversity & Business Platform. Vera is an expert Consultant for Green Roofs, outdoor and indoor Green Walls, Rain Gardens and Green Concrete.

Company:
Green4Cities
Country:
Austria
Website:
www.green4cities.com
Office:
Westbahnstrasse 7 Top 6a, 1070 Vienna, Austria
Publications:
Power of Surface – How Cities adapt to Climate Change

Dr. Helga Fassbinder

Session Chair

Dr. Helga Fassbinder is an urban planner, political scientist, writer, Professor Emeritus at the University of Technology Eindhoven in the Netherlands, former Chairperson of the TUE Institute of Urban Renewal and Urban Management, Professor Emeritus at the University of Technology Hamburg-Harburg, Germany, and former Head of the TUHH Institute of Urban Planning and Development. Since 2006 she has been member and vice Chair of the Technische Advies Commissie Hoofdgroenstructuur (a committee for the protection of green zones) for the City of Amsterdam.
Dr. Fassbinder initiated new ideas in urban planning long before the mainstream. At the end of the 60's, while still a student, she organized the fight against the demolition of Kreuzberg in Berlin and mobilized students in the Department of Architecture at the Technical University applying her new concept of a soft urban renewal approach working together with the residents. Her publications on urban renewal led to her appointment to the first academic Chair on Urban Renewal in Europe at the University of Technology Eindhoven. There she worked together with students supporting action groups in their negotiations in the fight against the demolition of their neighbourhoods.

Website:
www.helgafassbinder.com
Publications:
http://www.biotope-city.net/

Laura Gatti
The Bosco Verticale, Milan

After graduating in Agricultural Science from the University of Milan, Laura took her Post-Graduate Diploma in Parks and Gardens at the University of Turin with honorable mention. From early on, her career has focused on tree care through research, arboricultural implication studies, tree maintenance, development of alternative strategies, and the restoration of public and private historic parks such as the renowned Giardino Ducale in Parma (ca 1770), the Cavalieri di Vittorio Veneto Park – Winter Olympic Games Turin 2006, and Pisa's Giuliano da Sangallo fortress (ca 1515).

Based in Milan, her practice has worked across Italy and the Mediterranean as well as in different European countries, the Middle East and China. Her background in horticulture, landscape, engineering and urban life science gives her a broad perspective. Focusing on tree planting and care, Laura also advises cities and developers on innovations in mixed-use design, urban regeneration, urban soil conservation, vertical greening, urban farming and environmentally sustainable green building principles.

Company:
www.LauraGatti.it

Dusty Gedge
Mapping Urban Green Infrastructure in London

Dusty Gedge is a Green Infrastructure consultant working in London, UK and Europe. He is the current President of the European Federation of Green Roof Associations (EFB), founder of Livingroofs.org, and is a working group member of the EU Green Infrastructure and Ecosystem Services Working Group.
Biodiversity and birds on green roofs drew him into this work 20 years ago. Nature is at the heart of his work although he naturally deals with all the issues that cities face and how vegetation can help cities adapt to climate change. He has worked on Green Infrastructure projects in the UK for the last 15 years. Some of these are recognised as seminal projects, especially in London. Dusty Gedge also advises virtually on projects across the world through his consultancy firm the Green Infrastructure Consultancy.
Dusty Gedge has also been a TV presenter on a number of UK shows and makes his own Green Infrastructure and Green Roof and Nature Videos. He is also an avid nature photographer and social networker, posting on Twitter, Facebook and G+.

Company:
www.livingroofs.org
Country:
United Kingdom
Twitter:
greenroofsuk
Website:
www.dustygedge.co.uk
www.livingroofs.org
www.greenrooftraining.co.uk

Gary Grant
Ecosystem Services Come to Town

Gary is a consultant ecologist, Chartered Environmentalist, Fellow of the Chartered Institute of Ecology and Environmental Management, Director of the Green Infrastructure Consultancy, Thesis Supervisor at Bartlett Faculty of Built Environment at University College London, Member of the All Party Parliamentary Group on Biodiversity and author of two books: Green Roofs and Facades (BRE Press 2006) and Ecosystem Services Come to Town – Greening cities by working with nature (Wiley 2012). His new book, The Water Sensitive City will be published by Wiley in 2016.

Gary's projects include the London Olympic Park Biodiversity Action Plan, Whitehill-Bordon Eco Town, Lend Lease HQ Roof Garden, Westfield living wall, Natural History Museum Wildlife Garden, Education City, Qatar and Saadiyat Island, Abu Dhabi.

Twitter:
ecoschemes
Company:
Green Infrastructure Consultancy Ltd
Country:
UK
Publications:
Ecosystem Services Come to Town: Greening Cities by Working with Nature
Website:
greeninfrastructureconsultancy.com

Wolfgang Heidenreich
Public private partnerships for Green Infrastructure in Munich

After completing his academic studies in landscape ecology at the University of Kassel in Germany, Wolfgang Heidenreich worked for various landscape architects and engineering firms. His projects are in the fields of urban planning, landscape architecture, instrumentation and open space planning. They include renovation and new building projects across Germany.
Heidenreich is a member and co-worker in various public organisations and urban greening associations.

Company:
Landschafts-Architekturbüro Heidenreich
Country:
Munich, Germany
Publications:
Vorteile der Gebäudebegrünung – Übersicht für die Münchner Stadtgesellschaft, Begrünungsbüro in Green City e.V., Alexandra Schmidt, Wolfgang Heidenreich,
2. überarbeitete Auflage
Website:
www.greencity.de
Twitter:
www.twitter.com/greencityev

Dr. Manfred Köhler
The benefits of Green Infrastructure

Dr. Köhler studied at the Technical University of Berlin, with a Diploma Degree in 1981 and a PhD in 1987 on "Ecological effects of living wall systems".

Since 2008, Dr. Köhler has been Vice Dean of the Department of Landscape Science and Geomantic and is Founder of the Green Roof Research Centre, at the University of Applied Sciences, Neubrandenburg.

In 2008, he became co-founder and President of the World Green Infrastructure Network (WGIN) and is (www.worldgreenroof.org).

Member of: Federal Landscape architecture organisation (BDLA), Member of several FLL guideline working groups (www.FLL.de), Representative of the German FBB for international relations (www.fbb.de) and country representative at the European Green Roof Association EFB.

Since 2014, he has been Detao Master of Sustainable Architecture (Shanghai, China).

Approx. 150 scientific publications, mainly with a focus on green roofs, living walls and indoor greening.

Website:
gruendach-mv.de worldgreenroof.org
Office:
koehler@hs-nb.de

Ágnes Koller-Posztós & Andrea Sipos
Budapest: Where are we and where do we want to be?

Ágnes Koller-Posztós is a hungarian architect and urbanist. She is experienced in green policy issues of Budapest and currently collaborates in projects as e.g. "TÉR_KÖZ: Competition for districts of Budapest to support sustainable urban development projects" or the development of a Master plan of Public space utilization methods in Budapest.

Andrea Sipos is a hungarian landscape architect and is currently doing her PhD in Landscape Architecture. She works as advisor and administrator for landscape architecture in the Metropolitan Area of Budapest and has a wide range of knowledge from local and small scaled green infrastructure projects to long-term conceptions of the city.

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City of Budapest, Chief Architect Office
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Bernhard König & Lisa Maria Enzenhofer

team.breathe.austria: the Austrian Pavillion at Expo 2015 Milan

Bernhard König, project leader breathe.austria, studied architecture and urbanism in Weimar, Oxford and Zurich and has worked for Herzog & de Meuron in Basel, the Büro für Urbane Projekte in Leipzig and the Bauhaus Dessau Foundation before entering TU Graz, Institute for Architecture and Landscape as Researcher in 2010.

Lisa Maria Enzenhofer, project leader landscape breathe.austria, studied architecture in Graz and has worked in offices in Vienna, Graz and Malta. In 2012 she co-founded the collective Lendlabor where she initiated various projects in public spaces, focusing on vacant buildings and resources to promote social and ecological diversity in Poland, Brazil and Austria.

team.breathe.austria is a transdisciplinary team of individuals that was established to work on the Austrian Pavilion at Expo 2015 in an open and non-hierarchical way and in collaboration with specialists from various disciplines.

team.breathe.austria
Company:
Institute for Architecture and Landscape, LANDLAB ia&l
Graz University of Technology
Country:
Austria
Website:
breatheaustria.at

Dr. Horst Korn

Nature-based solutions in Cities, connecting urban and peri-urban Green Infrastructure

Dr. Horst Korn has been working in international conservation for biodiversity since 2003, and since 2007 has sat on the Working Group on Biodiversity and Climate Change for the Federal Agency for Nature Conservation, which Dr. Korn founded and developed.

The Working Group advises the Federal Environment Ministry on scientific aspects of biodiversity, especially implementation and further development of the Convention on Biological Diversity. For more than a decade, he has organized on a regular basis national, European and global workshops and conferences that deal with the links between Biodiversity and Climate Change.

Office:
Federal Agency for Nature Conservation
Country:
Isle of Vilm, Germany
Website:
Climate Change and Biodiversity
Publications:
Helping ecosystems in Europe to adapt to climate change
Proceedings of the European Conference „Climate Change and Nature Conservation in Europe – an ecological, policy and economic perspective“

Juliet Lidgren

Malmö: How planning got me into plumbing

Juliet Lidgren is the architect trying to implement ecosystem services into the planning process in the City of Malmö. She firmly believes that business as usual is no longer an option, since that got us in this situation to begin with. Juliet seeks alternative solutions to change legislation, making it both easy and legal to do the right thing as well as spreading knowledge and awareness about the state of the world and how climate change might affect Malmö. Work methods include system analysis, creating a common narrative and scanning the world for best practice.

Country:
Malmö, Sweden
Company:
City of Malmö

John Little

Inner city estate management for people and Green Infrastructure

John Little is known for his pioneering work on social housing estates in the UK, demonstrating how property can be converted into a growing paradise, especially at Clapton Park Estate in East London. He is also known for his work on small scale green roofs with his organisation, the Grass Roof Company. Through another company, Green Roof Shelters, Little also offers modules for small, biodiverse buildings.

Company:
Grass Roof Company
Country:
Horndon on the Hill, United Kingdom
Publications:
Small Green Roofs: Low-Tech Options for Greener Living, by Nigel Dunnett, Dusty Gedge, John Little, and Edmund C. Snodgrass
Twitter:
@grassroofco

Ferdinand Ludwig

Baubotanik – Building Architecture with Nature

Ferdinand Ludwig is co-founder and scientific coordinator of Research Group Baubotanik at the Institute for Architectural Theory (IGMA) at the University of Stuttgart. He studied architecture and his PhD thesis looked at the “Botanical basics of Baubotanik and their application to design practice”.

He is a pioneering architect in Baubotanik (Living Plant Construction), and in recent years has designed and realized projects that combine the growth processes of living plants with an engineering approach. He has analysed botanical growth and construction techniques to create rules for living plant structures. Ferdinand teaches at the University of Stuttgart, leads workshops and lectures on living architecture worldwide. In 2010 he started the collaborative office ludwig.schönle with Daniel Schönle, focusing on design strategies to integrate Baubotanik concepts into architecture and urban planning.

Company:
ludwig.schoenle
Publications:
Research Group Baubotanik, Institute for Architectural Theory

Peter Massini

London: Where are we and where do we want to be?

Peter Massini has spent the majority of his 20 year professional career as an ecologist and natural environment policy maker in London. He started at the London Wildlife Trust as East London Conservation Manager during the late 1980’s, and then moving to the London Ecology Unit, providing advice to London Boroughs on spatial planning issues, development control and site management.

At Natural England he had responsibility for the agency’s strategic planning and policy work for the London region and helped formulate London’s green infrastructure framework – the All London Green Grid – and the policies that helped foster green roofs and other forms of urban greening.

Peter is now the Greater London Authority’s Urban Greening Team Leader managing policies and programmes aimed at improving London’s green spaces and greening London’s built environment. He has a particular interest in understanding how to make the natural environment more relevant in London, by ensuring its many benefits are recognised as being an essential part of a liveable, resilient city.

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Sandra Naumann
Working with Green Infrastructure assessment and valuation

Sandra Naumann works as Senior Fellow at the Ecologic Institute and coordinates the Institute's biodiversity activities. Her work focuses on the assessment and enhancement of European and national land use and biodiversity conservation policies and their links to climate change.

Naumann is particularly interested in the design and implementation of nature-based solutions and green infrastructure in rural and urban areas, focusing on the analysis of costs and benefits, ways to more effectively involve and engage stakeholders, valuing social perception and how to generate multiple benefits. She was also a member of the recent expert group on "Nature based solutions and renaturing cities" commissioned by DG Research, which contributed to the development of the EU Research and Innovation policy agenda.

Company:
Ecologic Institute
Publications:
Green Infrastructure as a Bridging Concept Between Biodiversity Protection and the Green Economy. Design, Implementation and Cost Elements of Green Infrastructure Projects
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Website:
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Thomas Pucher
Cities of the Future: Approaches to urban development, Graz Reininghaus

Atelier Thomas Pucher's designs arise from meticulous research, grasping the spirit of the site and its context to create iconic buildings that stand for themselves. The Atelier Thomas Pucher team includes 30 architects and engineers from all over the world, together with a general planning team of 60 mechanical and structural engineers and consultants in energy and building physics.

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Bernhard Scharf
Green Pass for urban Green Infrastructure investment

Bernhard Scharf studied Landscape Architecture and Landscape Planning at the University of Life Sciences Vienna (BOKU). He wrote his master thesis on flowering turf as a drought and load resistant alternative to grass lawns. Since 2006, he has worked at the Institute of Soil Bioengineering and Landscape Construction (IBLB) with a research focus on vegetation technology, especially building-integrated greening, quantification and simulation of the effects of plants.

In 2014 he co-founded Green4Cities to support the development and realization of green infrastructure.

Main projects:
GrünStadtKlima project: www.gruenstadtklima.at // PROGREENcity project: www.progreencity.com // EXPO Austria Pavilion: expoaustria.at GreenConcrete project: www.schotterrasen.at // PV-Dachgarten
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Mari Ariluoma

TYPOLOGIES OF GREEN INFRASTRUCTURE

Defining the elements of urban green infrastructure for land use planning

Compared to previous concepts of green space planning, green infrastructure (GI) raises a more holistic approach combining social and ecological benefits. The concept of green infrastructure involves all the components of urban green and blue and the approach is not restricted to administratively or otherwise defined areas of public green space. Thus the green infrastructure concept differs from previous green area network approaches. In order to consider all the functions and ecosystem services provided by urban GI new tools are needed to support the planning process.

In this project the types of urban green infrastructure elements have been identified and defined. So far only a few attempts can be found that address the systematic classification of urban green infra-structure elements. The project aims at developing a tool that supports the planning of multi-functional GI and helps in incorporating the ecosystem services approach in the green area planning. The approach has been tested in a case study by analyzing a specific urban district in Helsinki. Through identifying the typologies and elements of GI the ecosystem services provided by the area are linked to the physical elements of urban space.

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AUSTRALIA ROAD COMMUNITY SUDS PARK

Benefitting ‘Host Communities’ through integrated SuDS and landscape design

The conceptual approach : In many cases, retrofit SuDS projects will benefit communities that are sometimes many miles away from the community that will have to live with the SuDS installation in their landscape. It is therefore important that the installation delivers some tangible benefits to the ‘host community’ and ‘host landscape’ improved access, amenity, safety, community cohesion, visual enhancement and increased wildlife habitat. Working for the LB of Hammersmith & Fulham, we designed a dynamic urban park on what was a busy road between a school and playgrounds. Our design uses the collection, treatment and storage of rainwater as a landscape resource to create a park that provides a safer route to school, space for community events, social interaction, valuable GI and a social heart to the estate. Key learning opportunities : How retrofit SuDS projects can be used to enhance the lives and environment of local residents through integrated design. We would like to include further community engagement and involvement in future projects of this kind. Implications : Australia Road acts as a model for how SuDS can be designed to be multi-functional and provide valuable amenity and biodiversity enhancements to urban areas.

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ENVIRONMENTAL IMPROVEMENT THROUGH GREEN BUILDING ENVELOPES

How are we going to make tomorrow worth living in the increasingly dense city? Can we develop a Green generator from the core of a building to its external envelope? Overheating and the deterioration of the climate burden our body and psyche. Vegetated buildings can contribute to local improvement. Fine dust and pollutants can be collected and filtered. Intelligent stormwater management can permanently improve micr oclimate. Vegetated and planted building envelopes can make artificial climate regulation unnecessary and create biodiverse stepping stones for a comfortable climate in the urban fabric. The aim is also to strengthen the individual design of urban spaces so that citizens can relate better to their city environment.

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Antonija Bogadi

GREEN INFRASTRUCTURE IMPLEMENTATION AT CITY SCALE – CASE STUDY OF VIENNA

Advancing urban green infrastructure planning and implementation in Vienna to promote ecosystem services towards more resilient and low impact city

The biophysical features of green infrastructure in urban areas, through the provision of cooler microclimates and reduction of surface water run-off offer the potential to help adapt cities for climate change. Presented research aims to examine how green infrastructure is developed and what are the further opportunities for its development in various types of urban structure in the city of Vienna. To implement green infrastructure into urban areas where the built form is already established is possible to a certain degree, but requires careful planning and understanding on how ecosystem services can be provided.

The research approached the topic at three levels: (1) analysis of synergies and compromises between urban structure and urban green space in Vienna; (2) understanding, in relation to urban form, of what are the required quantity, quality and configuration of urban green spaces to maintain, sustain and enhance ecosystem services compatible with other functions and (3) proposing how to develop highly functional green space under predetermined conditions, e.g., using technical innovation and their implementation on public and private properties.

The aim of the research results and their impact may help in the development of spatial strategies for the green infrastructure to preserve existing greenspace and create new greenspace such that a functional network is formed.

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Carolina Brandão

GREEN ROOFS FOR STORMWATER MANAGEMENT USING NATIVE MEDITERRANEAN VEGETATION

The hydrological performance of green roofs in a Mediterranean climate

This study intended to evaluate the hydrological performance of green roofs under Mediterranean climate, by comparing monocultures and combinations of native species and two different substrates. Urban areas generate considerable amounts of stormwater runoff due to a high percentage of impervious surfaces. In Mediterranean climates, during winter, there can be large volumes of rainfall in short periods of time causing floods. Green roofs are emerging as a tool for stormwater management. The use of native plants besides promoting biodiversity reduces maintenance and irrigation requirements since water is scarce during summer.

This work investigates the influence of rainfall, vegetation and substrate types upon the rainfall-runoff relations (RR) in a Mediterranean climate. Nine test beds were installed at a University building rooftop, incorporating two substrates and three different vegetation covers.

Precipitation and runoff data collection started in September 2014 and is still in progress. Results for the autumn/winter period show that the vegetated systems did not only reduce the amount of stormwater runoff, but also attenuated its peak and delayed its occurrence. Overall mean retention ranged from 63 % (unvegetated) to 82 % (shrub x grass x moss) and other RR parameters showed similar trends. For the most extreme rainfall events, with intensity higher than 20 mm h^{-1} and duration longer than 15 h (15 % of the events), the differences between substrate and cover did not influence RR.

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CAN SOIL-BASED SIMPLE-INTENSIVE GREEN ROOFS SUSTAIN MEDITERRANEAN ANNUAL DRY GRASSLAND FOR PRIORITY HABITAT 6220?

Nature-based approaches to Green Infrastructure and Ecosystem Services

Nature-based solutions are actions which are inspired by, supported by or copied from nature. In our work, we tested the suitability of green roofs (GRs) in hosting Mediterranean annual dry grassland, which according to NATURA 2000 are classified as part of the priority habitat 6220 (Pseudo-steppe with grasses and annuals of the Thero-Brachypodietea). The studied areas were two simple-intensive-GRs built in the early 1990s in Palermo, one neighbouring ex-cultivated yard, two natural sites in Palermo (Mt. Pellegrino, Cape Gallo) and two in Trapani (Mt. Cofano, Cape St. Vito). The growing medium used on the GRs was the typical Mediterranean red soil (Alfisol), common to the neighbouring agricultural land and natural areas. A total of 26 vegetation plots and 16 substrate samples were collected from the studied areas to assess the potential of soil-based GRs to host natural communities and in particular the one of the priority Habitat 6220. For this purpose, dissimilarities/similarities were checked in terms of chemical and physical properties between natural soils and GRs substrate. Results showed similar ranges of variation between the investigated soils properties, demonstrating the potentiality of the studied green roofs to host the target natural plant community.

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URBAN HEAT ISLANDS – STRATEGY PLAN VIENNA (UHISTRAT VIENNA)

Possible measures and their impact on urban climate at different planning and implementation levels

This paper presents the results of UHISTRAT Vienna. It sets out by determining what the potential is for consistent consideration of urban climate aspects at different levels of action and decision making and how to implement such consideration. The presentation goes on to explain the three fields of action identified, i.e. awareness building, information and public relations for UHI, as well as urban infrastructure and large-scale and more detailed technical and structural measures to support strong consideration of the issue. It shows the levels of action in planning from the master plan to the actual project and the options available. Two feasibility studies reveal how UHI-relevant measures can be implemented in designated areas of the city (Master Plan Nordbahn-/Innstrasse (20th municipal district, Land-use and building development plans/ quarters surrounding the Vienna University of Technology (the 4th).

The studies were assessed as to the feasibility of the measures proposed, which involved participation of different agencies of the Vienna City Administration. The summary points out the project's added value for the city, indicating that the journey Vienna has taken to protect the climate while at the same time adapting to the consequences of climate change is bound for success.

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INCREASING THE FUNCTIONALITY OF EXTENSIVE GREEN ROOFS

A multidisciplinary review of economically upgrading extensive green roofs

This preliminary research project aimed to increase the economic benefits of the building owner as the current benefits of extensive green roofs are mainly social. We aimed to develop new incentives and increase the demand for extensive green roofs. The project group consisted of bioengineers, an architect, thermal experts and a marketing expert. This unique multidisciplinary group (7 persons) benchmarked several technology crossovers such as thermal extraction and water purification from a technical, economic and market demand position.

The technical focus analysed theoretical feasibility, with its opportunities and benefits. The crossover with highly technical feasibility was reviewed for its cost-benefit ratio, based on a theoretical model. An inquiry of 300 Belgian home owners and 12 bilateral interviews with stakeholders, architects and contractors discussed the market interest of the different crossovers. The sequel project will focus on two crossover technologies that increase the Return on Investment (ROI) for the builder/investor. Combining thermal capitation and intelligent water management will need further fine tuning and market implementation. Minor research questions will be included in this two year sequel.

This project was financed by the Flemish government, primary green roof manufacturers, contractors and component suppliers.

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EDIBLE LIGHT WEIGHTED GREEN ROOF

Food production on extensive green roofs

World population is increasing and urbanization shows the need for local food production in cities. There is often a lack of areas for vegetable growing. Most green roofs are light weight, and most only planted with sedum or similar. But there is already the technical experience of gardening with less buffered substrates.

Since April 2014 the LWG in Veitshöchheim (Germany) reviews the food production on 24 roof models (each about 4.5 m²) and one former extensive green roof (more than 100 m²). In the tests all roofs are typically equipped with waterproofing, geotextiles and 8 cm of a usual extensive roof substrate. For good vegetable production on green roofs we used drip irrigation and mineral nitrogen fertilizer. The roofs produced salads, herbs, zucchini, onions, and much more year round.

In research, most vegetables grew well in the thin layer substrate. Ambitious cultures like peppers grew better in the second year, which received more watering and more fertilizer than in 2014. Vegetable production on extensive green roofs could be a chance for more local food production in cities and protect the climate by also reducing food CO_2 emissions.

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RESTORATION FOR ECONOMIC BENEFITS – IS THAT POSSIBLE?

Habitat restoration of an industrial site in East Hungary

In 2014, my company Deep Forest in consortium with the National Academy of Sciences started a unique habitat restoration project – the first restoration project of an industrial site in Hungary. This is the first restoration project for a "mosaic wood steppe" kind of habitat. It is relatively large scale (26 hectares) and is challenging on every level. For example, this year's rainfall was a record low for the region. The project is driven by some anticipated economic benefits besides promotional advantages of course. And it provided us with some great experiences and technical ideas for urban projects, especially for biodiverse green roofs.

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MATRIPOLIS

The Infrastucture of Libertarian Municipalism

Existing cities all share a major flaw. Their public spaces consist mostly of streets, where pedestrians and machine powered vehicles share the same space, as if these two movement systems were compatible. They are not.

Matripolis proposes a new urban infrastructure where machines and pedestrians each have their own separate dedicated space (just as rail traffic has always been recognized as needing its own dedicated system). Another problem shared by most cities is the scarcity of green space. These spaces are mostly either confined to parks or marginal land not suitable for building on.

Except for the wealthy few, couples wishing to start a family, recognizing the natural desire for children to play in a garden adjoining their home, often choose to move out of the city to the suburbs. But this creates other problems, such as disconnection from the diversity of social life that the city uniquely offers. Matripolis proposes a green infrastructure where social housing is directly juxtaposed to ample green space comprising community gardens, significant food production, recreation and play space in a setting friendly to life in general. Instead of people living in blocks, separated from each other by streams of traffic, Matripolis proposes living amphitheatres where self-governing communities form around the modern equivalent of the ancient Greek Agora.

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A TALE OF TWO CITIES

Origins of Metropolitan Ecosystems – Case Study of Boston and Vienna

The concept of ongoing, integrated urban ecosystems becomes the green infrastructure of the metropolis and therefore is an important factor in the improvement of urban quality of life.

If natural areas are protected for public use as a comprehensive system, this system as a whole becomes part of the cultural identity of the city; generates greater resistance to urbanisation processes; has a tendency to increase the surface of the conservation land; creates better resistance and better conditions in terms of biological life.

Research was carried out on two city case studies – Boston and Vienna, similar in population, but different in terms of their spatial dimensions, their political, economic and social structures.

The convergence in outcome from parallel approaches to creation of the urban ecosystems, based on surrounding natural areas, proves the interest of the research and the validity of the thesis. For more than a century both cities have maintained – indeed are developing – their green infrastructure. The outcome of this research is a powerful argument in the validity of above-mentioned long term comprehensive approach and strongly supports the long term planning methodology applied in the two cities. The existence of open green space systems, supported by a long-term policy in both metropolitan regions, has demonstrated a high degree of efficiency. It is economically reasonable to plan ahead, rather than respond to the growing pressures of urbanisation. Such large-scale protected areas can satisfy the needs of growing urban populations, while improving life conditions in cities.

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STORMWATER MANAGEMENT BY BLUE-GREEN INFRASTRUCTURE IN VIENNA, AUSTRIA

Feasibility Study for the Seestadt Aspern Nord Urban Development Area

Seestadt Aspern is Vienna's largest development area, being built by 2025 in three construction phases. Initially the implementation of stormwater management on individual building lots was only partly successfully.

The study forms the basis for decisions on the future drainage concept. It examines and assesses both a decentralized and semi-decentralized approach based on current state of the art techniques. Using a new artificial lake for flood detention, stormwater could be disconnected entirely from the sewerage system. Hydraulic requirements need to be incorporated in the overall design of the topography and streets, so storm water planning should precede or coincide with urban design.

Round table panels with the city administration pinpointed administrative and legal obstacles. These could not be completely eliminated. Major topics of discussion were the possible chloride contamination of groundwater by winter maintenance and the possible liabilities of the municipality for explicitly discharging stormwater in streets, parks and the lake. Administrative proceedings are not yet on the same status as the technical possibilities of green infrastructure.

Times required for getting approval are not keeping pace with project developments. Necessary future steps include influencing municipal policies and ensuring an early involvement of landscape architects in master planning.

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GREEN ROOFS IN GENEVA, SWITZERLAND

Potential refuge for plants and bryophytes?

Green roofs are known to serve as refuge sites for different organisms such as plants and animals. Because of the high diversity of green roofs existing in a city and their level of maintenance, their potential to host native or threatened plant species can be different from a city to another. In order to better regulates the implementation of green roofs in Geneva, it is crucial to better know what plant communities are found on green roofs and if they are important for the conservation of native species.

A two-year survey of plant and bryophyte communities was realized on 30 green roofs in the Canton of Geneva. Lists of planted and wild species and their relative abundance on each green roof were recorded.

A total of 298 plant species were inventoried. Half of these species were colonizing ones with 65 % of native and 15 % of threatened species. Forty-three mosses and liverworts species were identified representing 12 % of the bryoflora of Geneva. One invasive moss species was found.

This study showed that green roofs can be refuge for spontaneous native plants and bryophytes. This will be useful for developing new seed mixes with specific communities of indigenous species.

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TEXTILES FOR GREEN INFRASTRUCTURE, AN ELEGANT SYNERGY

Green and living walls made lightweight, flexible and smart

While textiles are already used in some green wall applications, innovation and research is limited. However, a vast range of textile based solutions are ready to be explored for green infrastructure.

Textiles can be tuned to fit needs, for example to alleviate structural issues, plant substrate incompatibilities and allow for integrated monitoring. For the structural design of green or living walls, high strength textiles, dedicated coatings and 3D structures can be deployed. Plant-substrate interactions can benefit for example from textiles based on natural fibres, biodegradable fibres or a combination of both. In addition, the fabric structure may be optimised for acquiring the ideal water/air balance, or to allow for easily planted green infrastructure, provide a suitable substrate for pre-grown walls or plantlets.
Moreover, textile functionalization may allow for breathable fabrics, water repellence or tuned water absorption capacity, nutrition management and slow release of fertilisers. Finally, recent improvements in smart textiles can provide self-diagnostic membranes for moisture, temperature, strain, vibration and chemical sensing.

In this work, an overview is given of existing textile based materials useful for green infrastructure. In addition, recent developments can also be inspiring for their use in green or living wall applications.

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Markus Jeschaunig

OASIS NO. 8

C2City: waste heat installation – Bananas from Graz!

Markus Jeschaunig, operating as an Agent in the Biosphere, examines in his long-term arts-based research project “C2City” (Cradle to Cradle City) human process technologies with regard to the biosphere and the environment.

The 2015 implemented project Oasis No. 8 is situated in a vacant lot in Graz and powered by the waste heat of refrigeration units from a restaurant to create a tropical microclimate for growing bananas, pineapples and banana plants.

As a parasitic architectural intervention it can keep the interior climate of an EFTE bubble at more than 15° Celsius over the winter, the minimum temperature required by the tropical plants. The greenhouse bubble creates a contrast to the historic centre of Graz and uses only unused energy, waste heat from a cold store.

The project is an attempt to reveal energy potentials, criticise established systems and demonstrate new modes of action. It raises exemplary questions about our handling of global resources and the consequences.

In late summer 2016 the bananas, pineapples and papayas are going to be harvested and tasted by everybody. An energy balance and documentation of the process will be published.

This project is run in collaboration with the Botanical Garden Graz and the Institute for Art in Public Space Styria.

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GREENING THE GREY: DOES URBAN GREEN SPACE CATER FOR SOCIETAL WELL-BEING AND BIODIVERSITY?

How well a single set of targets can deliver effective greenspace generation for all

Strong evidence suggests investing in green infrastructure can promote economic growth, health and wellbeing and biodiversity. Although opportunity exists to create and use green space within urban areas for both wellbeing and biodiversity, there is little evidence to indicate what spatial configurations are needed for multiple functions. We combine both habitat fragmentation for wildlife and green space accessibility for people to identify how well a single set of targets can deliver effective green space generation.

Health and well-being is measured through green space accessibility, using the 'Accessible Natural Greenspace Standard' (ANGSt) by Natural England, with Gloucester as the study city and pollinators as an indicator group for biodiversity. Flight foraging distances of bees determine city connectedness of key habitat types; allotments; nature reserves; and temporary wildflower seeded patches The outcomes considerably emphasise the impact frequent, smaller patches of suitable habitat has on network connectivity, dramatically increasing the reach and provision that can be supplied by a single permanent green space, or even an entire nature reserve.

The mapping software utilised is ArcGIS, enabling cartographic outputs that provide simple visual recommendations for improvement by highlighting key zones of green space deprivation throughout the city.

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RETHINKING GREEN: VENTURES AND PARTNERSHIPS ADDRESSING THE PUBLIC URBAN REALM

Green Infrastructure and Wellbeing in Public Housing

Green infrastructure (GI) development is at the forefront of the sustainable urban development agenda due of its mufti-functionality properties and benefits that contribute to sustainable water management, urban resilience, climate change mitigation, and UHI effect mitigation. A successful implementation of GI projects requires a multi-partner approach to development in order to have a social, economic and ecological impact. Gaining understanding of the current state of trends in successful practices, cab help shed light on the current challenges and opportunities that exist for advancement.

Against this background, this study is an investigation into the current state of green infrastructure development based on best management practices developed under close stakeholder cooperation. Five case-studies from the City of New York are analyzed taking into account the tools used to include private sector stakeholders as main actors in the development and maintenance of green infrastructure in urban projects. The results found three main strategies as stimulating factors for private sector inclusion in development including: private/public partnerships; social oriented approach to programming; and innovation. The successful aspects of the case studies weight heavily on the social sphere and on community oriented strategies addressing issues concerning livability in dense urban centers.

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EXPLORING BENEFITS AND CO-BENEFITS OF ECOSYSTEM-BASED APPROACHES TO SUPPORT URBAN ADAPTATION – IN PILOT CITIES IN THE CZECH REPUBLIC

Ecosystem-based approaches to adaptation (EBA) are recently promoted as a useful approach to reduce the adverse impacts of climate change while providing broad range of nature´s benefits. The UrbanAdapt project aims to support decision-making and to initiate and further develop the process of preparation urban adaptation strategies. City of Prague, Pilsen and Brno joined the UrbanAdapt project as pilot cities in Czech Republic.

To promote the use of EBA in urban adaptation, the adaptation cycle as a generic framework was applied to adaptation planning. Firstly, climate related risks and impacts experienced in cities in the present and for the future state in 2030 were assessed. To ensure effective participation of stakeholders, we organized participatory workshops where risks as well as adaptation measures have been rated. Various EBA measures have been prioritized by stakeholders using multiple criteria (including economic aspects, timeframe, etc.) along with main barriers and opportunities for implementation. The results of the participatory workshop indicate that most of the EBA measures have a very high priority among stakeholders. The preliminary results are presented for the city of Prague.

Outcomes of this study will support decision-making in the area of climate change, adaptation strategies development and urban planning.

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PARTICIPATION 2.0

Barriers and driving factors of urban gardening

The paper gives an overview on the results of the Austrian R&D-project ‘Participation 2.0’. The barrier between planners’ intentions and potential users’ perspectives regarding the contemporary form of (urban) living and gardening traditionally is driven by the absence of users and their needs, wishes and experiences within (early) planning phases. The project’s aim was to explore new and contemporary forms of participation in the planning process and all its stages by using social media approaches. The project grasped and collected the diverse and various perspectives of potential users for an innovative housing project in Vienna (“compact garden living”), in order to integrate different demands from the users’ side into the planning process from the very beginning. The housing model “compact garden living” represents urban green cities and combines green architecture with agricultural crops. With the help of six focus group interviews and several action oriented workshops, citizens’ approaches towards urban gardening, barriers and driving factors of individual and common cultivations of fruits, vegetables and herbs were analysed – and were made accessible for the planning process. The paper highlights the main results of this project and gives an insight into users’ demands concerning urban gardening on nearby buildings and common spaces.

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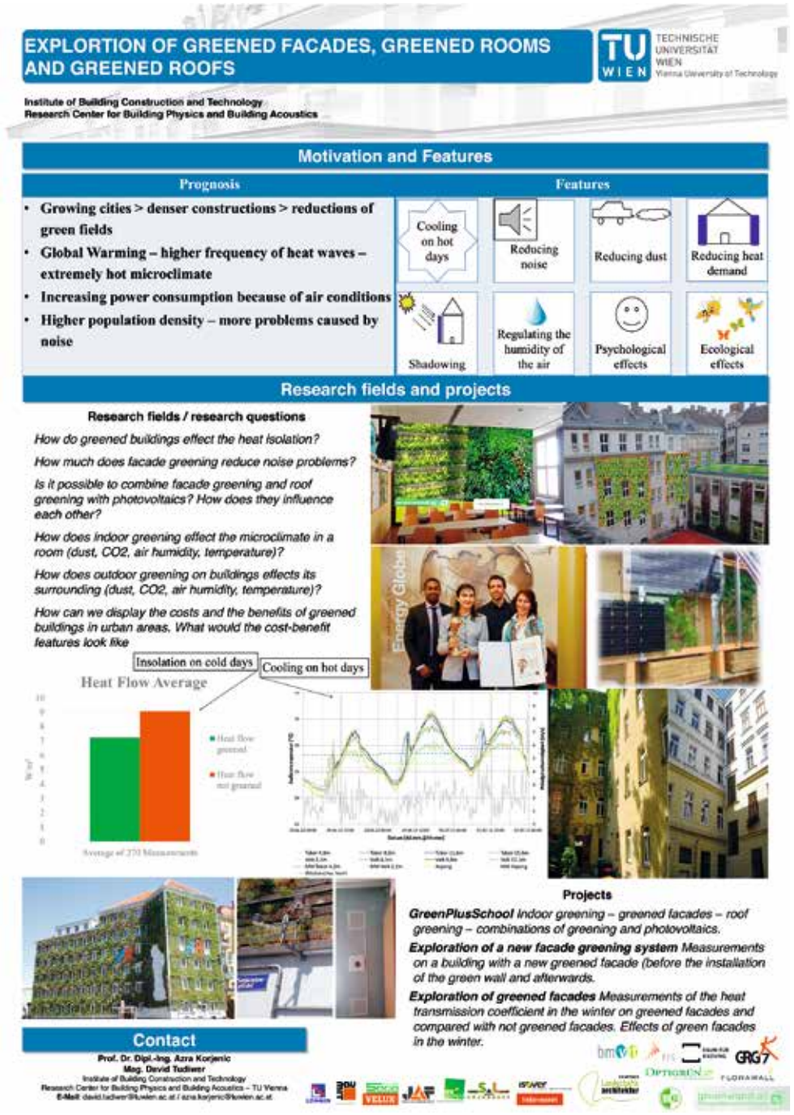
EXPLORING GREENED FACADES, ROOMS AND ROOFS ON A PUBLIC SCHOOL IN VIENNA

An integrated building vision



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Klaus Kramer

GI-VIENNA-GI

Geoinformatics for Vienna Green Urban Infrastructure

Starting as early as 1991, green space monitoring was developed in Vienna, classifying Vienna's green areas (Vienna's 400 km² divided in more than 60,000 areas) quantitatively and qualitatively. This long time span poses methodical challenges. Up until 2003, the areas were measured and trees were counted manually by using analogue stereo infrared-photos. Afterwards various methods, tools and data bases have been ported to a GIS-level. The size, status and the development of the green areas are then classified by means of digital colour-infrared aerial photographs, including semi-automatic evaluation of green roof tops.

A cadastre of green roof potential was set up on the basis of a detailed surface model in 2009 and published as an internet service to motivate house owners for greening their roofs and combining solar and green roof potentials in order to optimize effectivity.

In a further step an accessibility analysis of public green areas as well as an evaluation of the population's pressure on these areas was realized by means of mapping and analysis.Further steps to more automatic tools monitoring and evaluating of urban green are in progress.

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DYNAMICS OF SPONTANEOUS VEGETATION ON SUBTROPICAL ROOFTOPS IN HONG KONG

Transforming highly manicured green roofs into renaturalised biotopes

Spontaneous vegetation within a managed green space is often regarded as unwelcoming and insignificant weeds by many. This perception is still deep rooted among the general public in Hong Kong, as the ecological services provided by such greenery is not well informed. Skyrise geenery in this compact city is becoming prevalent and popular, often in the form of manicured neat and tidy patches of groundcover or shrubs, and are intrinsically required higher water and labour input for maintenance. A manicured extensive green roof with only 7 (2 native, 5 exotic) plant species were transformed into biodiverse habitats by replacing selected plant species with 20 species of native ferns and herbaceous plants over 15 months. After planting, a baseline plant survey was conducted and revealed that a total of 50 (35 native, 15 exotic) plant species grew as spontaneous growth, while 7 native species planted had died out. Recurrent quarterly plant surveys recorded the cover

abundance of each species, and dynamics of plant species were evaluated over the first year of study. During the first quarter, 12 (11 native, 1 exotic) plant species colonized.

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A CITY FOR ALL SPECIES

Incorporating ecosystem services into municipal planning: The case of Malmö, Sweden

It's hard (no doubt) to go from vision to action; especially it seems, in regards to sustainability and nature issues. We have been asking us the question how to reach our environmental goals and become more sustainable since the seventies and been given more or less the same answers since the eighties, but where is the action?

In Sweden, the state has proclaimed that consideration for ecosystems services shall be included in planning and decision-making (no later than 2018). In the city of Malmö, this has led to an initiative by planners to investigate if and how this can be done within the current planning process. In Sweden, the detailed development plans are the only legally binding planning documents, and it has been questioned if the current legal framework makes consideration of ES possible or if laws must be altered.

Given the complexity of the task it is being targeted from several angles:
A) The legal framework is studied together with 7 other municipalities and The National Board of Housing, Building and Planning. B) A system analysis of municipal planning and administration is carried out with participants working in different departments within the municipality. C) The link between the green infrastructure plan and detailed development plans is being investigated.
D) A GIS-based tool to visualise ecosystems services values is being developed.
E) Malmö is a part of WHO's Healthy Cities network, and the two projects are collaborating to increase equity and urban public health.

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BAUBOTANIK: CLIMATE ACTIVE DESIGN WITH LIVING ARCHITECTURE

Concepts and techniques to integrate trees in architecture and urbanism

More and more cities accept and integrate vegetation to achieve positive climatic effects due to shading and transpiration as well as air purification (fine dust separation) and noise filtration. In this regard mature trees are particularly effective. The aim of Baubotanik is to integrate trees in different ways in architecture and urban planning to achieve these effects directly in the built environment. Thus trees are connected with each other and with non-living constructional elements so that they grow into a vegetal-technical compound structure: single plants merge into a new, bigger organism and technical elements are incorporated in this plant structure. Thus tree-buildings emerge that can be used e.g. as vertical parks or for residential purposes.

The research group Baubotanik is dealing with the technical and aesthetical possibilities of constructing and designing with living trees, analysing biological growth principals and working on concepts to integrate developmental processes of plants into urban planning to make use of the ecologic, economic, social and spatial potential of trees. Theoretical investigations are accompanied by realised projects which themselves become the subject of research due to their innovative character. The paper presents this interaction/interplay by means of selected research projects and realised buildings and gives an overview over planning approaches and design methods.

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OUTDOOR LIVING WALL SYSTEMS EXPLORED

Monitoring and practical evaluation for implementation in cities

Living wall systems (LWS) have great potential for (re)greening cities. Nevertheless, their implementation is still marginal and not always successful. A practical and objective evaluation of commercially available systems is needed as knowledge of strengths and weaknesses of each system allow further optimisation and elaborated plant selection.

Therefore, pilot-installations (4m²) of six systems were installed in 2013 at PCS Ornamental Plant Research: PlantDesign, Wallflore-Per-E, 90-Green (Vertical Green Company), LivePanel-Outdoor (Mobilane), Flexipanel (Sempergreen), and Muurtuin.be.

The effect of orientation, plant selection and fertilisation between systems was minimized through the experimental set-up. From the start to the present, following parameters were monitored and evaluated: water and nutrient consumption, plant growth and maintenance, weed levels, water distribution and retention, ornamental value, and technical issues.

The results allow a substantiated choice for the best LWS fitted to each individual green infrastructure project as well as an optimal plant selection for the chosen system. Better choices will result in better performance and thus stimulate the implementation of LWS in cities. In addition the weaknesses discovered could stimulate producers to optimize their systems. In current and future experiments, additional systems will be evaluated, and more plant species will be tested to determine which plants are best fit for each system.

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FINANCING GREEN INFRASTRUCTURE IN LIVERPOOL (UK): DIFFICULT CHOICES FOR CITY-SCALE MANAGEMENT IN AN ERA OF AUSTERITY

Mechanisms for green infrastructure financing

The City of Liverpool is currently reviewing how it funds all its statutory and discretionary services. One element of this is a city-wide review of how Liverpool City Council finances the management of its green and open spaces. In conjunction with a systematic review of the costs and benefits associated with city's green infrastructure resources a city-scale process of consultation has been undertaken to establish what values the city's population place on the landscape.

Running in parallel with this has been an investigation into how alternative funding mechanisms can be integrated into the planning of Liverpool's green infrastructure. Drawing on experiences from other UK and European cities, Liverpool is exploring a multi-pronged approach to the long-term investment in green infrastructure.

The outcomes of this process include a form of social mapping of citizen valuation, as well as, a series of funding proposals for future management. The scale and nature of the investigative process is unique in the UK, as no long-term city-scale evaluation of green infrastructure has been conducted previously. The findings of the review, which will be released in January 2016 will therefore insights into how local government, developers and communities can finance investment in green infrastructure in the future.

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POTENTIALITIES OF INFRARED THERMOGRAPHY APPLICATION TO GREEN ROOFS AROMATIC PLANTS SURFACE TEMPERATURE EVALUATION

Preliminary thermography measurements on green roofs

The intense urbanization in the 19th century led to a change in the climate of urban environments. The replacement of vegetation and expansion of impervious areas promoted the appearance of several environmental problems, such as decrease of urban air quality, risk of floods, wildlife reduction and raise of air temperature in city centres. Green roofs technology may help to overcome these problems and seems to be a solution to reduce the heat island effect and the air temperature in the building's surroundings. Vegetation in roof tops can help lowering urban air temperature due to evapotranspiration.

In the present study, two green roof platforms with different substrates have been implemented with aromatic plant species. Infrared thermography studies have been performed on the potentialities of using the technique to assess the effect of different aromatic plants on temperature mitigation. The results showed that a qualitative evaluation of the surface temperature associated to each species, in a specific moment, can be performed. However, several limitations of this technique must be considered such as the emissivity(ies) of each specie and exterior conditions. The latter limitation can be overcome with dynamic measurements, for longer periods, that will be a future development of this work.

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HOW CAN A GREEN INFRASTRUCTURE INDEX AS PLANNING INSTRUMENT INCLUDE ECONOMIC EFFECTS?

Considerations for Vienna

Over the last decade, cities like Berlin, Graz or Singapore have developed indices for Green Infrastructure (GI) as a planning instrument. Most of these indices attempt to quantify the ecological function of different types of GI, but have limited coverage on the economic aspects.

In this study, we investigate how the capitalization of GI in real estate property values could be included in a GI-index for Vienna. By simplifying certain assumptions, we conclude that a benevolent planner who wants to maximize benefits for households needs to install GI in areas where rental prices are capped or where long term contracts exist.

Otherwise, the surplus generated by GI is capitalized in rental prices with landlords benefiting. We believe the social or ecological benefits of GI which are not capitalized in rents are not captured. Empirical evidence is given in the form of descriptive statistics for Vienna as far as available data allows.

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FREILUFTSUPERMARKT

Harvest your city in the open air supermarket

For centuries the size and wealth of a town were defined by its climate, its topography and the natural resources available in the immediate hinterland. During the industrialization period, the traditional relationship between city and landscape was progressively decoupled: the industrialized city started to expand and densify regardless of its natural setting and the availability of local resources for supplying the population. Today, inhabitants of metropolitan areas are longing for more nature, consumers are asking for regional and fair products, mobility between town and rural areas is slowly evolving. In this context, landscape architects and urban planners need to rethink the city's relationship to soil.

The Agropolis movement reintegrates food-production in the city as an urban development tool. It provides solutions both for the close periphery of growing cities as well as for intra-urban sites in shrinking towns. First prototypes of an open-air supermarket have been implemented with success in Vienna and Munich. They show how the Agropolis concept can be used both as an interim solution to upgrade dismissed industrial areas and as an initial component for future city developments.

Beyond the benefits for the microclimate and the local ecosystem, one of the main scopes is the social (re-)activation of urban areas. Food production and consumption are turned into an experience of nature and space in an edible landscape. Beyond urban gardening, the vision is to make food production accessible to all urban consumers.

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HOLISTIC ECO-SUSTAINABLE INFRASTRUCTURE

Holistic methods to design and build eco-sustainable infrastructure

This study describes new methods to develop a holistic, eco-sustainable infrastructure utilizing innovative and integrative technologies, as well as new approaches to education, socio-economic-political governance and the planning needed to ensure successful implementation.

Current urban infrastructure that was implemented to produce and distribute energy, food, water, build shelter, dispose of and recycle waste, and facilitate the transportation of humans, animals and goods, has grown largely out of historical needs to utilize planetary resources essential to human survival and comfort, and not by careful, rational, or eco-sustainable foresight.

Meeting the increasing demands and consumption of a rising population was achieved by simply adding to and scaling up existing infrastructure. While some remediation is undeniably possible and needed in existing urban infrastructure, new holistic methods to design eco-sustainably are crucial to greatly reduce or completely eliminate human impacts on the environment. The human appropriation of resources can be maintained only while preserving biodiversity and a viable planet. With this work, we aim to provide an initial holistic structure that shows ample opportunities to achieve sustainable human development.

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CONCEPTS FOR GREEN WALLS, GREEN ROOFS AND WATER BALANCE FOR MICRO-URBAN GREEN AREAS

The aim of this presentation is to present two main themes of urban green: green walls and green roofs. The presentation describes their primary forms and presents their main qualities and features. As is recognised these days, climate change is a problem people need to solve all over the world. Lack of food, potable water and clean air are problems humans need to face.

This presentation aims to describe green walls and roofs as a potential remedy to help solve these problems by employing their main features, such as retaining and cleaning water, depending on the layers of construction that may be changed, according to human needs. The presentation highlights the difference between different materials and different construction techniques used to design green roofs and walls that could be ideal for the climate, place and users.

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MONITORING GREEN ROOF ECOSYSTEM SERVICES IN GENEVA: FROM THEORY TO PRACTICE

In 2014, a 2 year project began on green roofs of the Canton of Geneva. The objective of this project is to monitor ecosystem services of green roofs regarding water retention, biodiversity and climate mitigation. The aim is to recommend actions and develop decision making tools for managers about green roof establishment and management.

Thirty green roofs were monitored in July and August 2014 and 2015. Biodiversity (plants and arthropods) was recorded on these roofs as well as soil substrate composition, structure and thickness. Flow meters were installed on a sub sample of the thirty roofs to evaluate water retention. Climatic profiles on and around green roofs were measured and evapotranspiration was calculated.

An important variation between green roofs of the same type (extensive or intensive) was observed for plants (species and abundance) and soil substrates (composition and physical properties). Because these two components influence the capacity of the roof to retain water and mitigate air temperature variations, a unique conclusion cannot be drawn regarding ecosystem services provided by these green roofs. This project highlights the difficulties of measuring in situ the environmental performance of green roofs and maintaining the qualities of green roofs over time.

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IDENTIFYING ECOSYSTEM SERVICES OF URBAN GREEN INFRASTRUCTURE

Pilot project undertaken in Lower Austria

From 2012-2014 we worked on a pilot project in a town in Lower Austria (supported by the Lower Austrian Wohnbauforschung) dealing with the calculation of Carbon storage in ground cover and trees, identifying urban heat islands and heavy stormwater events as well as the perception of cultural ecosystem services of green infrastructure by the community. The first step was to develop a framework together with a core stakeholder group to recognize the potential for social-cultural and environmental adaptations (SWOT analysis). We developed a dialogue to explore the relationship between people and their urban nature to talk about implementing green infrastructure and using the benefits. To do so we assessed local knowledge and place-based values with neighbourhood groups in conjunction with assessing biophysical parameters, like the functions of the existing ground cover, the urban heat islands and rainwater management possibilities. The second step was to investigate ground cover with LiDAR data to calculate the biomass and the storage and sequestration of CO_2. The next step was to develop modules for implementations of green infrastructure together with the stakeholder groups, realize parts of them and set up a first structure for adaptive management with stakeholders.

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IMPLEMENTING URBAN RAINWATER MANAGEMENT SYSTEMS

Between policy and practice

Despite the multiple benefits of sustainable urban rainwater management and the variety of technical and instrumental options to support its implementation (from green roofs, retention ponds, infiltration trenches, permeable pavements to collection and use), these practices seem to be generally restricted to isolated model projects. This paper presents preliminary findings from UrbanRain, a research project funded by the Swedish Research Foundation (Formas), examining the challenges and opportunities for main-streaming rainwater harvesting in three European cities. We review the evolution of rainwater management practices in Berlin over the last 35 years. To do this, we map and typify implemented projects (according to targeted problems, envisaged solutions, how, when and where they were implemented and the stakeholders involved), and assess policy and planning instruments applied, paying special attention to changing institutional arrangements.

This retrospective analysis points at connections between the evolution of instruments and projects. For example, while in the 1980s large, public pilot projects predominated, since the 2000s smaller private projects have increased. Tools such as targeted funding, split wastewater tariffs, tender requirements or discharge prohibition appear to be crucial behind this development. The paper concludes by synthesizing the findings of this analysis and showing what implications it has for mainstreaming rainwater management in the future.

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AUSTRIAN PAVILION COMPETITION AT THE EXPO 2015

The Austrian Pavilion at Expo 2015 in Milan is a showcase project which combines building and the environment

BREATHE.AUSTRIA, the Austrian pavilion at Expo 2015 in Milan, is a showcase project which combines building and the environment. Through the largescale planting of 560m2 of forest, it creates a complex network of people, the environment and climate. The pavilion forms a frame around generous vegetation and acts as a vessel for the performance of the internal landscape.

The framed shape produces the microclimate of an Austrian forest. The vegetation generates 62.5kg of oxygen per hour, enough to meet the demand for 1,800 people, thus contributing to global oxygen production. This process is technically supported by evaporative cooling but is entirely free of air conditioners.

In this way a dense Austrian forest can be recreated with comparatively natural measures, that is based on the cooling effect of evapotranspiration of plants and forest soil. The 100 percent planting of forest vegetation is an exemplary contribution to urban conditions, as the integral use of landscape can provide urban forms of life with enough oxygen and cooled air. The pavilion represents viewing technology and natural environments as a whole picture that could inspire numerous other projects. The Austrian Pavilion creates a place which connects the seemingly incompatible: technology and natural diversity. The pavilion as ‘air generating station’ can act as a climate stabiliser and can be functionally integrated

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Dr. Faye Thomsit

UNDERSTANDING THE IMPACT OF VEGETATIVE COVER ON TEMPERATURE AND RELATIVE HUMIDITY (RH) IN SUMMER WEATHER CONDITIONS IN THE UK

Green façades provide a number of benefits including reduced temperature extremes around the building, trapping particulate pollutants, supporting biodiversity etc. However, there is still concern among architects and construction engineers that vegetation increases relative humidity (RH) around the building envelope and will lead to damp problems within the building. To investigate this, we made outdoor summertime measurements during 2014 in Reading (UK) on model buildings (insulated brick cuboids) which had vegetative cover provided by Hedera helix, Parthenocissus tricuspidata ‘veitchii’ or Pileostegia viburnoides. Four replicates of each species were tested alongside bare buildings.

The internal temperature was significantly lower for all vegetated buildings, compared with the bare buildings. The RH however, was significantly higher under the Hedera foliage than any other treatment during the warmest measured days. This indicated that while vegetation may provide a cooling effect during the summer, the increase in RH especially under dense foliage such as established Hedera helix may change the moisture dynamics around the building. Additionally species and cultivar choice might be important to control the RH rise. Our work is now focusing on developing a year-round understanding of impact for a number of climbing plant species, in a range of weather scenarios.

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NATURE AS MODEL

Classifying mature extensive green roof vegetation using EIVs

Nature served as the model for green roofs’ original system designs in the 1970-80s. Analogue habitats of central Europe led to species lists and engineered soil profiles that remain central to the industry today. Little work has evaluated the outcome of those early de-signs, however, or related the original intentions of the nature-based model to contemporary issues and needs.

With an interest in describing the vegetation, a sample of old extensive green roofs in Germany was surveyed using ecological field methods. The species identified were matched with Ellenberg Indicator Values (EIV), which serve as habitat indicators for light, temperature, continentality, moisture, pH, and available nitrogen. Three main vegetation types were distinguished using EIV range, dominance and species diversity. The “Species-poor Sedum roof” is a response to homogeneity (construction, site conditions, etc.), while the “Sedum meadow” is diversified through gradients of shelter (from sun and wind) and provisions of seed rain.

Thus it seems that these systems can sustain extensive cover over the long term, but floristic diversity is only assured given heterogeneous conditions and propagule replenishment. If extensive green roofs are to match contemporary issues of rapid urbanization and declining biodiversity, then their original intentions and specifications require some renewal.

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BREATHING WALLS

Ecological Patterns of Performance

This presentation features a series of hybrid living walls created to optimize ecological performance through combining innovative materials + new patters and forms:

1. Living Gills – a hybrid modular system that uses sound, sculpture, light, plants and network to create meaningful connections and beautiful spaces in the urban environment. The Living Gills modular pocket system is inspired by mushroom gills with organic patterns of appearance, yet simultaneously modular qualities.

2. Hotel – a hybrid 'living' wall system that challenges the way we currently think about urban architectural surfaces. B. Hotel living walls are designed to help mitigate the bee Colony Collapse Disorder (CDD) and help grow and accommodate life locally for mason bees.

3. Breathing Walls – a hybrid green wall with built-in air purification made from organic concrete is inspired by the principles of the Japanese philosophy: Wabi Sabi. Breathing Walls provide urban living systems benefits through ecological patterns of concrete membranes or skins celebrating change over time.

4. Sponge Space – explores how living systems can be implemented into public spaces to store and clean water like sponges. Incorporating water systems and plants also provides an opportunity to enhance the experiential qualities of spaces.

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REMOTE SENSING – BASED TOOL FOR GREEN INFRASTRUCTURE MONITORING

Identifying of changes in Warsaw's natural system

The main aim of the study was the development of a monitoring method of the state of green infrastructure. The most important assumption was repeatability of the analysis, which relates to the objectivity of the measures used.

The assessment involved estimating the proportion between vegetated and urban areas within the city borders of Warsaw (Poland). The research was carried out for two terms: 2006 and 2014. The analyses were performed within the functional units defined in the Warsaw Spatial Policy. The method involves vegetation index calculated using Landsat imagery.

Based on test data obtained by photo interpretation of the high-resolution imagery several indices were tested. The Soil-Adjusted Vegetation Index (SAVI) was found as the most accurate and universal for different local conditions.

The results confirmed the vegetation loss in respective units. In most cases, it was caused by new housing areas and also by road infrastructure development. The method provides plausible results and is repeatable for different Landsat imagery. Due to the availability of a long time series of free satellite imagery, a regular update is feasible of the monitoring results, as well as multi-temporal studies. The developed method is sufficient for further studies where other factors can be integrated – social, economic and environmental.

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GREEN RIBBON AS A VISION, STRATEGY AND PROJECT

An elementary design approach for the urban fringe of Ostend

Funded by the European Commission the City of Ostend and the Flemish Bouwmeester, launched a competition for the Masterplan Green Ribbon of Ostend in 2011. The winning entry by Technum-ADRarchitectes/Georges Descombes proposed a vision based on a dual strategy.

The Masterplan Green Ribbon is reconfiguring the urban fringe of Ostend. This is a caleidoscopic landscape made of different productive entities. The Green Ribbon is a trajectory from which to observe this landscape. This line is turned in a civic public space through punctual interventions along this line.

Six design elements are implemented: platforms, plateaus, passages, water edges, gardens and avenues. These interventions intensify the landscape experience and provide places where both natural and cultural processes are congregated, exchanged and revealed, thereby integrating the Green Ribbon in its surrounding landscape. This masterplan is not a blueprint for the development of the Green Ribbon, but it serves as an idea, a way of thinking, vital in bringing stakeholders together.

As a result several pilot projects have started: the construction of the city forest will start in 2016. A pilot project will be developed for a large scale urban agriculture.

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URBAN GREENING EVALUATION TOOLKIT FOR HEALTHY CITIES PLANNING

An integrated modelling and measurement approach

Urban heat islands, pollution, and future climate change are major concerns for human health and liveable cities. To develop integrated urban green infrastructure through architecture, planning and landscape design is a promising approach for tackling these issues. However, there is a lack of quantification of the improvements in human thermal comfort and associated health benefits. There is a need to understand the performance of vegetation and its interaction with city dwellers and the built environment.

This research aims to improve our understanding of the role of vegetation in promoting climate change mitigation, adaptation, resilience and health and wellbeing in cities. Multiple parameterizations with state-of-the-art modelling and measurement toolkits will be reviewed and analysed for various urban morphologies in different climates. We propose a more holistic approach to integrate measurement and computer simulation tools to evaluate urban-planning programmes, focusing on mitigation/adaptation strategies and the thermal comfort of inhabitants.

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THE EFFECTS OF IMPLEMENTATION OF THE GREEN ROOFS IN URBAN AREAS ON THE BASIS OF WARSAW

Mapping existing and potential flat green roofs in parts of Warsaw

The purpose of the research is to assign prerequisites, benefits, disadvantages and opportunities of realisation of green roofs in three chosen areas of Warsaw (business district, residential and industrial). Total analysed surface is 3.65 km^2.

The goal was achieved by creating map of existing green roofs (with division of extensive and intensive) and conventionally covered roofs without potential of greening and with potential to be green (roofs with potential were divided into five categories: from thin extensive to thick intensive). The next step was to estimate the area and effects of existing and potential green roofs.

The method used is a desk research based on the methodology created by the Green Infrastructure Consultancy, previously used for mapping green roofs in London. Analysis was based on satellite maps from maps.google.com; geoportal.gov.pl and Google Earth Pro programme.

Research showed big potential in creating green roofs in the analysed areas, accounted for 81 % of conventional, flat roofs. This is opportunity of creating new green areas, which support water retention, biodiversity, reduce air pollution and urban island effect – improving life quality in cities.

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ECO SURFACES AS THE NEW URBAN WILD: A QUALTITATIVE EXPLORATION OF URBANITES' PERCEPTION OF LANDSCAPE ELEMENTS FOR STORMWATER MANAGEMENT

Approaches to sustainable design and aesthetics in urban areas

The use and range of urban landscape stormwater management elements such as green roofs, green walls and green curbs placed in the public settings are rapidly growing. These are novel and innovative elements in urban landscapes and the research regarding their perception and the attitude towards different vegetation types on them is limited. While the importance of biodiverse vegetation is stressed from the ecosystems services perspective, it often conflicts with ambiguous responses by urbanites to 'wild' and 'messy' appearance of vegetation in dense urban areas.

Using a phenomenological approach this study explores the perceptions of three types of stormwater management elements in Copenhagen (Denmark), a city leading in implementing sustainable climate change adaptation solutions. Sixty semi-structured, onsite interviews were conducted in six cases to explore (a) aesthetic experiences regarding the element itself and the vegetation cover, and (b) how/ if the nature values influences the aesthetic experience of the non-familiar urban element with regard to the 'wilder' aesthetics.

Results show what the differences and similarities are regarding the aesthetic experience for the 'wilder' vegetation for storm-water management elements. The expected results are important in regard of providing information for the framework for introducing more biodiverse vegetation for the located in public spaces stormwater management elements from the urban residents' perspective.

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POLISH GREEN WALL

Vertical Water Retention System

Polish Green Wall (PGW) is made with organic technology and an automatic life-support system. PGW was developed on a box or rack construction allowing the façade isolation of moisture and of water retention. Extensive green walls are made of modules with up to 2.5m height and thickness of about 15-25cm, made in the system rack design. A small wall thickness limits the selection of species to low and freeze-proof stonecrop, ferns or mosses. Intensive green walls of similar height to 2.5m have a minimum thickness of 35cm, built on the box structure. The PGW intensive system effectively protects the roots, and specially selected plants can produce interesting effects throughout the year. Both systems are available as façade or freestanding. Intensive green walls act as an acoustic baffle - absorbing sound twice as efficiently as a standard acoustic screen.

Currently we are preparing a research program funded by a grant NCBR Biostrateg ID 270 606 -2016 to 2018 where intercollegiate research team will work on the use of PGW in to Vertical Water Retention System (green roofs + green facade + storage reservoirs) and its possibilities of using in urban design – at the example of one of Warsaw districts.

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CLIMATE PROTECTION AND GREEN INFRASTRUCTURE IN CITIES

A project at the Centre for Urban Ecology and Climate Change Adaptation (ZSK)

Climate change adaptation via urban green infrastructure (UGI) can significantly reduce the Urban Heat Island (UHI) effect while at the same time contributing to mitigation by reducing energy demands. Even so these different goals are still rarely considered together. The project Climate Mitigation and Urban Green Infrastructure at the Centre for Urban Ecology and Climate Change Adaptation addresses these challenges by developing integrated strategies for urban planning. While climate policies are agreed at (inter)national level, it is the local level that needs to translate these goals into action.

Through comparative analysis of three Bavarian case studies, the opportunities and challenges local governments face for implementing climate policies into planning are identified. In order to translate national policies into strategies at the local level knowledge is needed on the potential and limitations of measures for mitigation and adaptation. We examined the synergies of different green infrastructure measures with quantitative analyses of climate regulating effects and residential energy demand reduction.

In qualitative studies the effects on biodiversity and quality of open space are also considered. Furthermore, the project analyses the capacity of local governments and legal opportunities for implementing climate change related measures into urban planning. Besides the synergies between mitigation and adaptation, the study also aims to identify how integrated planning for climate change can enhance general strategies for urban development. Based on this information, the project makes recommendations to promote the implementation of multifunctional green infrastructure for mitigation and adaptation.

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Award Winners // List of Posters

The Hague, Netherlands

ZEEHELDENTUIN # 353

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The Zeeheldentuin is an oasis of green in the middle of a grey urban area. In this community garden you can find vegetable gardens, a fruit orchard, an ornamental flower garden with seating areas, and a nature playground for the children. The garden is created with natural elements and reused materials, and plantings are biologically nursed and attractive to all kinds of insects. The garden is located in the Zeehelden neighborhood, close to the center of The Hague, which is a quite stony area. As a result, a cool spot with refreshing water and green is now available in summer, and at the same time a place is provided where excessive water can be drained into the ground.

The community garden is an initiative of the inhabitants, who fought for more green in their neighborhood. They succeeded in receiving a plot of land, where a new housing block was planned initially. The design is developed in deliberation with the inhabitants, and the construction and maintenance is done on a voluntary basis. In this way, inhabitants created their own green oasis where they can participate in activities, and enjoy a piece of nature in the city.

Biodiversity

Because the garden has a fruit orchard, vegetable gardens, and ornamental gardens with flowers and herbs, many different species can be found in and around the garden. The plants are biologically grown in a city nursery, which is established especially for this garden. The owners of the vegetable gardens can buy seeds and plants from the city nursery as well. The flowery grassland, which covers almost half of the garden, contains only native species. Many natural materials are used to construct the elements in the garden: wood, willow branches, stone, tiles, shells, etc. Next to the spots that are created for specific animals, small holes can be found everywhere in the garden. There are birdhouses for different types of birds, and hotels for various insects. Furthermore, insects can live between the stones, and butterflies and bees are attracted by certain plants.

Climate Change Adaptation

The design area has four zones which are, next to the different functions, made of a few different kinds of permeable surfaces. These surfaces are made with grass, shells, sand and wooden planks. Because the surface is made permeable, water is allowed to sink into the ground after a rain shower. This would not have been the case when this was another grey and stony area, like its surroundings. Additional water can temporarily be stored in the branch of water that meanders through the garden. This helps to avoid water nuisance after heavy rainfall, and is at the same time used by children ta play with or climb around. The permeable surfaces also help to avoid heat islands in warmer periods, together with the vegetation. The trees create shadow in which people can sit to cool down. Also, the air cools down because of the evapotranspiration of the leaves from the trees and other vegetation. In this way the local temperature can be lowered with a few degrees, which results in a pleasant environment to stay in during a hot summer day.

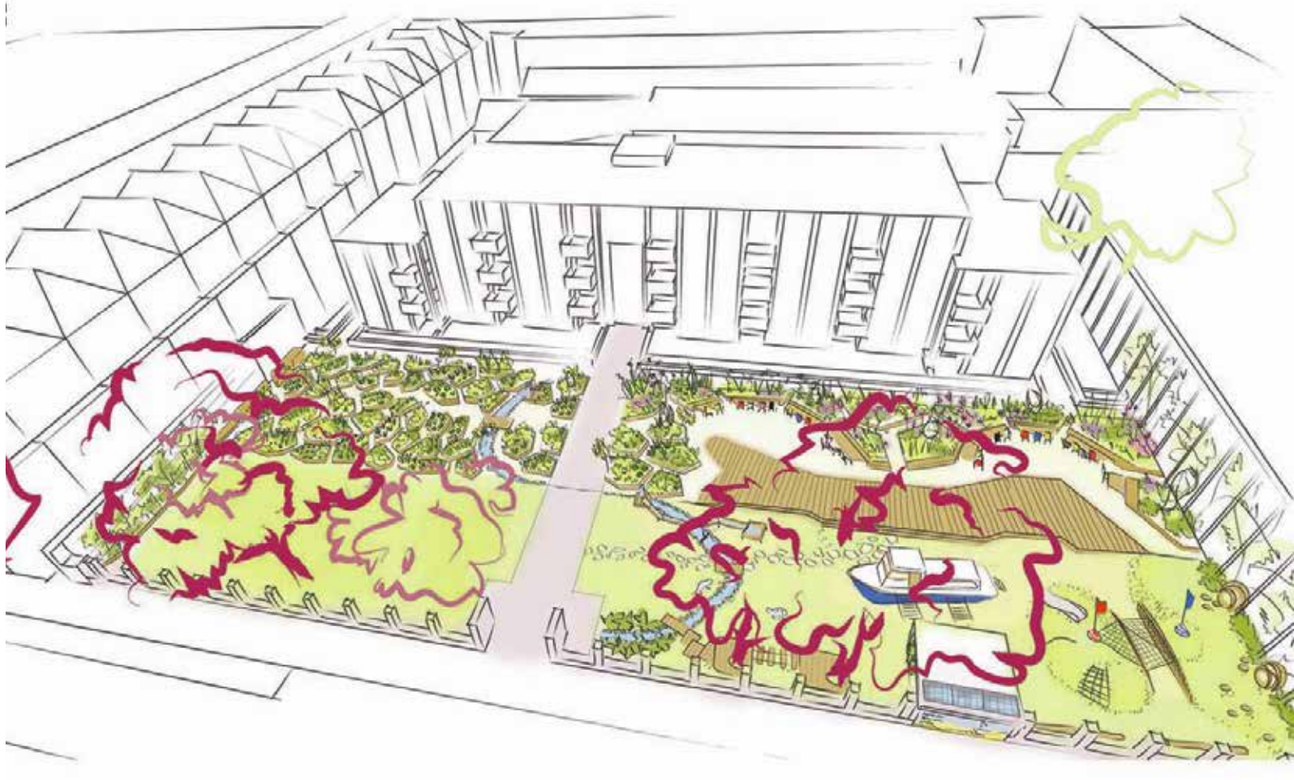
1st PLACE

Resource depletion

Most of the elements that are used to construct the garden are reused. Some things are even from somewhere or someone from the neighborhood, like the boat in the playground. The vegetable gardens are constructed with reused and waste materials, such as sawn planks from trees, willow branches, and tiles. Willow branches are used to create playing elements in the playground as well. The plants can be watered by use of a water pump, which directly pumps up ground water from the soil. Since this water is tested not to be polluted, it can be used instead of drinking water for the watering of the plants.

Innovative approaches

The neighborhood garden is established in a very special way. It all started with an idea to make a green oasis in the middle of the city, which came from a few local residents. After years of persistence, they managed to get a piece of land from the municipality. Instead of another building block in a grey urban area, it was now possible to create the nature in the city they wanted. After the initiative, there was also neighborhood participation in the design, construction and maintenance of the garden. So the garden is not only created for the neighborhood, but also by the neighborhood. The vegetable gardens are divided between interested residents, so they can grow their own local vegetables or herbs. In addition, the art works in the garden are from an artist from the neighborhood. Together with a remain of the farmer school that was on the same location, this really makes the community garden part of the neighborhood.



♯ 353

Zeeheldentuin The Hague (NL)

Biodiversity

Places for insects and small animals,
natural materials, biologically grown plants

Climate Change Adaptation

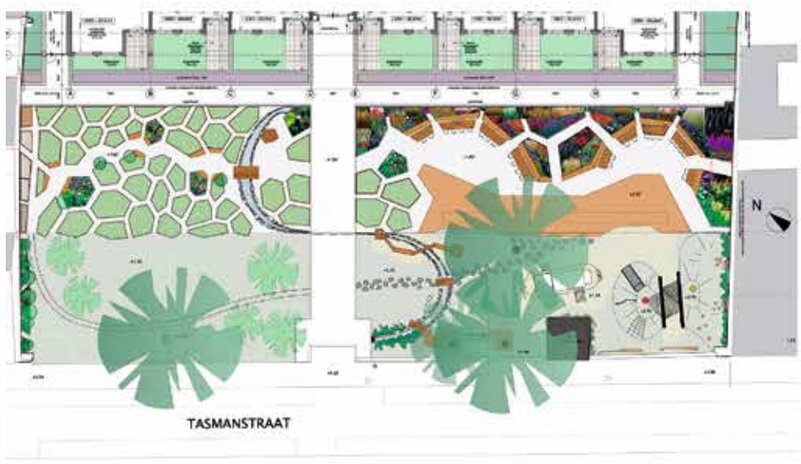
Permeable surfaces,
vegetation,
and water storage
to avoid heat islands
and water nuisance

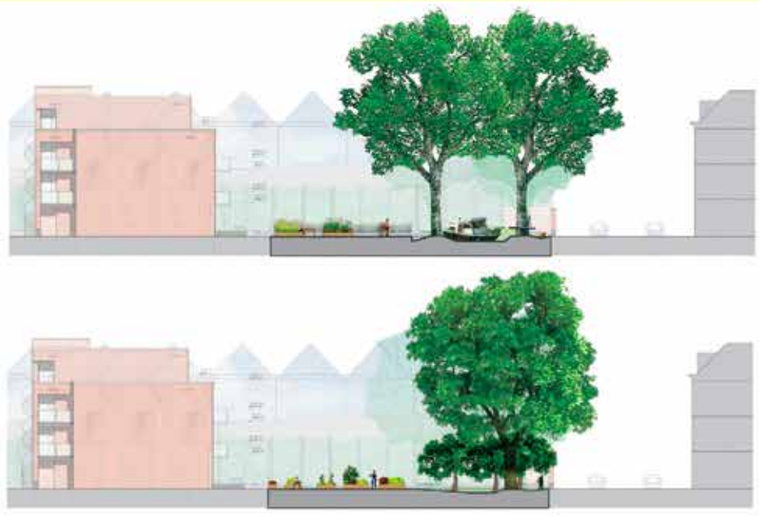
Reuse of elements,
use of waste materials,
plants are watered
with ground water

Resource Depletion

Neighbourhood participation in design, construction
and maintenance, vegetable gardens owned by inhabitants,
local artist presents his art works

Innovative Approaches





2nd PLACE

Ludwigsburg, Germany

GREEN LIVING ROOM LUDWIGSBURG # 415

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Pilot Demonstration Site // Urban Green Infrastructure and Urban Climate Comfort Zone.

What is it about? The Green Living Room, built in April 2014, is a EU funded project within the TURAS research consortium started on October 1st 2011. The aim of this pilot was to cover all aspects of the research that is being done: Transitioning Towards Urban Resilience and Sustainability.

The Green Living Room is a local intervention mitigation measure against the urban heat island effect in Ludwigsburg. The Green Living Room was inspired by existing green wall concepts and projects with living plant construction (Baubotanik, see Innovative Approaches). The combination of a unique tree structure with modular green wall elements generates multifunctional and innovative green infrastructure.

The functions of the "Green Room":
Noise reduction
Adaption to the climate change
Shade
Dust filter
Cooling effect due to evaporation
Wellbeing in the city
Water storage
Habitat for plants and animals
Social meeting place

A total of 7,000 shrubs and 128 plane trees provide the Green Living Room with 140 m² of vertical green space on top of the town hall's underground car park in Ludwigsburg, Germany

The modular principle with the pre-planted baskets quickly and easily creates green oases with function as noise barriers, privacy protection and vertical ecosystems.

3rd PLACE

Sofia, Bulgaria

SUSTAINABLE OFFICE IN SOFIA # 464

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Sofia Airport Center is the first LEED Gold Certified sustainable office development in Sofia, providing international standard working environment adapted to be in harmony with the nature. The business complex spreads on approximately 150 acres, of which over 60 acres are designated for a park area. The landscape design is vital for SAC and has a leading role in its overall concept. Creating a green and envrinonmentally friendly working place is inherent for the modern companies working with thoughts for the future generations.

The composition of the open spaces at SAC comprises of the following functional areas: visitors parking, main approach called "Spanish Steps", main plaza and park area with a central lake.
We have been working to create a landscape as close to natural forms as possible. For this purpose, we have used one main technique – creating many different in their size and height geoplastics with oval and droplet form. There is a walking path passing among them that is connected to the building through a bridge over the lake. These geoplastics with natural forms bring variety into the otherwise flat terrain and create interesting views and cozy nooks for relaxation. The park is home for a wide variety of plant species that attract pollinating insects and birds, which increase the biodiversity in the region.

Green roofs: The majority of the plant species used include large-size deciduous trees typical for the region, but we have widely used ornamental flowering fruit trees. For creating diversity and splendor around buildings, we have laid flower beds of perennial flowers, evergreen and semi-evergreen shrubs and ornamental grasses. The three main types of roof gardens situated on three levels - intensive, semi-intensive and extensive roof garden – are present in the complex.

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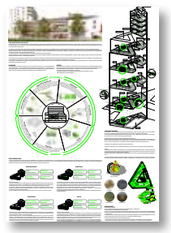

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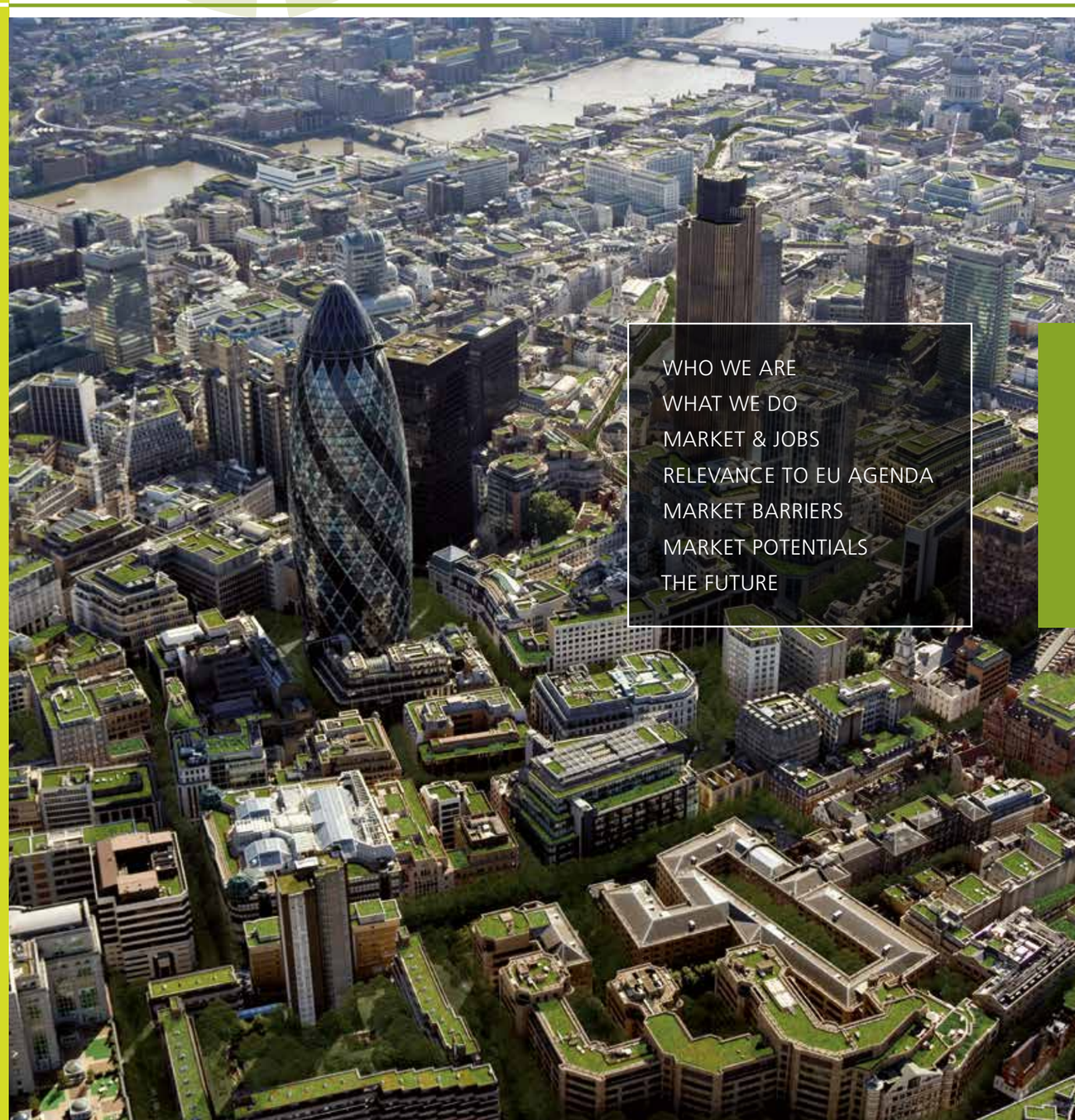
2015 WHITE PAPER

GREENER CITIES IN EUROPE

EFB 2015 White Paper



WHO WE ARE
WHAT WE DO
MARKET & JOBS
RELEVANCE TO EU AGENDA
MARKET BARRIERS
MARKET POTENTIALS
THE FUTURE

WHO WE ARE

The EFB was founded in 1997 by the national associations of Switzerland, Austria and Germany; the federation is based in Vienna. There are currently 14 national green roof and wall associations that are members of the federation:

- Austria (VfB)
- Belgium (BVGG)
- Czech Republic (SZUZ)
- Germany (FBB)
- Greece (GRGR)
- France (ADIVET)
- Hungary (ZEOSZ)
- Italy (AIVEP)
- Netherlands (VBB)
- Poland (PSDZ)
- Portugal (ANCV)
- United Kingdom (livingroofs.org)
- Scandinavia: Sweden, Norway, Finland (SGRA)
- Switzerland (SFG)

Enzi, EFB 2014

The national associations themselves consist of over 350 Small to Medium Enterprises and their employees, dealing with manufacturing, supplying and construction of Green Roofs and Walls in Europe.

All national associations have extraordinary members from Universities, City Governments, Planning and Architecture bodies related to the association.

WHAT WE DO

Green Roofs and Walls offer a wide range of different measurable benefits. They are, therefore, considered an important element of the Urban Green Infrastructure network. The EFB is supporting Green Roofs and Walls on a European level:

- **Encouragement and Support:**
  New Countries setting up national Associations
- **Policy and Consultancy:**
  Encouraging and supporting Cities and national Member associations in setting up Policy strategies
- **Education and Training, Promotion:**
  Development of European Training materials and seminar plans (Green Roof Course and **Biosolar roof project**)
- **Knowledge Transfer:**
  The establishment of thematic Working Groups within member countries and also at a transnational level; Organising of study tours in various cities
- **Research and Evaluation Exchange:**
  Exchange of research data, Information and establishing market reports
- **Best Practice:**
  Exchanging best practice guidelines and standards
- **Communication and Discussion:**
  At Conferences, B&B Platform, EU GI Working Group
- **Extended Networks:**
  The Federation co-operates with international organisation such as the **World Green Infrastructure Network** (WGIN), **International Green Roof Association** (IGRA)

Biodiverse Green Roof in Hungary, Budapest: a mix between extensive and intensive structures adressing pollinators needs (Dezsényi, Malmberg, Enzi 2013)

MARKET & JOBS

To provide an understanding of the current green roof markets in Europe, the EFB has started an evaluation process with its members in 2014. This is a relatively difficult task and the initial findings are only an overview of what the market is. The Federation hopes to refine the methods and figures in coming years.

The estimation lists six countries in Europe. The markets in each one of these countries are very different due to varying policy activities and incentives. All figures are conservative estimates, and the figures consider the manufactured and delivered quantities of green roof components such as substrates and other layers. The most detailed market report in the world is from Germany. This market is the most mature and therefore has the most accurate data. Currently there are 86 million m² of green roofs that have been installed in Germany and many flat roofs are already greened. The German Association has been monitoring a constant market trend since 2008 that shows the market is increasing by an average 5 % per year. In most countries the majority of green roofs are extensive with the exception of Hungary. Here the market is mainly in the area of intensive green roofs (65 %).

There is great potential to increase the market for green roofs and walls throughout Europe. The Federation would like the markets in other European countries to move towards the volumes installed in Germany. There are growth opportunities within the sector of high skilled jobs, adressing the growing potential of decision making support as well:

- Education and Training, Competence
- Conferences and Networks
- Consulting of applied urban Green Infrastructure projects
- Research and Development (Tools and Technologies, Synergies)

Examples Europe

Target Country	Green Roof Stock total m² (2014)	Green Roofs new/year m²	ratio extensive %	ratio intensive %	Yearly sales figures €
Austria	4.500.000	500.000	73 %	27 %	27.350.000
Germany	86.000.000	8.000.000	85 %	15 %	254.000.000
Hungary	1.250.000	100.000	35 %	65 %	5.662.500
Scandinavia (S, N, DK)		600.000	85 %	15 %	16.050.000
Switzerland		1.800.000	95 %	5 %	51.300.000
UK	3.700.000	250.000	80 %	20 %	28.000.000
	95.450.000	**11.250.000**			**382.362.500**

Trend: growing (FBB DE)

Source: European Federation of Green Roofs and Walls – EFB 2015 (unpublished)

RELEVANCE TO EU AGENDA

Synergies between Biodiversity and Renewable Energy Production in Switzerland (Gedge, Baumann 2014)

There are various strategies and policies emanating from the European Commission, which the EFB, as an industry, can have a direct and positive effect upon.

Green Infrastructure and Ecosystem Services Strategy (GIES)

Although this strategy is directly linked to the delivery of biodiversity across the Union, the focus of GIES implicitly links across the sustainability agenda. The Federation members have been instrumental in delivering biodiversity in cities, particularly in the UK and Switzerland. In these countries certain cities have specific policies for ecological compensation. Within the Swiss Green Roof Standards there is a standard for ecological compensation. Recently our other German speaking Associations (Austria and Germany) have joined up with the Swiss to write specific guidance on the delivery of biodiversity on green roofs. This is partly in response to EU strategy.

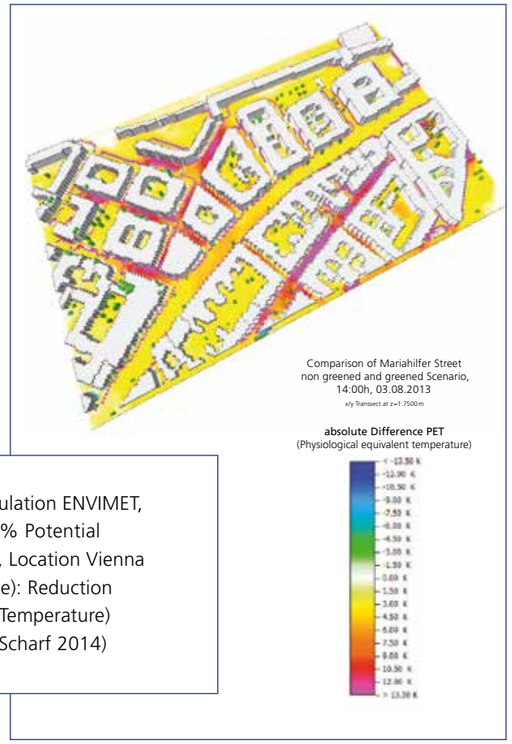
The Federation has been an active member of the GIES working group and is disappointed that the working group may cease to exist. One of the issues the Federation is concerned about is how the working group has been closely tied to the Biodiversity Strategy for Europe. Whilst the Federation fully supports the Biodiversity Strategy, GIES provides a much broader range of benefits, especially in urban areas.

The technologies associated with our Federation help to provide a wide range of ecosystem services on buildings and for the cities in general.

These include issues related to water, clean air, and temperature regulation, social and economic well-being. Some of these services are specifically relevant to other pressing areas within the Commissions activities.

Climate Change Adaptation (CCA)

The delivery of green roofs and walls in the urban realm will address many issues associated with climate change. The increased likelihood of flash floods and excess urban heat are headline issues. These issues will become increasingly important for urban areas to deal with. Already cities such as Vienna are looking to these types of interventions to ameliorate these negative effects. Adaptation to change is a key strategy for the commission within the Climate Action agenda. We are convinced that green infrastructure in the built environment will be an important element in creating resilient cities.



Microclimatic Simulation ENVIMET, Scenario use 100 % Potential Green Wall Space, Location Vienna (Mariahilfer Strasse): Reduction of PET (perceived Temperature) of 3-13 K (Bruse, Scharf 2014)

Potentials of the Urban, Wildlife to the City: our Pollinators need support (Gedge 2013)

The Low Carbon Market

Green roofs and walls can help to reduce the carbon load of buildings especially in summertime. They can help reduce cooling loads in buildings and in winter they can also have a positive effect on heating loads.

The ongoing **Biosolar roof project**, promotes the green roof/solar energy combination at roof level. This is a EU funded project. This approach not only provides low carbon energy through optimized solar production, but also the provision of biodiversity by specific planting and ecological approaches. As our industry grows we will be able to respond further in helping deliver these objectives through innovation and implementation.

Health and Well-being

Provision of green space in cities is an important factor to ensure citizens can lead healthy lives. Many of Europe's cities are densely built and there is often little space to improve and increase areas of green space. A city is naturally dense with building mass, especially in the central core. Greening up the cities of the future in Europe will require buildings new and old to adopt green roof and wall technology to help improve the health and well-being of citizens. There is already growing demand for this approach in a number of European cities, such as Paris, Copenhagen and Berlin.

Provision of green space on hospitals, healthcare centres and other medical buildings can provide patients with access to green space, which can help recovery rates. There is now a body of evidence that recognizes the role of nature and green space for health and wellbeing.

Another area that is becoming increasingly important, is the role of green space within buildings. The use of interior greening can significantly increase the health and of occupants. This is particularly important in the work place where there is growing evidence that indoor planting can reduce sick leave and increase productivity. Our members produce and supply a range of indoor green walls for buildings. This is another global growth area in which Europe is leading the field.

Green roofs and walls can also, especially in the central districts of cities, help absorb air borne pollutants, which can adversely effect the health of citizens across the Union.

The Economy

The global market for green roofs and walls is predicted to amount to €6.8 billion market by 2017. Europe has traditionally been the market leader in green roof and wall technology. Over the coming years many of our companies will be addressing this burgeoning market through the development of new products and services as the world market grows. This is particularly true of the German companies who are currently the leading green roof companies in the world. Many other industry players in Europe are also becoming benchmark companies, such as the Dutch company Sempergreen.

However Europe could fall behind as new countries innovate and address the challenges for the industry in the twenty first century. It is therefore important that Europe recognises the contribution our industry has already provided for the global market. Support for industry through research and innovation projects can help maintain our market edge in the global market for green roof and wall technologies across the globe.

5 different Green Roofs and Walls on/in LEED Platinum certified Green House Budapest (Dezsényi, Malmberg, Enzi 2014)

MARKET BARRIERS

There are unfortunately barriers to creating a fully fledged green roof and wall market across the whole of Europe. Currently in the vast majority of European cities they are treated as a relatively unimportant element of the built environment.

Planning/Legislation

Developers consider the costs prohibitive to include the technologies in their designs without direct planning and legal interventions.

Green roof and wall technology is generally reliant on progressive policies at a regional or city scale to ensure that new developments and buildings are required to implement these technologies. For example Berlin currently has 1 m^2 of green roof per citizen and many other German cities, through Federal and regional planning have delivered similarly densities per citizen over the last 30 years.

Retrofitting of Green roofs and walls

To address climate change, cities will need to consider the retrofitting of green space in cities. However, although many cities have identified the potential, there is a serious question of how this will be funded. Whilst cities may need this additional green space, it remains a question of how to implement it. The main barrier is still financial.

Another barrier is a lack of innovation globally on the production of good quality lightweight systems with the performance criteria to meet the various climate change and biodiversity scenarios.

Green Walls and their contribution
to the Urban Climate, Vienna
(Enzi, Oberbichler, Haas, Reitterer 2015

The Federation considers there to be an immediate need to:

- Develop financial mechanisms to help deliver a retrofit market across the Union.
- Support the development of innovative and appropriate lightweight solutions for the greening of buildings that would currently be excluded from retrofit projects.

Maintenance: Financial Obstacle vs. Jobs and Growth

Maintaining green space is also seen as another financial barrier. Many public and private clients see maintenance as an obstacle, ignoring the potential it holds.

Pollinators need support (Gedge 2013)

MARKET POTENTIALS

There are two main areas of potential for the future:

Increasing the number of cities and regions implementing strategies and polices to deliver Green Roofs and Walls

The green roof and wall market is relatively small. However with more cities and regions developing favourable planning policies to increase implementation on new developments, this market will grow. In London, with the adoption of a specific policy on green roofs and walls, the market size increased by 300 % over 7 years. Outside of London, other major contributions in UK are constrained by national planning objectives that are currently not favorable to the development of specific urban green infrastructure policies. This is also the case in many other countries across the Union.

Old Building stock embraces Green Walls for a long time already, Vienna (Enzi, Preiss 2013)

Retrofitting of Existing Stock

If the main barriers to retrofitting existing stock can be overcome through the development of financial and innovative solutions, then the potential market size for green roofs and walls could deliver real economic, social and environmental benefits.

It is estimated in London, that 30 % of Central London's existing roofspaces could be greened. That equates to 10 million m^2 of potential green roofs within the central activity zone. With an average price of 60 per m^2 for the cost of installation in London that equates to potential business in the region of € 600 million. Currently London has 0.3 m^2 of green roofs per citizen. If the existing roofs that could be greened were, then every Londoner would have 1.4 m^2 of green roofs. Aside from the immediate economic value to the green roof market, that would significantly increase the social and environmental benefits to the population of London.

It is difficult to use a similar approach to urban areas across the Union, as London is a relatively unique city in terms of it's built fabric. Furthermore costs of green roofs in London are relatively high. However if a fifth of every capital city in the Union had the potential to be retrofitted with green roofs with an average price of € 30 m^2 the potential market size in Europe would be in the order of € 3.36 billion.

Green Roofs, Urban Gardening and Social cohesion in Paris, France (Lassalle, Enzi 2013)

THE FUTURE

Green roofs and walls provide a full range of benefits across the social, environment and economic agendas. The Federation therefore proposes a vision:

For every urban citizen within the Union there will be 5 m^2 of green roof or wall by 2030

Considering that two-thirds of the population of the European Union dwells in the Urban Environment that equates to a population of 365 million people.

The Federation considers that lack of urban green space in our cities can be addressed by our industry. If all urban citizens by 2030 were to have at least 5 m^2 of green roofs or walls each, the current population would lead to an additional 1,82 billion m^2 of green roofs and walls in Europe. Using current prices the green roof and wall market would be worth in the region of over € 62 billion market. Of course this figure is likely to be much higher as by 2030 the urban population will have grown further.

Business and Biodiversity: 0-Emission Boutique Hotel Stadthalle, Vienna (Reitterer, Enzi 2014)

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GREENER CITIES IN EUROPE

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Looking forward to Next Year's Conference Event

EUGIC – looking to the future

This 1st European Urban Green Infrastructure Conference is the first chapter of a longer narrative. This story is about ensuring that the economic, physical and social wellbeing of cities and citizens can be significantly improved by embracing an urban Green Infrastructure approach.

This is the intention behind the European Commission's Ecosystem Services and Green Infrastructure Strategy. What we glean from this conference we will feed back to the Commission. You the conference delegates are part of that message.

The conference has been designed to be as interactive as possible. Your questions, comments and vision are vital to communicate beyond the conference itself. This is important to ensure that the converstation continues well beyond what we have planted together in Vienna.
We will broadcast your collective and individual thoughts, both to the Commission, the Member States, the cities and the citizens of Europe. There is an audience eager to act, and the produce of this conference we hope will support them in their endeavours.

The first chapter of the EUGIC story will end on November 24th, but chapter two starts on November 25th. EUGIC will be working to meet again in 2016 to nurture what has been planted here and to continue to grow the story of urban Green Infrastructure in Europe.

Dusty Gedge

President of the European Federation of Green Roof Associations (EFB)

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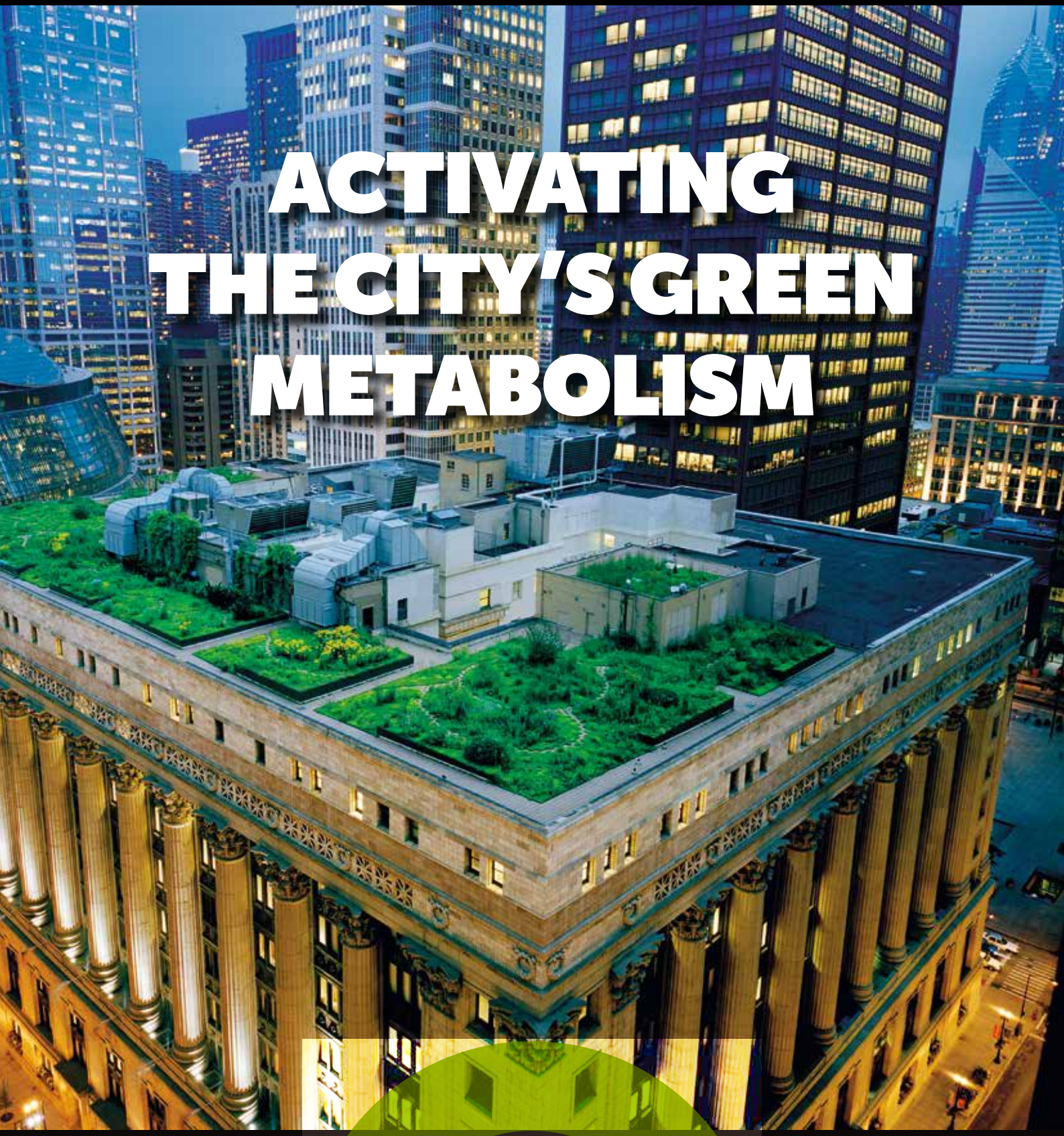
ACTIVATING THE CITY'S GREEN METABOLISM



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