

URBIO: an introduction to the International Network in Urban Biodiversity and Design

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Abstract We provide a brief description of the roots, history and activities of the International Network in Urban Biodiversity and Design (URBIO). The network for education and research has its roots in Germany and was founded during the first URBIO conference in Erfurt, Germany, in 2008 with the aim of promoting urban biodiversity and design through a continuing dialogue with the Convention on Biological Diversity. The main task of the network is to support scientific exchange between researchers, practitioners, and stakeholders in the wide field of urban biodiversity and design. The second URBIO conference was held in 2010 in Nagoya, Japan, and led to further network development.

Keywords Convention on Biological Diversity (CBD) · Education · Network · Research · Urban biodiversity · Urban design

Introduction

Urban biodiversity is the variety and richness of living organisms (including genetic variation) and habitat diversity found in and on the edge of human settlements. This

biodiversity ranges from the rural fringe to the urban core. At the landscape and habitat level, it includes:

- Remnants of pristine natural landscapes (e.g. primeval forests, rock faces);
- (Traditional) agricultural landscapes (e.g. meadows, arable land, plantations);
- Urban–industrial landscapes (e.g. city centers, residential areas, industrial parks, railway areas, formal parks and gardens, brown fields).

Urban biodiversity is determined by the planning, design and management of the built environment, which are, in turn, influenced by the economic, social, and cultural values and dynamics of the human population. With the rapid growth of an increasingly urban world population, especially since the mid-twentieth century, urbanization has become one of the main drivers of the threat to global biodiversity. Sustainable urban development, including managing and designing urban biodiversity, is therefore of crucial importance to the future of global biodiversity.

To promote urban biodiversity and sustainable urban design, the scientific network Urban Biodiversity and Design (URBIO) was founded with two main aims:

- To foster scientific exchange between researchers, practitioners, and stakeholders;
- To implement the results through a continuing dialogue with the Convention on Biological Diversity (CBD).

The network organizes international scientific conferences or workshops prior to the Conference of the Parties to the CBD (COP) meetings, maintains a Web site, and distributes newsletters that are sent regularly to the network members from the network office. Currently, the network has more than 700 members from more than 50 countries representing all disciplines involved in research, planning,

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design, and management of the green urban environments. Members include biologists, ecologists, landscape architects, planners, horticulturists, and urban designers. The network maintains contact with several related scientific societies and working groups and is a member of the Global Partnership on Cities and Biodiversity (GPCB)—a task force on cities and local authorities that was established with the secretariat of the CBD, Council for Local Environmental Initiatives (ICLEI) and its Local Action for Biodiversity program, United Nations Environment Programme (UNEP), United Nations Human Settlements Programme (UN-HABITAT), International Union for Conservation of Nature (IUCN) Countdown 2010, United Nations Educational, Scientific, and Cultural Organization (UNESCO), academic institutes, as well as the cities of Curitiba, Bonn, Nagoya, Montreal and the City-State of Singapore. The GPCB aims to support cities in sustainable management of their biodiversity resources; assist them in implementing practices that support national, regional, and international strategies, plans, and agendas on biodiversity; and help them learn from existing initiatives (GPCB 2010).

We use this special feature of Landscape and Ecological Engineering with the keynote speeches of the second URBIO conference in Nagoya 2010 to introduce the network's aims, roots, and current tasks.

The roots of URBIO in Europe

The investigation of biodiversity in cities has a long tradition in Europe (Sukopp 2002). The flora of ruins and walls has been studied for centuries, e.g., on the Colosseum in Rome (Panarolis 1643 after Sukopp 2002; Celesti Grapow et al. 2001). More comprehensive studies of the flora in urban areas were completed in London in the fifteenth century and Paris in the seventeenth and eighteenth centuries. Publications on birds and mammals increased slowly during the nineteenth century and grew rapidly after 1950 (Sukopp 2002).

For the first time, a continuous exchange between urban ecologists and designers began in Germany in the 1970s, along with the first comprehensive urban ecology studies in Berlin (Sukopp 2008, first published in 1972). In 1978, the working group Biotope Mapping in Urban Areas was initiated by Herbert Sukopp (Berlin, Germany) and set up by the German Federal Research Centre for Nature Conservation and Landscape Ecology (today the Federal Agency for Nature Conservation) to develop a national program for biodiversity research in urban areas. The aim was to establish uniform methods for investigating urban habitats, to obtain comparable results on the national level, and provide ecological information for management and planning in urban areas (Sukopp et al. 1979). From 1979 to

2005, this working group held annual meetings in different German cities as well as in Vienna (Austria). In 1993, the group presented a program for standardized investigation methods of urban habitats as a basis for sustainable city planning (Schulte et al. 1993). In addition, a bibliography of research on nature conservation in urban areas was regularly published (Sukopp 1994).

In 2000, more than 222 German cities and local authorities had completed biotope mapping in their municipal areas (Schulte and Sukopp 2000). The 21st and last meeting was held in Jena in 2004 in cooperation with the working group Urban Ecology of the Ecological Society of Germany, Austria, and Switzerland. This meeting with the titled “Biodiversity in urban areas—basics and examples of implementing the Convention on Biological Diversity in urban areas”, resulted in the decision to organize a similar conference on the international stage (Müller 2005).

In 2005, the above mentioned working groups merged to form the Competence Network Urban Ecology (CONTU-REC), which organized as their third conference in 2008 the first international Urban Biodiversity and Design conference: URBIO 2008.

Urban biodiversity within the CBD

The impact of urbanization on biodiversity and other natural resources was considered by the CBD in 1992 and has been discussed at the subsequent nine Conferences of the Parties. Whereas cities pose major challenges to the protection of biodiversity, the opportunities they offer have received little consideration to date. An exception was the sixth COP (COP 6) in The Hague in 2002, where it was recommended that part of COP 9 should focus on the issue “Biodiversity of urban and suburban areas”. However, during COP 7 in Kuala Lumpur in 2004, the topic was postponed indefinitely.

A major step toward recognizing the potential of cities for increasing biodiversity was made in Curitiba in March 2007, when 34 mayors and many of their senior officials from cities across four continents initiated a global partnership to promote the theme “cities and biodiversity”, with the objective of encouraging local authorities to implement the CBD. Particular emphasis was placed on raising public awareness and educating future generations, as well as disseminating best practices and lessons learned through cooperation between cities. In order to provide a forum for the exchange of knowledge and experiences, the declaration also recommended establishing a clearing-house mechanism within the secretariat of the CBD. The participants mandated a steering committee comprising five mayors from each of the four continents to take the lead in engaging local authorities in implementing the CBD and participating in the municipal COP 9 preconference

Table 1 Number of authors from each country participating in the first International Network in Urban Biodiversity and Design (URBIO) conference in Erfurt, Germany, 2008 (source: Müller et al. 2008a)

Participating country	Representatives from participating country
Algeria	1
Argentina	4
Australia	7
Austria	15
Belgium	8
Bosnia and Herzegovina	1
Brazil	14
Canada	4
Chile	1
China	5
Croatia	2
Czech Republic	2
Denmark	5
Egypt	2
Estonia	1
Finland	8
France	18
Germany	119
Greece	3
Hungary	10
India	9
Indonesia	10
Iran	3
Italy	7
Japan	12
Kuwait	2
Mexico	12
Netherlands	9
New Zealand	5
Nigeria	2
Norway	1
Poland	4
Portugal	18
Romania	16
Russia	4
Slovakia	1
South Africa	16
Spain	5
Sweden	9
Switzerland	23
Turkey	13
United Kingdom	27
USA	29
Total: 43	467

- Urban biodiversity and climate change;
- Design and future of urban biodiversity.

Additionally, four excursions were made to sites where some of the best practices relating to urban biodiversity and sustainable design could be inspected and practical difficulties and solutions discussed. The sites were the historic city and bastion Petersburg in the conference city Erfurt; the UNESCO World Heritage Park an der Ilm, Weimar; the UNESCO World Heritage Wartburg Castle, Eisenach, and the Natur-Park Südgelände, Berlin. There was also a postexcursion visit to one of the most important European beech -forest reserves: the Nationalpark Hainich in Thuringia. Participants of this first URBIO conference committed to the Erfurt Declaration URBIO 2008 to support further CBD initiatives on Cities and Biodiversity through:

- Sharing their knowledge and commitment throughout this conference and in the future;
- Establishing a global URBIO network for education and research into urban biodiversity;
- Promoting urban biodiversity through continuing dialogue with the CBD, especially linking future URBIO conferences with future COP meetings.

The Erfurt Declaration URBIO 2008 emphasized the importance of urban biodiversity to halt global biodiversity loss and ensure that all cities are green, pleasant, and prosperous places. Furthermore, it was an important scientific contribution to the debate during COP 9 on the topic of cities and biodiversity. All keynote speeches, the Erfurt Declaration URBIO 2008, and the four preconference books including a conference edition of a review and bibliography on biological diversity and cities (Müller et al. 2008a, b; Müller and Kirmer 2008; Werner and Zahner 2009) are available on the URBIO network Web site (http://www.fh-erfurt.de/urbio/httpdocs/content/urbio_publications.php). The more important results of the URBIO conference were published in a book titled *Urban Biodiversity and Design* (Müller et al. 2010).

The Erfurt conference was the first scientific meeting to discuss and consider the current state of scientific knowledge and practices in relation to biodiversity and the planning, design, and management of the urban environment from a global perspective. Preparation of the conference and the related book were prepared within a research project at the University of Applied Sciences, Erfurt, and supported by the Federal Agency for Nature Conservation, with funding from the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety.

URBIO 2010 in Nagoya, Japan

In Japan, there is a long tradition of research in urban ecology. Since the early 1970s Interdisciplinary Studies of Urban Ecosystems in the Metropolis of Tokyo have been carried out (Numata 1977). Therefore, it was especially fitting that the second network conference, URBIO 2010, was held from 18 to 22 May in Nagoya, Japan, prior to COP 10 and the City Biodiversity Summit 2010. The conference was organized by the URBIO 2010 organizing committee with financial support from numerous Japanese societies. The main theme of the conference was Urban Biodiversity in the Ecological Network, with the following two subthemes.

Ecosystem network and habitat quality in and around the urban area

The urban ecosystem is unique, and its main feature is that it is an open system characterized by great fluxes of information, material, and energy from the surrounding ecosystems. Biodiversity in urban areas is determined by species turnover through immigration and extinction, and habitat quality is not only affected by ecological conditions of the habitat, but also by functional and structural connectivity and their relationships.

Networking the activities of urban people

To improve and optimize urban biodiversity, the participation of local people is essential. Activities for conservation and restoration of urban biodiversity are enhanced by establishing networks of human resources. Those networks should include public and private sectors, local authorities, nongovernmental organization urban wildlife groups, enterprises, housing associations, and other such organizations. Contact with nature should be a part of everyday life for urban people. Incentives and activities are needed to raise awareness and to encourage practical activities in the public and private sectors to improve urban biodiversity.

Three hundred and forty presentations on theoretical and practical results focusing on these themes were discussed by 460 participants from 30 countries. Seven keynote speeches and oral and poster presentations were made; keynote papers appear in this special feature, and the proceedings (URBIO 2010 Organizing Committee 2010) are available at <http://www.jilac.jp/URBIO2010/doku.php>. Oral presentations were grouped into 16 proposed sessions and eight general sessions. Themes of proposed sessions were: (1) Planning and designing an ecological network in an urban area; (2) Comparative studies of cities: links to urban biodiversity and urban design; (3) Urban river: its

ecological functions and integrated river-basin management; (4) Urban area ecological functions of terrestrial-aquatic ecotones; (5) Urban greening for human health; (6) Landscape architecture objectives in pursuing the symbiotic relationship between people and nature; (7) Evaluating and monitoring biodiversity and ecosystem services in cities; (8) Corporate responsibility for urban biodiversity and design; (9) Citizen participation and biodiversity; (10) Designing low-carbon societies in Asia; (11) Global warming and urban biodiversity—status and strategy; (12) Landscape planning, management, and ecological education; (13) *Satoyama* management and biodiversity; (14) Contemporary *Satoyama*—sharing urban and rural experiences and knowledge; (15) Restoration ecology network in Asia; (16) Influence of landscape design on biodiversity.

A workshop on the CBI was also organized by the URBIO 2010 Organizing Committee and in addition to conference presentations there were midconference excursions to provide an opportunity for discussions with non-profit organization (NPO) members at field sites where they are making continuous efforts to conserve/restore biodiversity. There were nine options with regard to visit urban green space, shrine forest, *Satoyama*, river, and canals in urban area and tidal flats. Through the conference discussion, participants reaffirmed and shared the importance of advancing the following efforts at conserving and enhancing urban biodiversity: (1) Establishing a quantitative evaluation systems for urban biodiversity such as CBI; (2) Mitigating and adapting to climate change; (3) Enhancing environmental education; (4) Considering functional aspects of urban biodiversity, including cultural and spiritual benefits; (5) Promoting interlinkages between business and biodiversity; (6) Forming an ecological network. The concept of *Satoyama* provided insights into a way of living in harmony with nature and into managing biodiversity in cities.

As a result of the conference, Nagoya Declaration—URBIO 2010 was adopted by the participants at the General Assembly of URBIO on 21 May (Appendix 1) in which they resolved to tackle challenges for the future of urban biodiversity. The declaration was delivered to the City Biodiversity Summit 2010 which was held in October 2010.

Outlook

During the Nagoya conference, members of the first URBIO steering committee that included URBIO 2008 advisory board members and URBIO 2010 organizing committee members discussed the outcome of URBIO 2010 and the future of the network. The Japanese organizing committee promised to support the URBIO network, especially in terms of representing the network during the

events to COP 10 in Nagoya. In the next 2 years, the duties of the network, e.g., maintaining contact with the GPCB, preparing and disseminating URBIO newsletters, and coordinating preparation of the next conference, will be carried out by the URBIO offices in Germany and Japan.

Especially for young researchers, the network started with an URBIO online discussion forum in 2010 to expand and intensify scientific exchange and discussions. It has also been requested that the network establish further working groups on related themes of urban biodiversity and design.

Appendix 1: The Nagoya Declaration–URBIO 2010

This declaration was submitted during the 2nd International Conference of the Network Urban Biodiversity and Design URBIO 2010 “Urban Biodiversity in the Ecological Network”, 18–22 May 2010, Nagoya, Japan.

Preamble

It is especially fitting that in the International Year of Biodiversity, the 10th Meeting of the Parties to the Convention on Biological Diversity is held in Japan, one of the most urbanized countries in the world where people have a long tradition of living in harmony with nature as illustrated by the *Satoyama*¹ experience.

Over the last four years, several biodiversity initiatives have greatly contributed to ensuring that “Cities and Local Authorities” become part of the solution in response to the biodiversity challenges that the world is facing. Performing a coordinating role for these efforts to avoid duplication and strengthen links is the Global Partnership on Cities and Biodiversity, chaired by the Secretariat of the CBD. Furthermore commitments such as the Curitiba Declarations (2007² and 2010³), the Bonn Call for Action⁴, the first CBD Conference of the Parties (COP) Decision on Cities and Local Authorities, (Decision IX/28: Promoting

engagement of cities and local authorities),⁵ the Erfurt Declaration URBIO 2008⁶ and the Durban Commitment⁷ have demonstrated that “Cities and Local Authorities” and the Parties to the CBD alike, are engaged towards cooperation and action. They have expressed the need to work together, and with various relevant partners, in order to reduce the rate of loss of the biodiversity of our planet. The development of an index to measure biodiversity in cities was proposed at COP 9, and the establishment of a CBD-led City Biodiversity Index (CBI) was initiated by Singapore in collaboration with the Global Partnership on Cities and Biodiversity.

Fulfilling the commitment of the scientists at the URBIO 2008 meeting just prior to COP 9, the URBIO 2010 meeting was held in Nagoya, Japan, in May 2010. The main theme of the conference was “Urban Biodiversity in the Ecological Network” with two subthemes “Ecosystem Network and Quality of Habitats in and around the Urban Area” and “Networking the Activities of Urban People”. Three hundred and forty presentations on theoretical and practical results focusing on ways to conserve and enhance urban biodiversity were discussed by 460 participants from 30 countries. The outcomes gave scientific insights into the design of urban landscape to increase biodiversity, and into ways to encourage practical activities to promote ecosystem services.

Outcomes from URBIO 2010

Urban ecosystems and biodiversity generate numerous benefits for urban residents related to water regulation, air quality, recreation and health. Conservation and enhancement of urban biodiversity should be more closely linked with essential components of environmental sustainability including mitigation of and adaptation to climate change, integrated water management, ecosystem resilience and other public services for urban dwellers.

- The urban ecological network has to be maintained, restored and developed with respect to patches, corridors and the urban matrix. Ecological networks should be well designed to adapt to climate change and to conserve local biodiversity in fragmented urban ecosystems. Remnant patches, such as shrine forests and

¹ PARIS DECLARATION ON THE “SATOYAMA INITIATIVE”: <http://satoyama-initiative.org/en/wp-content/uploads/390/Paris-Declaration-EN-26042010.pdf>.

² CURITIBA DECLARATION ON CITIES AND BIODIVERSITY: <http://www.cbd.int/doc/meetings/biodiv/mayors-01/mayors-01-declaration-en.pdf>.

³ SECOND CURITIBA DECLARATION ON LOCAL AUTHORITIES AND BIODIVERSITY: <http://www.cbd.int/doc/?meeting=MAYORS-02>.

⁴ CITIES AND BIODIVERSITY BONN CALL FOR ACTION: http://www.iclei.org/fileadmin/template/project_templates/LAB-bonn-2008/user_upload/Press/BonnCall_FINAL_29May08.pdf.

⁵ COP 9 DECISION IX/28: PROMOTING ENGAGEMENT OF CITIES AND LOCAL AUTHORITIES: <http://www.cbd.int/doc/decisions/cop-09/cop-09-dec-28-en.pdf>.

⁶ ERFURT DECLARATION, URBIO 2008: http://www.fh-erfurt.de/urbio/httpdocs/content/ErfurtDeclaration_Eng.php.

⁷ DURBAN COMMITMENT: http://www.iclei.org/fileadmin/template/project_templates/localactionbiodiversity/user_upload/LAB_Files/Durban_Commitment_14_Aug2008.pdf.

cemeteries exist in many cities and are important biodiversity resources.

- Management practices, restoration and ecological design must drive conservation and counter threats to native biodiversity. For example *Satoyama* provides an insight into a way of living in harmony with nature and into the management of biodiversity in cities.
- Establishment of quantitative evaluation systems for biodiversity is crucial for decision making for conservation and design.
- The success of biodiversity projects depends on close collaboration between the public and business sectors.
- Environmental education and participation of local communities are strong tools for raising awareness of biodiversity.

Challenges for the future

Based on the above outcomes, the following challenges for the future of urban biodiversity must be addressed:

- To maintain and improve the performance of ecological networks we need a better understanding of the relationships and the interactions between patches, corridors and the urban matrix. Theoretical and practical methods for planning and designing resilient ecological corridors should be developed.
- Strategic and holistic research into urban biodiversity with respect to the mitigation of and adaptation to climate change is crucial.
- Further comparative studies of urban biodiversity are necessary for the monitoring, management, restoration and design of biodiversity.
- Functional aspects of urban biodiversity should be connected with the valuation of ecosystem services including cultural and spiritual benefits.
- Developments in ecological design should alleviate biodiversity loss and climate change.
- Scientific associations, networks and working groups should support international and local networks, and encourage the formation of governance to coordinate ecologists, civil engineers, landscape architects, planners, policy makers and citizens in the application of research outcomes to urban design.
- Greater efforts should be made to highlight the interlinkages between business and biodiversity.
- Professionals should be more active in providing relevant information to policy makers.
- The success in achieving our goals depends on the engagement of national governments, regional governments, funding partners and relevant organizations.

Integrative conclusions

The adoption of the “Plan of Action on Cities, Local Authorities and Biodiversity (2011–2020)” by COP 10 and its implementation would be a crucial step to halt the global loss of biodiversity and ensure that all our cities are green, pleasant and prosperous places.

As a community of urban biodiversity professionals we will support further CBD initiatives on “Cities and Biodiversity” through:

- sharing our knowledge and commitment through this conference and in the future,
- promoting urban biodiversity through continuing dialogue with the CBD especially, linking future URban BIOdiversity and Design Network meetings with future COP meetings.

On behalf of the

2nd International Conference of the Network URban BIOdiversity and Design URBIO 2010 “Urban Biodiversity in the Ecological Network” 18–22 May 2010, Nagoya, Japan, Prof. Dr. Yukihiro Morimoto (Co-chair of URBIO 2010), Mr. Tadayoshi Inoue (Co-chair of URBIO 2010), Prof. Dr. Mahito Kamada (Head of Secretariat of URBIO 2010) and Prof. Dr. Norbert Müller (President of URBIO). 21 May, 2010, Nagoya, Japan.

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