

GREEN SURGE

BIOCULTURAL DIVERSITY – CONCEPT AND ASSESSMENT

D2.1:

Published project report on BCD concept and explorative survey of BCD in 20 European cities

WP2:

Assessment of urban biocultural diversity

Partners involved:

UH, WU and MRI

Researchers:

Arjen Buijs, Marleen Buizer, Birgit Elands, Jari Niemelä, Luca Száraz, Kati Vierikko

Description:

The report outlines the conceptual framework for assessment of biocultural diversity (BCD) in urban areas as a part of the EU FP7 (ENV.2013.6.2-5-603567) GREEN SURGE project (2013-2017)



Primary authors: Vierikko, K. (UH, Finland), Elands, B. (WU, Netherlands), Száraz, L. (MRI, Hungary) and Niemelä, J. (UH, Finland)

Revised version, August 2015

TABLE OF CONTENTS

Summary	4
1 Introduction	6
1.1 WP2 links to other WPs in the GREEN SURGE project	6
1.2 WP2 research activities in 2014	8
2 Conceptual framework for urban Biocultural Diversity (BCD)	11
2.1 The origin of the BCD concept	11
2.2 An innovative approach to assessing BCD in European cities	12
2.2.1 BCD and ecosystem service approach	12
2.3 Research framework for urban BCD	14
2.3.1 First pillar: Manifestations of BCD	16
2.3.2 Second pillar: Maintenance of BCD – Cultural mechanisms and practices	17
2.3.3 Third pillar: Transdisciplinary research on biocultural creatives	18
3 Biocultural diversity research in GREEN SURGE	20
3.1 First Pillar – Research on BCD manifestations	20
3.2 Second Pillar – Research on cultural practices and mechanisms of creating BCD	21
3.3 Third Pillar – Transdisciplinary research on biocultural creatives	22
4 Methodology to study BCD in 20 European cities	23
4.1 Selection of cases	23
4.2 Data collection	26
4.3 Data analyses	28
5 Findings for BCD in the 20 European cities	30

5.1	Manifestations of BCD – biological diversity in European cities	31
5.2	Manifestations of BCD – cultural diversity in European cities	35
5.3	Maintaining BCD – biodiversity policy objectives in green spaces	39
5.4	Policy objectives for BCD in European cities	41
5.5	Complex dimensions of BCD in European cities: towards typology and indicators	43
5.6	Bioculturally significant places	46
6	Conclusions and acknowledgements	49
7	Reference list	513

SUMMARY

Although the concept of biocultural diversity (BCD) has been advocated in international committees and policy circles in the context of developing countries, the concept lacks a clear theoretical and empirical foundation for application in an urban context. This report (Deliverable 2.1) of the GREEN SURGE project presents a conceptual framework of BCD for urban context and analyses of BCD interpretations, manifestations and practices in governance and planning policy of green areas in 20 European cities. The report is directed to a broad audience ranging from researchers to practitioners and decision-makers who are involved in urban studies, management or planning of urban green areas, respectively.

The concept of BCD offers a new way of thinking about biodiversity conservation by looking at culturally significant and valued biodiversity (Cocks and Wiersum, 2014). In the GREEN SURGE project we will assess both the i) diversity in values and culturally inspired practices of people in dealing with biodiversity, and ii) the diversity in biophysical manifestations (e.g. species richness or variety in biotopes, green spaces) of urban BCD and their interactions. The general objective of urban BCD studies is to contribute towards a better understanding of the multiple manifestations of BCD in European cities.

GREEN SURGE has developed a research framework with three BCD research pillars. The first research pillar takes as a starting point studies on how people use, perceive and value the biodiversity that is associated with different types of urban green spaces, as well as how biodiversity is influenced and shaped by institutions, communities or citizens. In the second pillar we assess the nature of cultural mechanisms and practices that are used in maintaining this diversity. Mechanisms may consist of shared language, norms and symbols that guide the conservation and management of biodiversity as an ecological or cultural heritage object. These mechanisms and practices can vary greatly between cultural groups, institutions, cities and nations. The third research pillar strives towards transdisciplinary research where science is not only for information gathering, but also for interactive analysis, making sure multiple knowledge are drawn upon, and critical debate about the kind of observations made in the research pillars one and two. The third pillar of research will focus specifically on biocultural creatives.

The above research framework was used to analyse the planning and governance systems in place for green areas in European cities. WP5 and WP6, in collaboration with WP2, provided an assessment of current state of green infrastructure planning, participative governance and BCD practices in 20 case cities in Europe. The aim of the work in WP2 was to identify how city officials interpret planning objectives and management practices in the 20 studied cities, and how these influence on biodiversity and cultural diversity in cities. We classified main manifestation types for biodiversity and cultural diversity that emerged from the context of 20 European cities. We also identified different kinds of management practices that aim to maintain, improve or create new kinds of biodiversity in cities. We summarized how biological and cultural diversity and their dynamic interaction have been implemented in the current policy and called them as strategic approach to BCD. We identified more than ten different policy objectives to support BCD in the 20 European cities either at local or city level. From the interviews it became clear that spatial scale mattered for interpreting BCD policy and management.

We feel that Deliverable 2.1 and the research it presents is an appropriate start to identify how culture interacts within biodiversity and how biodiversity is (co-)managed or (co-)produced by institutions and citizens in the urban setting. We want to remind that this is the first iterative outcome of BCD concept research in the GREEN SURGE project, and the concept will be further elaborated during the project to a typology for BCD. Furthermore, potential indicators for urban BCD will be developed in the GREEN SURGE project.

Key words: Biocultural diversity, biological diversity, cultural diversity, content analyses, European cities, planning policy

1 INTRODUCTION

This report (Deliverable 2.1) of the GREEN SURGE project presents the conceptual framework of biocultural diversity (BCD) for urban context and first analyses of BCD manifestations and cultural practices for BCD in 20 European cities. The document is directed to a broad audience of researchers, practitioners and decision-makers involved or interested in urban studies, management or planning of urban green areas.

As stated in the project's Description of Work (DoW, p. 9), the overall aim of the WP2 is

- *to develop and apply an innovative transdisciplinary approach of linking biological diversity with cultural diversity by developing a conceptual biocultural (BCD) framework, and*
- *by using the framework to examine how groups of residents with different cultural and socio-economic backgrounds value and interact with urban green spaces and their associated biological diversity at multiple scales (from species to ecosystems) in European cities*

This report presents a conceptual framework for BCD that gives the theoretical frame for analyses of BCD in the GREEN SURGE project, and provides an idea of how these research orientations can be integrated to form a coherent, overall perspective on urban BCD research.

Work Package 2 (WP2) is divided into three tasks: WP2.1: Developing a conceptual framework for BCD; WP2.2: Assessment of BCD in European urban areas and urban green spaces components; and WP2.3: Developing a typology and database of BCD with urban green infrastructure (UGI). The present D2.1 provides an overview of the concept development work carried out under task WP2.1. BCD studies under task WP2.1 have progressed along two axes: (i) developing the conceptual research framework for urban BCD and (ii) an initial survey and analyses of the notions of BCD in 20 cities around Europe together with partners involved in Task 2.2.

First, this report presents interlinkages between WP2 and other WPs in the GREEN SURGE project to give an overview of the BCD related research in the project. Second, we discuss the origin of BCD approach, and introduce a modified BCD concept to the urban context, which differs from the original concept by being more dynamic. Third, we present outlines for BCD research in GREEN SURGE, and finally, we present the results from the explorative analyses of BCD in 20 European cities that was carried out together with partners in WP5 and WP6.

Responsible partners for producing the conceptual framework and BCD analyses of 20 cities were Wageningen University (WU) and University of Helsinki (UH). In addition, partners from the Metropolitan Research Institute (MRI) helped with the data analyses of explorative surveys of twenty cities. Other contributing partners to WP2 are given in Figure 1 and Table 1.

1.1 WP2 links to other WPs in the GREEN SURGE project

GREEN SURGE is organised as eight distinct, but interlinked Work Packages. WP2 has the role of developing a conceptual framework for BCD, testing its use, evaluating methods and identifying good practices. The BCD concept will be used and assessed in WP3: Functional linkages –

statistical and causal relationships, trade-offs, synergies and spatial conflicts – between urban green spaces; WP4: Contributing to the Green Economy – integration of monetary and non-monetary valuation of urban green spaces in the BCD context; WP5: Green Infrastructure planning and implementation – identify and analyse good practices of UGI planning and implementation; WP6: Innovative governance of urban green spaces and BCD – focuses on governance that integrates participatory approaches (bottom-up) within planning processes; and finally WP7: Urban Learning Labs.

BCD-related findings will also be central to activities under WP1 (project management) and WP8 (knowledge brokerage and dissemination). The development work of conceptual framework of BCD has been a starting point for other activities. The conceptual framework of BCD provides a theoretical research frame and research context to other WPs in the GREEN SURGE project. Many partners will be involved to the BCD research in the near future of GREEN SURGE project (Fig. 1 and Table 1).

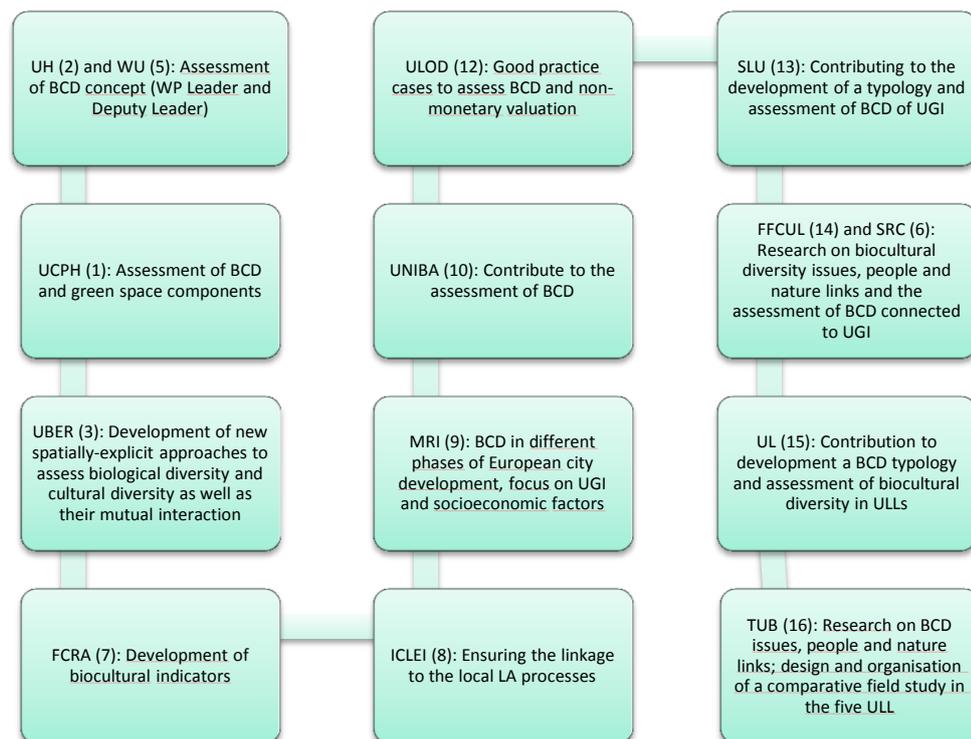


Figure 1. Contributions of GREEN SURGE partners to WP2. The conceptual framework of BCD provides theoretical research frame and research context to other research activities in the GREEN SURGE project. Numbers in brackets are abbreviations for the WP2 contributors explained in Table 1.

TABLE 1. LIST OF CONTRIBUTING PARTICIPANTS TO WP2 AND THEIR WORK MONTHS

No.	Legal name (short name) and working months	Country	Organisation type
1	Københavns Universitet (UCPH) 5	Denmark	Research Organisation
2	Helsingin yliopisto (UH) 31	Finland	Research Organisation
3	Humboldt Universität zu Berlin (UBER) 6	Germany	Research Organisation
5	Wageningen University (WU) 10	Netherlands	Research Organisation
6	Stockholms Universitet (SRC) 4	Sweden	Research Organisation
7	Forestry Commission Research Agency (FCRA) 2	United Kingdom	Public Body
8	ICLEI European Secretariat GmbH (ICLEI) 1	Germany	SME
9	Metropolitan Research Institute (MRI) 6	Hungary	SME
10	Università delgi studi di Bari 'Aldo Moro' (UNIBA) 6	Italy	Research Organisation
12	Uniwersytet Łódzki (ULOD) 12	Poland	Research Organisation
13	Sveriges Landsbruksuniversitet (SLU) 5	Sweden	Research Organisation
14	Fundação da Faculdade de Ciências Da Universidade de Lisboa (FFCUL) 18	Portugal	Non-profit Research Organisation
15	Univerza v Ljubljana (UL) 10	Slovenia	Research Organisation
16	Technische Universität Berlin (TUB) 25	Germany	Research Organisation

1.2 WP2 research activities in 2014

The first WP2 meeting was organized in Berlin, Germany, and hosted by Technische Universität Berlin (TUB) on 21st March 2014. Sixteen researchers from eight institutions attended the meeting (see Fig. 2). The aim of the meeting was to discuss all parts of WP2 and the linkages between the different tasks (Task 2.1: GREEN SURGE concept on BCD; Task 2.2.1: Assessing existing BCD data; Task 2.2.2: Field study within WP2 and ULLs).

The second WP2 meeting was organized during the PGA meeting in Edinburgh on 17-18th November 2014. During the meeting partners discussed the conceptual framework of BCD and presented ongoing research in Task 2.1 and 2.2. Presentations were given by: Kati Vierikko (UH), Jari Niemelä (UH), Birgit Elands (WU), Maja Steen Møller (UCPH), Margarida Santos-Reis (FFCUL) and Luca Száraz (MRI). In total 14 researchers from seven institutions joined to the WP2 meeting in Edinburg.

The conceptual framework for BCD was also developed through frequent e-mail exchange, google drive writings, several Skype meetings and a meeting trip in Netherlands in early August

2014 (by Kati Vierikko from UH). In addition, key scientists with previous experiences in studying BCD in the urban context were consulted during the development process of the GREEN SURGE BCD framework, namely Freerk Wiersum (Wageningen University, the Netherlands) and Michelle Cocks (Rhodes University, South-Africa).

Submitted scientific journal manuscripts in 2014:

- *Exploring Biocultural Diversity in Cities – A framework for research to enhance governance in the urban landscape. Submitted to a special issue of Environmental Science & Policy.*
- *Policy interpretations and manifestation of biocultural diversity in urbanised Europe: conservation of lived biodiversity. Submitted to a special issue of Biodiversity and Conservation.*

WP2 and BCD presentations in 2014:

- *Elands, B. (2014). Biocultural diversity in Europe: connecting people to nature in an urban context. In: Linking Biological and Cultural Diversity in Europe; Abstract book. 1st European Conference for the Implementation of the UNESCO-SCBD Joint Programme on Biological and Cultural Diversity, 8-11 April, 2014, Florence, Italy, p. 31.*
- *Elands, B., Buizer, M. & F. Wiersum (2014). Biocultural diversity in Europe: connecting people to nature from tropical regions to European urban areas. Presentation given at the 1st European Conference for the Implementation of the UNESCO-SCBD Joint Programme on Biological and Cultural Diversity, 8-11 April, 2014, Florence, Italy.*
- *Vierikko, K., Niemelä, J., Buizer, M. and Elands, B. (2014). Green Infrastructure and Urban Biodiversity for Sustainable Urban Development and the Green Economy (GREEN SURGE) – Is there place for biocultural diversity in the cities?" Poster presentation, the 7th annual International ESP Conference, 5-9 September 2014, San Jose, Costa Rica.*

In addition, the GREEN SURGE project and BCD concept were introduced as part of the oral presentation "Human demands and nature supplies – do they meet in Helsinki, Finland" in the annual CIENS City Conference, 21 August, Oslo, Norway by K. Vierikko, at the IUFRO World Congress in Salt Lake City, the Swedish IALE conference, the 2014 Canadian Urban Forest Conference, and the conference of the UK Arboricultural Association by GREEN SURGE project leader Cecil Konijnendijk van den Bosch.



Figure 2. Participants taking a rest during the first WP2 meeting, held in Berlin. The following persons attended the meeting: Arjen Buijs (WU, Netherlands), Marleen Buizer (WU, Netherlands), Anders Busse Nielsen (SLU, Sweden), Daniel Brinkmeyer (TUB, Germany), Piotr Czembrowski (ULOD, Poland), Leonie Fischer (TUB, Germany), Dagmar Haase (TUM, Germany), Jasmin Honold (TUB, Germany), Nadja Kabisch (UBER, Germany), Michael Strohbach (UBER, Germany), Ingo Kowarik (TUB, Germany), Jakub Kronenberg (ULOD, Poland), Jari Niemelä (UH, Finland), Marina Pintar (UL, Slovenia), Emily Rall (TUM, Germany), Mike Smith (FCRA, United Kingdom), Kati Vierikko (UH, Finland). In the picture from left to right: Jakub, Nadja, Mike, Michael and Anders.

2 CONCEPTUAL FRAMEWORK FOR URBAN BIOCULTURAL DIVERSITY (BCD)

2.1 The origin of the BCD concept

Predominantly, the BCD approach has been used for studying traditional ecological knowledge (TEK) of indigenous groups and their roles in nature conservation in developing countries, particularly through case studies in Latin America, Asia and South Africa (Pretty et al., 2009; Maffi and Woodley, 2010). A study on cultural and spiritual values of biodiversity that was carried out as a contribution to the global biodiversity assessment at the end of the 20th century (Posey, 1999) contributed

significantly to the understanding of the intersections of biological and cultural diversity amongst indigenous people and local communities in tropical countries (Pretty et al., 2009). Subsequently, the concept was specified as involving the diversity of life in all its manifestations – biological, cultural, and linguistic – which are interrelated (and likely co-evolved) within a complex socio-ecological system (Persic and Martin, 2008; Maffi and Woodley, 2010). Notably in tropical countries specific attention has been given to exploring the implications of this link for both nature and culture (Maffi, 2004; Maffi and Woodley, 2010). In many places inhabited by indigenous and traditional people a positive correlation between the number of plant species and the number of cultural and linguistic groups has been observed (Loh and Harmon, 2005). Several studies have also identified common threats to both biodiversity and cultural diversity (Pilgrim et al., 2008; Pretty et al., 2009). Consequently, the concept of BCD has been often presented within the framework of retention of BCD amongst indigenous people, which is lost due to socioeconomic modernization (Pilgrim et al., 2008; Rapport and Maffi, 2010). As illustrated by the Convention on Biological Diversity, the conservation of traditional values and practices by traditional societies is considered as a means to prevent the loss of biodiversity.

Biocultural diversity was specified as involving the diversity of life in all its manifestations – biological, cultural and linguistic – which are interlinked (and likely co-evolved) within a complex socio-ecological system (Persic and Martin, 2008; Maffi and Woodley, 2010)

Gradually, the concept of BCD has become further modified. It became recognised that the concept is not only of significance in respect to conservation of traditional systems of BCD, but also for understanding how cultural dynamics impact the way modernized societies interact with biodiversity (Cocks, 2006; Cocks and Wiersum, 2014). In a dynamic sense, it relates to the various manifestations of social-ecological systems – where biological and cultural dynamics are developed interactively over time. These long-term interactions are reflected in the formation of specific types of cultural landscapes (e.g. Pungetti, 2013). The diversity in human and ecological systems is considered to support the capacity of social-ecological systems to adapt to local environmental conditions and changes (Maffi, 2004, p. 12). These adaptations, constantly evolving in response to environmental changes, are “institutionalized in social organization, cultural knowledge, beliefs and values, technology and language” (Maffi, 2004, p. 12). These adaptive responses are expressed through creative practices for living with and interacting with biodiversity (Turnhout et al., 2013). In social-ecological systems (SES) and in BCD that can be conceptualized as one aspect of SES diversity is a key determinant for maintenance, and for adaptation capacity (Folke et al., 2005; Maffi, 2010, p. 12; Turner et al., 2003).

Consequently, the BCD concept cannot only be used for understanding interactions between cultures or cultural characteristics and biodiversity in traditional societies and rural communities living in more or less natural environments, but also in respect to such interactions in highly modernized societies (e.g. Barthel et al., 2010; Moreno-Penaranda, 2013). In Europe, it has been recently recognised that it is important to maintain BCD with its tangible and intangible values (Florence Declaration, 2014; Pungetti, 2013). The Florence Declaration (2014) for conserving BCD in Europe explicitly states the need to recognise “the vital importance of cultural and biological diversity for present and future generations and the well-being of contemporary societies in urban and rural settings”. The GREEN SURGE project will specifically focus on BCD in European cities.

2.2 An innovative approach to assessing BCD in European cities

Cities can be seen as cultural and biological *rendezvous* providing many situations for diverse associations within and between culture and biodiversity. Cultural values held by urban inhabitants create opportunities for developing innovative approaches towards biodiversity conservation. Green spaces in urban settings can be biologically rich and

Cities can be seen as cultural and biological *rendervouz* providing many situations for diverse associations within and between culture and nature.

provide diverse habitats for many species (Aronson et al., 2014; Elmqvist et al., 2013). Many studies have been undertaken to assess the importance of biodiversity conservation in urban areas (Kühn et al., 2004; McKinney, 2008; Gaston, 2010; Niemelä et al., 2011; Elmqvist et al., 2013). In urban ecological research much attention has been given to the need to conserve native biodiversity (Puppim de Oliveira et al., 2011). Recently, the concept of ecosystems services (ES) has been employed in the urban context (e.g. Haines-Young and Potschin, 2010; Gomez-Baggethum and Barton, 2013; Hubacek and Kronenberg, 2013; Haase et al., 2014, Larondelle and Kabisch, 2014). This approach aims at identifying beneficial and valuable services provided by ecosystems and developing policy and planning methods for better conservation of natural environments and biodiversity, e.g. through developing innovative approaches towards greening the economy (e.g. Niemelä et al., 2010). In addition to material services in the form of provisioning services, regulating services and supporting services, urban biodiversity provides valuable cultural services which are defined as the non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation or aesthetic experiences (MEA, 2005).

2.2.1 BCD and ecosystem service approach

The ES concept and research is based on the epistemological assumption of a dualistic world, separating ecosystems from the socio-cultural system, and making a clear distinction between human and non-human dimensions (MEA, 2005). This model has been originally developed to emphasize that human well-being is strongly dependent on nature and biodiversity. The most

elaborated version of human-nature interaction is the cascade model (e.g. Haines-Young, 2010). In this model services provide the “bridge” between human and non-human systems. We can easily identify two distinct arguments presented by ES scientists on how the ES models, such as the cascade model, should be developed to better illustrate links between human and nature, between anthropocentric and biocentric perspectives.

Authors in the field of natural sciences look at the cascade model from the biocentric point of view, and they have attempted to develop the model further to identify specific ecological functions that actually provides service (e.g. Service Supporting Unit, SPU) (e.g. Luck et al., 2003, Kremen, 2005; Kontogianni et al., 2010). On the contrary, authors in the field of political sciences and economics have put considerable effort into determining when an actual service (e.g. potential, intermediate or final) is constructed by socio-economic context, and into humans’ role in defining or producing (e.g. labour, energy input) services that benefit human wellbeing (e.g. Fisher et al., 2009; Spangenberg, 2013). In both cases, however, researchers tend to maintain the dualistic idea of non-human (supply, object) and human (demand, determinant) environment, with “services” as a bridge between supply and demand (see also Müller et al., 2010, Fig. 1). The cascade model as a conceptual framework to understand human-nature relationships tends to pay little attention to reciprocal interaction of human and nature, and the human-nature relationship is presented as a passive flow from nature to human wellbeing. Indeed, Braat and de Groot (2012, p. 8) speak of a “unidirectional downward flow”. This is in spite of the fact that in the related field of socio-ecological system thinking human-nature interaction is introduced like a dynamic bundle where both systems (more or less together and simultaneously) have to adapt constantly to changing situations to maintain their resilience (Berkes et al., 2003; Folke, 2006; Gallopin et al., 2006).

Another key goal in the ES approach is mapping and visualizing of spatial patterns of ecosystem services (Burkhard et al., 2009). The explicit quantification and mapping of ecosystem services are considered as key elements of implementing the ES concept into decision-making (Daily and Matson, 2008). ES mapping is typically broad-scale and top-down observations of different services, identified by experts and professions. Results are heavily dependent on availability and quality of (GIS based) data, and visualization of benefits or values. Many ES researchers

agree that local or decision context should be carefully defined and included in the ES approach, especially as regards less tangible values such as cultural ecosystem services (e.g. Fisher et al., 2009; Chan et al., 2012; Gee and Burkhard 2013). In line with many other authors, we agree that in the ES discourse the participation of local stakeholders is scarce, academics are dominating the debate, and focus is on larger scales (e.g. Seppelt et al., 2011; Opdam, 2014). If a participatory ES approach neglects close bundles of ecological and social systems, or fails to identify socio-cultural impacts, the process can produce unwanted and disputed situation, resulting in failure

With the idea of services as a bridge between humans and nature, BCD gives expression to the idea that biological diversity and cultural diversity are intertwined – they are ‘made’ together and they are inextricably linked – culture is an inherent part of producing many services.

to understand of the role of ES in complex socio-ecological systems such as cities (Chan et al., 2012; Lele et al., 2014).

The concept of BCD builds upon the idea that nature is not just something that exists ‘out there’, but is socially constructed. In contrast with the idea of services as a bridge *between* humans and nature, BCD gives expression to the idea that biological diversity and cultural diversity are intertwined – they are ‘made’ together, imply each other and are inextricably linked – culture is inherent part of producing services. The concept of BCD also accentuates the dynamic, constantly evolving, nature of interactions between humans and nature. Thus, the concept of BCD offers a new way of thinking about biodiversity conservation by looking at culturally significant and valued biodiversity (Cocks and Wiersum, 2014). It may not only involve the conservation of the original natural biodiversity, but also the creation of new manifestations of urban biodiversity at the level of both species composition (e.g. urban parks and gardens) and urban green landscapes. An example of such innovations in the creation of specific constellations of urban biodiversity is the development of green architecture (e.g. green roofs and vegetated walls) in which plants do not only serve ornamental purposes, but also assist in micro-climate management, maintain suitable habitats for many species, and capture pollutants.

In the GREEN SURGE project we will assess both the i) diversity in values and culturally inspired practices of people in dealing with biodiversity, and ii) the diversity in biophysical manifestations (e.g. species richness or variety in biotopes, green spaces) of urban BCD and their interactions. The general objective of urban BCD studies is to contribute towards a better understanding of the multiple manifestations of BCD in European cities. This innovative research has as specific aims (i) to develop the BCD concept in urban context; (ii) to apply an urban BCD concept in studying integration between culture and biodiversity, and (iii) to develop successful participatory governance for strengthening social cohesion and biodiversity conservation in cities (GREEN SURGE DoW, 2013, p.3).

2.3 Research framework for urban BCD

In the urban context, BCD is not just the sum of biological and cultural diversity across all its levels. Rather, BCD should also be considered as a dynamic process in which culture interacts with biodiversity at different spatial and temporal scales. In order to study BCD in the urban context, we

In the urban context, BCD is not just the sum of biological and cultural diversity across all its levels

need, first of all, to study relationships between cultural diversity and biodiversity associated to urban green spaces. Secondly, we need to analyse how cultural practices and mechanisms (language, norms, institutions) influence relationships between cultural and biological diversity and vice versa. Thirdly, we need to understand how we can stimulate BCD under novel emerging socio-cultural and economic conditions on the basis of ‘learning and making together’. This can be accomplished by assessing the practices of biocultural creatives (Elands and van Koppen, 2013). Such biocultural creatives develop innovative practices to maintain BCD either through new ways of human interaction with biodiversity or through creation of new biocultural

assemblages. In other words, they stimulate and facilitate the social-ecological memory in respect to ecologically and socially sustainable biocultural practices (Barthel et al., 2010).

The key concepts guiding urban BCD research are summarized in the Table 2. From the above considerations emerges the research framework for urban BCD study which consists of three pillars (Fig. 3): (i) Manifestations of BCD, (ii) Maintenance of BCD, and (iii) Creations of BCD (see also Elands and van Koppen, 2013). To make the research objectives on BCD in GREEN SURGE clearer we highlight the major research questions for each pillar. The WPs and Tasks will contribute with answers to these questions.

2.3.1 First pillar: Manifestations of BCD

The first research pillar takes as a starting point the study on how different people use, perceive or value biodiversity that is associated with different types of urban green spaces, as well as in how biodiversity is influenced and shaped by individual, cultural groups or institutions in cities. The ecosystem services approach highlights that green spaces with their associated biodiversity can provide important services to people in urban regions (Niemelä et al., 2010). However, different people may value biodiversity and natural capital in a quite different ways. Whether an ecosystem function is regarded as a service, i.e. a benefit to people, or a disservice (e.g. the presence of biting insects) may in some cases depend on societal values and demands that clearly vary among cultural groups (e.g. Gómez-Baggethum and Barton, 2013; Haines-Yong and Potschin 2010). The different methods used to elicit these values and demands may also affect how we understand these values (Hubacek and Kronenberg, 2013).

To support biodiversity maintenance in cities we need to understand (i) what specific manifestations of BCD occur, (ii) how different types of natural and adapted ecosystems affect the use and appreciation of urban green spaces, (iii) how these values and uses depend on cultural differences and experiences of urban residents, and (iv) how processes of place attachment, place identity or place making modulate value systems, uses and biodiversity of urban green spaces (e.g. Farnum et al. 2005; Altman and Law, 1992).

Research questions for pillar 1: Manifestations of BCD in European cities

- *What manifestations of BCD can be distinguished and what are their main characteristics?*
- *Do varying levels of biodiversity and inclusion of cultural objects affect human perception, valuation of, and interaction with green spaces among different cultural groups, between types of green spaces or between cities?*
- *How does place making – a space becomes a meaningful place – influence biodiversity, valuation and use of green spaces by different cultural groups?*
- *How does valuation of biodiversity affect the way green spaces are planned and managed?*

TABLE 2. KEY TERMS AND THEIR DEFINITIONS

Key term	
Biodiversity, biological diversity (BD)	Variability among living organisms and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems (Convention of Biological Diversity).
Biocultural diversity (BCD)	BCD is considered here as a research concept emphasizing variability among cultural groups with respect to their value system, cultural practices, mechanisms and knowledge related to different levels of biodiversity (Cocks and Wiersum, 2014).
Biocultural system	A system in which biological and cultural interactions are developed jointly over the long run. The diversity of human life and biodiversity are considered to support adaption capacity of biocultural systems to local environmental conditions and changes (Maffi, 2004).
Cultural ecosystem services (CES)	The non-material benefits people obtain from ecosystems through spiritual enrichment, cognitive development, reflection, recreation and aesthetic experiences (Millennium Ecosystem Assessment, 2005).
Cultural diversity (CD)	Cultural diversity is considered here as variability among spiritual, linguistic, material, intellectual, practical and emotional features ranging from individual ideas to entire cultures, and interaction among all of these (Loh and Harmon, 2005).
Cultural group	Group of people that is classified based on either their demographic, socio-economic, ethnic or national (native or immigrant) characteristics (own definition).
Cultural mechanisms and practices	Practices are actions that can have (in)direct influence on the environment such as managing, monitoring, protecting. Mechanisms are features beyond the practice such institutions, knowledge, rituals, beliefs or values (Berkes and Folke, 2000).
Green area or green space	Both natural and man-made vegetated areas in urban areas, including water bodies, constructed green roofs and green walls. Green spaces or areas may also include cultural objects (e.g. historical buildings, statues) and recreational infrastructure (own definition).
Social-ecological memory	Variety of forms through which behaviours of people are shaped by the past. It functions as collectively shared mental maps for engaging with ecosystem management (Barthel et al., 2010).
Social-ecological system (SES)	Concept according to which social and ecological systems are truly interdependent. SES is a complex adaptive system (Berkes and Folke, 2003). Biocultural systems can be considered as social-ecological systems.

2.3.2 Second pillar: Maintenance of BCD – Cultural mechanisms and practices

The second pillar deals with different cultural practices and mechanism and how they i) frame the interaction between culture and biodiversity, ii) shape BCD at local, landscape and city levels (Cocks and Wiersum, 2014). In the first pillar of BCD research we have focused on the diversity of BCD manifestations and on how different cultural groups value and use urban biodiversity. In this second pillar we assess the nature of cultural mechanisms and practices that maintain this diversity. The mechanisms may consist of shared language, norms and symbols that guide the

conservation and management of biodiversity as an ecological or cultural heritage object. These mechanisms and practices can vary greatly between individuals, communities, institutions, cities and nations. They can be based on formal norms and objectives formulated in policy documents such as Nature Conservation Act or Biodiversity Strategy or Green Structure Plan, or in informal norms or symbols, such as shared unspoken rules among community gardeners (Barthel et al., 2010). Both formal and informal norms significantly affect interactions between culture and biodiversity on different spatial scales.

Cultural practices for creating BCD may consist of culturally inspired practices of individuals, cultural groups or organizations. For example, place making may be the result of culturally-inspired practices, such as volunteer work on restoration of an urban creek or participation in communal gardening or less tangible practices, such as storytelling. Each of these practices modulates biological and cultural values and results in a specific type of biocultural manifestation. Cultural practices can be identified either by studying management behaviours and traditions or by gradually contextualising physical BCD manifestations in green spaces. Some globally adopted cultural practices have suppressed both biological and cultural diversity. For example, buying “easy-to-manage cultivated plants” from a supermarket will likely decrease social-ecological memory on the cultivation of historic local cultivars of food or ornamental species. In contrast, location-specific practices, such as hedges separating landowners’ plots in the UK or closed fences separating gardens in the Netherlands are examples of cultural landscapes with location-specific assemblages of biodiversity that reflect the endurance of social-ecological memories (e.g. Pungetti, 2013; Stephenson, 2008). The second pillar can be summarized as three main research questions in the GREEN SURGE project.

Research questions for Pillar 2: Creating BCD – Cultural mechanisms and practices in European cities

- *How do different cultural mechanisms (planning and governance systems) concerning green areas in European cities influenced biological and cultural diversity?*
- *How do cultural mechanisms and practices (planning norms, management rules etc.) influence the interaction between culture (use of green spaces) and nature (associated biodiversity)?*
- *How do cultural mechanisms and practices for managing urban green spaces differ between European cities?*

2.3.3 Third pillar: Transdisciplinary research on biocultural creatives

The third research pillar focuses on interaction and co-creation of knowledge among scientists, policymakers, and citizen-groups. Co-creation is central for BCD information gathering as well as interactive analysis and critical debate about the kind of observations made in research pillars one and two. The first two pillars of research can be characterized as multi- or interdisciplinary in terms of the position of the (team of) researchers who are observers and analysts cooperating between disciplines but who remain largely external to the ‘target object’ of research. The interaction with other stakeholders is often limited to the researcher gathering information (data) and conducting interviews, organising focus group discussions, or engaging in participant observation.

The third pillar of research will focus specifically on the values and experiential knowledge that stimulate dynamics in BCD. It will involve an assessment of the activities and driving forces of ‘biocultural creatives’ of individuals, institutions or communities (Elands and Van Koppen, 2013). Citizens are considered as the drivers of biocultural dynamics as their activities reflect how different value/practice systems relating to different cultures come together to continuously invent, re-invent and ‘co-create’ new constellations of living with biodiversity. The activities of these creatives form a ‘library’ to assess the dynamics of social-ecological memories (Barthel et al., 2010) and a learning lab to identify novel approaches to both conserving and developing BCD in urban areas for protecting culturally significant biodiversity, developing new constellations of BCD or developing new forms of optimizing the ecological services of biodiversity. This research on locally initiated transformative processes forms a distinctive pillar of research focusing specifically on the human agency in creating novel forms of cultural-ecological interaction. It should not to be seen as ‘just’ a supplement to the other types of research, but rather forms a link between the first two pillars and the action research of the five Urban Learning Laboratories (ULL).

Research questions for Pillar 3: The role Biocultural creatives

- *What kind of biocultural creatives can be distinguished in different European cities; what kind of practices are involved and how are they organized?*
- *To what extent are the dynamic practices stimulated by participative governance support structures or are they spontaneous processes?*
- *Which practices hold promise for wider dissemination and application and how can the local insights be up-scaled to other, ‘higher’ levels of decision-making? Does this prioritize some public goods over others?*
- *How do professionals, other local stakeholder groups and policy makers interpret and appreciate the activities of different kinds of biocultural creatives? Is it possible to identify specific practices that are promising in developing new types of BCD and/or profiting from their ecological services and/or cultural resilience?*



Figure 3. Three pillars of transdisciplinary research on urban BCD.

3 BIOCULTURAL DIVERSITY RESEARCH IN GREEN SURGE

The concept of BCD draws attention to the multiplicity of interactions between humans and nature by i) looking at how different cultural and socio-economic groups interact with biodiversity by identifying culturally meaningful biodiversity, ii) examining how different management practices and cultural mechanisms shape biodiversity, and how physical manifestations in urban settings or conceptual manifestations in documents reflect cultural diversity, and finally iii) how we can support innovative participative governance of BCD creatives in transdisciplinary ways. The three-pillar conceptual framework introduced above is a starting point for BCD research in GREEN SURGE. BCD research in the project is simultaneously carried out in different phases and at multiple scales from the local and context-dependent scale (ULL cities) to European level analyses of interlinkages between biodiversity and cultural diversity in European cities. Based on the main research objectives of BCD research implied in WP2, we can separate six different research phases: conceptual, policy, value, statistical, transdisciplinary and analytical (Fig. 4). This deliverable covers the conceptual phase of BCD research. The final outcome of WP2 working closely with other WPs will be a typology and potential indicators for understanding and identifying BCD at multiple scales. At least three scientific papers will be produced from these analyses. Below all research phases are presented in more detail using the three-pillar research framework presented above (Fig. 3).

3.1 First Pillar – Research on BCD manifestations

The BCD concept developed in WP2 will be used to assess BCD simultaneously at multiple spatial scales. The statistical and value phase of the BCD research (Fig. 4) can be anchored to the first pillar, and it is part of Task 2.2 of WP2. Results of these phases will be presented in the next Deliverable of WP2 (D2.2, month 26).

Statistical phase: The statistical relationship between socio-demographic parameters (such as population density and total population, population with different national background) with biodiversity (here, bird species richness) will be studied. Furthermore, accessibility of green spaces and experience with nature in different parts of the cities will be explored. Existing quantitative data on biodiversity and cultural diversity of a range of European cities will be collected and used to explore relationships between biological and cultural parameters at larger spatial scales (i.e., urban region, total or parts of the city/neighbourhood). This assessment will illustrate differences among cities respective their green spaces components and uncover the relationship between green space size and configuration and bird diversity. Contributing partner: UBER (3); UL (15).

Value phase: To better understand interactions between different levels of biodiversity and cultural diversity, two approaches will be taken. First, existing studies from environmental psychology will be reviewed to disclose the state of knowledge on the valuation of biodiversity at the gene, species, or ecosystem levels in different types of urban green spaces. Leading partner: TUB (16). Second, a field study will be conducted in the 5 Urban Learning Lab (ULL) cities (Bari, Berlin, Edinburgh, Ljubljana and Malmö) to fill important knowledge gaps concerning the role of biodiversity in the perception, valuation of, and interaction with different types of urban green

infrastructure (UGI). Following a pre-test, which was been conducted in Berlin in 2014, field surveys will be conducted in 2015 in each ULL city to investigate whether different levels of biodiversity affect human perception, valuation of, and use of different green areas (forests, park, roadside vegetation and wasteland). Different cultural groups in each city will be surveyed to allow for intercultural and socio-economic comparisons. Vegetation will be assessed in four UGI types at three biodiversity levels (low, medium, high) in order to account for variations in biodiversity with much detail. The field survey will comprise a questionnaire and photographic stimuli. Contributing partners: FCRA (7), UNIBA (10), SLU (13), UL (15), TUB (16), UBER (3).

Another approach for studying BD manifestations at the local context in WP2 will be performed by partners in Helsinki, Finland (UH) and Lisbon, Portugal (FFCUL). To analyse interlinkages between biological and cultural diversity in terms of different user groups within urban parks and between two European cities (Helsinki and Lisbon), data of species richness (taxonomic and/or functional groups) and biophysical characteristics will be collected in addition to interviews and observations of park visitors. To explore what kinds of different meanings people with different cultural or socio-economic background attach to green spaces, and to explore how people use and experience green areas as part of their daily practices, the BCD research particularly lends itself for phenomenological, ethnographic and other qualitative research methods, e.g. interviews and field observations in the field (in-situ research). Contributing partners: UH (2), FFCUL (14)

3.2 Second Pillar – Research on cultural practices and mechanisms of creating BCD

Policy phase: To analyze what kind of planning and governance systems concerning green areas there are in European cities, WP5 and WP6 jointly with WP2 made an assessment of current state of green infrastructure planning and BCD practices in 20 case cities in Europe (Tier 1 research). The aim was to identify how BCD is interpreted, and how different planning and management practices or adopted cultural mechanism influence the biological and cultural diversity and their interactions in cities. Results of Tier 1 studies will be presented in the next chapter. In-depth case study research with examples of good BCD practices, with development of innovative governance, strategies and tools for urban green infrastructure planning at a metropolitan level through will be conducted by making interviews, document and desk analysis and deliberative workshops (Tiers 2 and 3 in WP5 and WP6). Contributing partners: UCPH (1), UH (2), WU (5), TUM (4), SRC (6).

An additional pilot study was undertaken during autumn 2014 in Copenhagen, testing ways of using mobile phone for self-reporting on BCD creativity. The first test groups consisted of Master level students at the landscape- and nature planning educations at the Faculty of Science, University of Copenhagen. Students report examples of innovative BCD expression by sending photos and comments to a server at the university. Pictures and comments are geo-tagged and thus also contain place-specific information about where these examples are situated in the city. The idea is to crowd-source knowledge on creative BCD. The method is in development phase and for the next round of tests some modifications will occur. It is the aim that the technical set-up will be useful for the in-situ investigation by WP2 the forthcoming summer. Contributing partner: UCPH (1).

3.3 Third Pillar – Transdisciplinary research on biocultural creatives

Transdisciplinary phase: The most significant part of the transdisciplinary research in the GREEN SURGE project will take place in the five ULLs in WP7. The overall objective for WP7 is to facilitate collaborative learning and knowledge production between practitioners, policy makers, researchers and other stakeholders. Transdisciplinary research in the third pillar of BCD research endeavours for application of learning alliance methodology by combining a science-driven approach and bottom-up knowledge or experience-based approach. For example, when exploring BCD in cities, a transdisciplinary inquiry into ‘good practices’ of BCD may start with the identification of developments that different participants frame as good practice, to be followed by explorations of the criteria of success and failure used by the different participants. Through a range of different learning processes, top-down, research-led knowledge comes together with, and is tested against bottom-up stakeholder knowledge through a series of workshops in all 5 ULL cities . Contributing partners: All partners will have some contributions to the third pillar of BCD research. This phase of BCD research is most critical to the development of appropriate and practical typology and indicators for BCD.

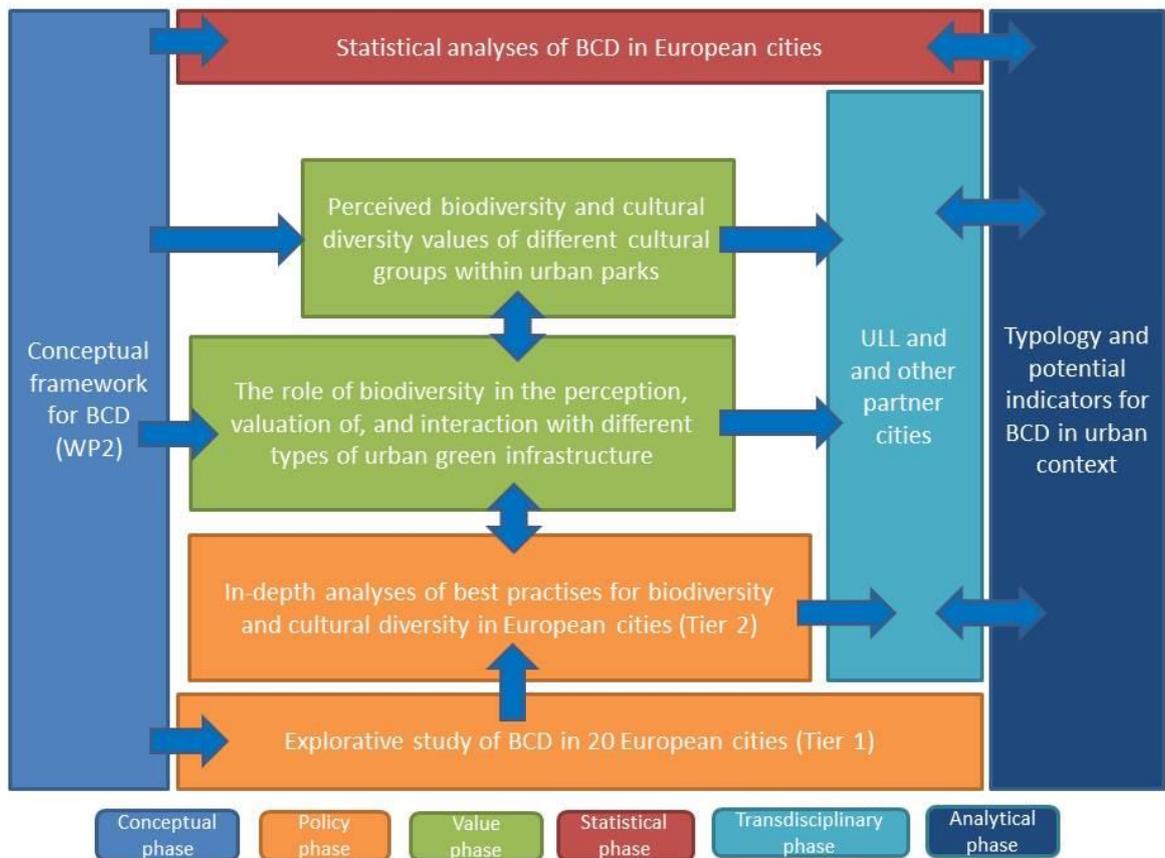


Figure 4. Different research phases and methodological approaches for multi-scale BCD studies in the GREEN SURGE project. Close collaboration with stakeholders in ULL and other cities is crucial to develop typology and potential indicators for BCD in the urban context.

4 METHODOLOGY TO STUDY BCD IN 20 EUROPEAN CITIES (TIER 1)

To analyse governance arrangement and planning processes for UGI, and linkages between biodiversity and cultural diversity, the research in the GREEN SURGE project is divided into three overlapping phases. In the first phase (Tier 1), an explorative survey was carried out to assess to what extent BCD is recognized and applied in urban planning and governance in 20 cities ('second pillar', section 3.2. above). In the second phase (Tier 2), innovative BCD practices will be studied more in detail and analysed to what extent they contribute to UGI planning. In the last phase (Tier 3), the results are incorporated in action research programmes in five Urban Learning Lab cities. Here we report the results of the explorative survey of BCD in 20 European cities (Tier 1).

As mentioned earlier, Task 2.1 has been carried out simultaneously in two phases: (i) developing the conceptual research framework for urban BCD and (ii) a survey and comparative analysis of the notions of BCD in 20 cities around Europe (Tier 1). To analyse what kind of planning and governance systems concerning green areas there are in European cities, WP5 and WP6 in collaboration with WP2 provided an assessment of current state of urban green infrastructure (UGI) planning, participative governance and BCD practices in 20 case study cities in Europe. The aim in WP2 was to identify how different planning and management practices or adopted cultural mechanisms (creating BCD) shape biodiversity and cultural diversity in cities. Here we briefly present the research design that is introduced in detail in GREEN SURGE Milestone 34 "The analytical framework for assessment of the current state of urban green infrastructure planning in Europe" (Hansen et al. 2014). The Tier 1 analyses of the 20 cities will contribute to answering the following research questions related to two pillars of BCD:

- *How is BCD interpreted by policy-makers (Pillar 1)?*
- *What kind of manifestations of BCD related biological and cultural diversity can be identified in current UGI policy? (Pillar 1)*
- *How have planning policies and management practices in European cities influenced biological and cultural diversity? (Pillar 2)*
- *What kinds of relationships exist between manifestations of BCD? (Pillar 1 and 2)*

4.1 Selection of the 20 cities

The selection of the 20 case study cities for the Tier 1 analysis aimed to provide a representative sample of European cities both as regards planning systems and cultures as well as characteristics affecting planning realities across Europe (i.e. population dynamics and green space coverage). Based on discussions with project partners during and after the GREEN SURGE kick-off meeting in Copenhagen (2-3 December 2013) the selection of the 20 cities was based on two main considerations. First, cities should be included in the European Urban Atlas (2014) and Urban Audit datasets (2014) in order to have access to comparable data on land use, socio-demographics and economic development. Second, the cities should reflect the variation among European cities. This meant that cities, in addition to representing different planning families and territorial government types, also should reflect the physical geography and socio-demographic composition of Europe. We used the Urban Atlas and Urban Audit datasets to identify relevant criteria. For this study, three indicators were considered as representing the

diversity of European cities as well as crucial differences in terms of the capacity to govern urban green space:

- *Population size (as an indicator for the administrative capacity for green space planning)*
- *Population dynamics (as an indicator for economic prosperity)*
- *Green space per capita (as an indicator for urban green area density)*

For the per capita green space in m², the areas for each core city covered by green space were combined with the population for the year 2006.¹ However, total amount of green space per capita can be much higher, because natural areas, e.g. forests, are mapped as green areas only in certain cases. In general, agricultural land or forests are not counted as urban green spaces. The Urban Atlas (2014) defines urban green space as “public green areas for predominantly recreational use.” Private green and blue areas are excluded. Further, green spaces with less than 250 m² are not mapped (Urban Atlas, 2014). For example, if all green area types would be considered the amount of green spaces would be over 100 m² instead of 25 m² (according to Urban Atlas) per person in Helsinki.

Nadin and Stead (2008) developed a classification based upon spatial, legal and social aspects of planning and applied it within several European projects. According to their classification, five classes of planning contexts can be distinguished in Europe: (1) Nordic, (2) British, (3) Mediterranean, (4) Central European, and (5) EU New Member States. In our study, cities were selected so that they represented these various planning traditions. The selection was further detailed on the basis of population size and dynamics as well as amount of green space per capita. The selection also included the five Urban Learning Labs cities of GREEN SURGE, i.e. Bari (Italy), Berlin (Germany), Edinburg (UK), Malmö (Sweden) and Ljubljana (Slovenia). Table 3 presents the 20 selected cities with their key characteristics and Figure 5 their locations in Europe.

¹ Urban Atlas classes: urban green, forest, agriculture areas. For detailed description of land cover classes see European Commission (2011). Mapping Guide for a European Urban Atlas. Retrieved from <http://www.eea.europa.eu/data-and-maps/data/urban-atlas/mapping-guide>

Table 3. The 20 selected cities (Tier 1 cities) with their key characteristics classified into five planning families according to Nadin and Stead (2008).

City	Country	Core city area (ha)	Larger urban zone (ha)	Per capita public urban green space (m ² /inhabitant) 2006*	Population core city 2012	Population larger urban zone 2012	Annual population change rate core city 1990-2012
Nordic planning family							
Århus	Denmark	47,035	452,271	31.34	319,094	485,672	0.01
Helsinki ^{***}	Finland	17,672	304,790	25.51	595,384	1,366,241	0.93
Malmö	Sweden	15,368	184,675	35.01	307,758	615,721 ^{**}	1.36
British planning family: land use management							
Bristol	United Kingdom	11,153	133,652	27.30	432,451	893,567 ^{**}	0.46
Edinburgh	United Kingdom	26,236	172,596	32.69	482,640	840,200	0.50
New member states planning family: post-socialist							
Ljubljana ^{***}	Slovenia	27,563	255,476	9.29	280,607	536,484	0.14
Lódz	Poland	29,428	285,834	11.81	718,960	935,124	-0.75
Oradea	Romania	11,598	20,396	4.46	196,367	210,851	-0.56
Poznan	Poland	26,260	371,790	36.39	550,742	963,332	-0.30
Szeged	Hungary	28,731	75,575	33.38	162,183	162,183	-0.39
Central European planning family: regional economic planning							
Amsterdam	Netherlands	21,872	117,255	17.62	790,110	2,485,103	0.62
Utrecht	Netherlands	10,000	38,848	21.04	316,275	730,369	1.70
Berlin	Germany	88,966	174,6975	16.82	3,501,872	5,097,712	0.05
Halle an der Saale	Germany	13,686	157,326	25.16	233,705	428,838	-1.10
Linz	Austria	9650	174,642	27.14	189,889		-0.38
Mediterranean planning family: urbanism							
Bari	Italy	11,471	89,763	5.57	313,213	577,283	-0.40
Barcelona	Spain	9458	179,405	2.96	1,620,943	4,917,162	-0.23
Lisboa ^{***}	Portugal	8545	143,669	23.36	696,488	2,817,901	-0.90
Almada ^{***}	Portugal	n.d.	n.d.	n.d.			
Milano	Italy	18,079	134,504	8.98	1,262,101	4,135,172	-0.37
Notes:							
* Urban Atlas defines urban green space as “public green areas for predominantly recreational use”. Peri-urban natural areas, such as forests and agricultural land, are mapped as green urban areas only in certain cases. In general, peri-urban green areas are not counted. Private green and blue areas are also not included. Further, green spaces with less than 250 m ² are not mapped as well. This leads to deviation with per capita green space values used by city officials. Deviances have been noted for Helsinki and Ljubljana.							
** population in 2011							

*** Specific information about some cities:

Helsinki has about 95 m²/inhabitant other green areas of which 80 m² forest area per inhabitant.

Lisbon: the figures include Almada as well.

Almada has 174,030 inhabitants (2012) and an annual population change rate 2001-2012 from 0.66%

Ljubljana has about 560 m² green area per inhabitant of which 542 m² public green space; in the compact city 106 m² green area per inhabitant of which 66 m² public green space.



Figure 5. Location of the 20 European cities in Tier 1 research.

4.2 Data collection

In each of the 20 cities, local researchers used a similar multi-method approach to data collection. Their personal experience and knowledge of the local situation has proven valuable, mainly in the selection of interviewees and desk study materials. The material providing the background to our findings consisted of:

- A semi-structured interview with municipality officials. The interview included specific questions on green space planning, BCD and governance.
- A desk study of relevant literature and documents was conducted to verify and supplement results from the interview. On the one hand, it enabled the researcher to critically reflect upon the results from the interview and, if in doubt, make comments for the study leaders. On the other hand, it also enabled collection of information that would go beyond the scope of the interview (e.g. description of planning instruments for UGI on the city- and city-regional level). The additional information collected pertained to the organisational, administrative, cultural and historical context of each case.

- *The analysis of two central planning documents by local partners focusing on two most important plans or policies related to UGI to provide insight on if or how different policy themes and UGI principles were considered in planning and how the plans were implemented.*

As the data for Tier 1 were collected by several researchers, good guidance and structuring of the process was crucial to secure consistent data collection. Thus, a set of documents with instructions as well as supporting documents such as an information sheet for city officials were created and distributed to the participating researchers. Coordination of the Tier 1 study with preparations, data collections and analyses was made by researchers in WP5. Because leading partners (UH and WU) of WP2 did not participate in the coordination of data collection, the mixed-method approach is not presented exhaustively in this Deliverable. Detailed description of managing the Tier 1 study can be found in the Deliverable 5.1 (Davies et al. 2015).

The city official to be interviewed in each city was chosen by the local researcher. An interview with closed and open questions was constructed (see Appendix 1). Each interview took place in the native language, except in Oradea, where the interview language was English, and lasted 1 to 2 hours. The BCD-oriented questions raised in the questionnaire provide us insights on how the concept of BCD is understood and how biodiversity and cultural diversity are considered in green area planning or management practices in the city. To overcome the limitations of one interview per city, interview protocols were reviewed with regard to the objectivity of the interviewees and additional reflections of the interviewer. However, interview results need to be interpreted with caution as the interview data reflect the ideas and opinions of the urban planners and do not necessarily reflect the official city perspective and urban green conditions. On the other hand, they do provide a good overview of the diversity of interpretations of the concept of BCD and how it is expressed in European cities. Questions about BCD covered four sections (A-D) with closed and open-ended questions. BCD related questions can be divided into the following types (for details see Appendix 1):

- *Views about biodiversity – three statements about conserving biodiversity and open question about participation of citizens and criteria for species selection in green area planning (III.A)*
- *Policies and approaches addressing biological and cultural diversity – questions concern the policies, programs, measures and official guidelines that the case city have implemented in relation to biological and cultural diversity (III.B)*
- *Urban green spaces and cultural practices – questions about place characteristics, needs of different cultural groups and equal access to green spaces (III.C)*
- *Perceived problems and opportunities in regard to biocultural diversity (III.D)*

As stated above, a desk study was conducted to verify and supplement results from the interviews. It also served to collect information that would go beyond the scope of the questionnaire (e.g., description of planning instruments for UGI on the city- and city-regional level). The desk study further enabled the scientist to critically reflect upon the results from the questionnaire and, if in doubt, make comments for the study leaders. As an additional approach, a document analysis was conducted by the local scientists and focused on up to two important plans or policies related to UGI. Following a coding protocol, the scientists read the documents carefully and added data to the protocol (e.g., which policy concepts were addressed, which implementation measures were indicated).

Interview data were translated by the local researchers into English and served as the basis for an iterative process of data analysis and adaptation of the city portraits. The city portraits include a holistic presentation of the data on BCD analyses (interviews, desk and document analyses plus additional data). The initial description was made following a general format that was developed on the basis of a first comparative presentation of all cases. These initial descriptions were checked for consistency and comparability by the coordinating research team and further adapted by the researchers if necessary. BCD portraits represent views of what BCD is referring to and how it is addressed in policy. Following instruction local researchers highlighted main findings from interviews and other sources to describe the perceived linkages between biodiversity (or nature/green) and cultural diversity and how these linkages are expressed in urban green space policies. The following question needed to receive close attention:

- *Is the concept of BCD recognized/used or was during the interview only referred to the concepts of biodiversity and cultural diversity?*
- *Were the concepts of biological diversity and cultural diversity used separately or in combination?*
- *What major issues were indicated in the interview in respect of strategic city plan, ecological infrastructure, biodiversity, cultural diversity, (cultural) heritage sites, location-specific urban spaces?*

In addition, local researcher were asked to mention at least one **bioculturally significant place** to indicate which specific spaces were mentioned during the interview or suggest some other spaces. Researchers were asked to present their main biodiversity and cultural (heritage) features, and what are the specific uses of bioculturally significant places. Each of the 20 case study portraits within BCD can be found on the GREEN SURGE project website (<http://greensurge.eu/products/case-studies/>).

4.3 Data analyses

BCD portraits, raw interview data and coded questionnaire matrix for the BCD sections (questions IIIA-D) provided the main data sources for analysing policy interpretations, manifestations and creations of BCD in European cities. Analyses were performed in two ways: (1) To compare BCD manifestations and policy actions for biological and cultural diversity between the 20 European cities and five planning families, statistics from coded questionnaire matrices were presented. The raw interview data and BCD portraits provided by local researchers were analysed using content analyses. To recognize BCD manifestations and policy patterns in the data and to make comparisons between cities contents of texts were transcribed into binary codes (1= content identified in the text, 0= variable not identified) (Table 4). We identified and coded sentences or contents which indicated:

- *biophysical manifestations of green spaces as variables of strategically significant biological diversity,*
- *management practices of UGI as an indicator of creating biodiversity either at the city or local level,*
- *tangible or intangible manifestations for cultural diversity,*
- *planning objectives and values to manage biological and cultural diversity at the local and the city level.*

The comparative analysis will identify the multiple interpretations of the concept of BCD at the city and planning family level. In view of its explorative nature, the results should not be strictly

interpreted as city-specific representations of how they deal with BCD, but rather as indicative data about the diversity in interpretations of the nature and significance of urban BCD.

Table 4. Example of how coding of BCD portraits and raw interviews was done. For each city all contents mentioned above were either coded as (1) or not (0) from the portrait texts and the raw interview data. Interview and portrait data were combined.

Biophysical manifestations for BCD
Which compositions of BD are important or mentioned by interviewees or in planning policies/ objectives

City	Country	Specific assemblages of BD		Functional diversity		Fauna and flora		Plant diversity	
		Portrait	Interview	Portrait	Interview	Portrait	Interview	Portrait	Interview
Almada	Portugal	1	0	1	0	1	0	1	0
Amsterdam	Netherlands	1	0	0	0	0	0	0	0
Barcelona	Spain	0	0	0	0	1	1	0	0
Bari	Italy	0	0	0	0	0	0	0	0
Berlin	Germany	0	0	0	0	0	0	0	0
Bristol	UK	1	0	0	0	0	0	0	0
Edinburgh	UK	1	0	0	0	0	0	0	0
Halle	Germany	0	0	0	0	0	0	0	0
Helsinki	Finland	1	0	1	0	0	0	1	1
Linz	Austria	0	0	0	0	1	1	1	0
Lisbon	Portugal	1	0	0	1	0	0	0	0
Ljubljana	Slovenia	1	0	0	0	0	0	0	0
Lodz	Poland	0	0	0	0	0	0	0	0
Malmö	Sweden	0	0	1	0	0	0	1	1
Milan	Italy	0	0	0	0	0	0	0	0
Oradea	Romania	0	0	0	0	0	0	0	0
Poznan	Poland	0	0	0	0	0	0	1	1
Szeged	Hungary	0	0	0	0	0	0	0	0
Utrecht	Netherlands	1	1	0	0	0	0	0	0
Århus	Denmark	0	0	0	0	0	0	0	0
	SUM	8	1	3	1	3	2	5	3

5 FINDINGS FOR BCD IN THE 20 EUROPEAN CITIES

The interviewees and portraits indicated a diversity of interpretations of the nature of green urban spaces and how they relate to specific types of BCD. In most cities the concept was not recognized by interviewees (Table 5). However, when interviewees expressed BCD in their own words they often referred to the sum of biodiversity and cultural diversity, planning or management processes, cooperation or engagement between different stakeholders, needs of different cultural, social or user groups regarding green spaces, biological characteristics or ecological sustainability in human-dominated urban parks, or complex long-term human-nature interaction. In five cities cultural and biological diversity were considered separately, and in two cities they were seen as competing or involving trade-offs. The most common example of complementary interactions was the development or maintenance green network at the city level. Many cities have a policy to establish a green space network that would benefit biodiversity, accessibility and recreational use of green spaces. We will continue this discussion in sections 5.3 and 5.4. Next, we will present results on biophysical manifestations for biological diversity, and tangible or intangible manifestations for cultural diversity identified by content analyses. Comparisons between 20 cities are presented based on analyses of coded questionnaire matrix.

5.1 Manifestations of BCD – biological diversity in European cities

Most studied cities did not recognize the concept BCD, however, city officers and policy documents could have many objectives to maintain both sides of BCD, but separately. Therefore, before presenting results and discussing interactions between biological and cultural diversity, and how BCD concept has been implemented as part of planning and governance systems of the 20 European cities, we first identified BCD manifestations for biological and cultural diversity separately. We identified 26 different manifestations for biological diversity based on interviews and desk studies. We classified them under the four main manifestations types:

- *Biophysical manifestations* – measurable characteristics of species or green spaces, without social values (endangered, aesthetics). The nature of these manifestations is science - or expert -oriented, however, they are strongly context-dependent (native species) and policy goals for these characteristics can vary greatly.
- *Biodiversity manifestations* – diversity of species, species groups or green spaces that can be measured by using different measures such as Shannon-Wiener diversity index.
- *Value-laden manifestations* – socially defined characteristics of green spaces or species. They are commonly context-dependent and non-tangible characteristics of biological diversity in cities and differ thereby from the two earlier types of manifestations. Value-laden manifestations can vary strongly between cities or even between green areas within a city. In many cases there are contradicting opinions about of their position in planning and governance of UGI.
- *Policy-oriented manifestations* – *biological diversity emerged from the policy concept, and was seen more of a strategic type of biodiversity. These types of manifestations are commonly related to policy goals or values held by local officials, residents or decision-makers. Measuring or identifying these kind of manifestations is more difficult than the first two, and their nature can vary between cities (Fig. 6).*

Table 5. Definitions for BCD and whether it was identified by city officials or appeared in analysed policy documents in the 20 European cities classified according to their planning families.

City	BCD identified	Expressions for BCD or interaction biological and cultural diversity
Helsinki	No	biological and cultural diversity are considered separately and targets to maintain them are not considered complimentary, sometimes even competing
Malmö	No	maintenance of a diversity of urban green spaces in the form of a variety of parks and gardening complexes differing in design and function and containing a wide variety of native and non-native species
Århus	No	changing socio-cultural orientations has resulted in a gradual change in parks from garden-like to more park-like
Bristol	No	accessible green spaces of different types (natural, formal, informal, play spaces & active spaces) to all citizens
Edinburgh	No	strong focus on conservation of existing green spaces to preserve the highly regarded townscape of the city. A partnership between the local authority and relevant environmental NGOs has
Amsterdam	No	there can be diversity in the amount of diversity
Utrecht	No	the notion is reflected in a multi-level approach towards planning and managing urban green spaces
Berlin	No	cultural diversity and biological diversity are both important issues for the city of Berlin. However, in green space plans and strategies the linkages between both concepts are so far limited
Halle	No	the concept is interpreted as referring to the sum of biodiversity and cultural diversity.
Linz	No	urban green space is mainly for human use even if this sometimes might impact the biodiversity
Ljubljana	No	aims to maintain and complete such a well-structured network of evenly distributed green spaces across the entire city in order to not only create ecological connectivity, but also to ensure good and even accessibility for all resident
Lodz	No	indicated that green spaces are designed in a way to accommodate the needs of all users. These areas remind the inhabitants and visitors of the interactions between nature and culture
Oradea	No	main concept used in urban green space planning is the concept of sustainability
Poznan	No	multifunctional green spaces that meet the needs of different user groups
Szeged	No	concept of biocultural diversity is interpreted as referring to the sum of biodiversity and cultural diversity
Almada	No	cooperation between the municipality and local stakeholder groups for managing different assemblages of biodiversity
Milan	No	was related to the presence of both transnational green projects (e.g., cultural landscape projects and ecological corridor projects)
Barcelona	No	the creation of a green network is considered crucial for enabling connectivity and promoting diversity. No need to consider cultural diversity, because the city is culturally very diverse (as such)
Lisbon	No	there is a concern with cultural and biological diversities, not necessarily simultaneously, since the terms are not necessarily linked with each other
Bari	Some	human-nature or human-human interaction in nature, the historical and cultural identity of these landscapes and indigenous farming practices. to manage green spaces to integrate the cultural orientations of the native Italian people and the immigrants and to provide adequate facilities and allow cultural expression

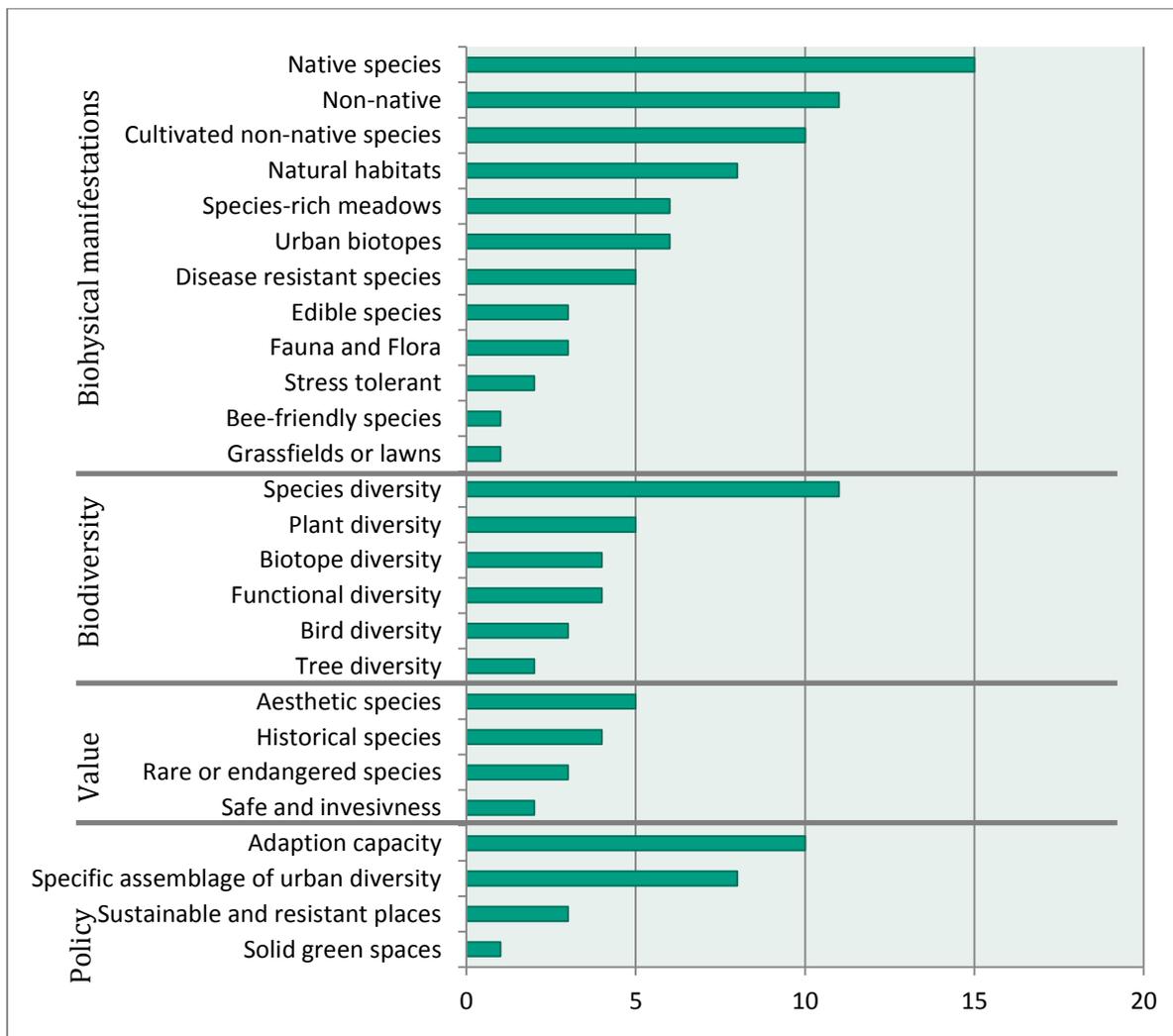


Figure 6. Four manifestation types for biological diversity and number of cities (n) mentioning them.

The first type of manifestations, i.e. biophysical manifestations covered different kinds of green areas and their characteristics. For instance, 15 cities of the 20 mentioned native species as a characteristic/manifestation of BCD. Also natural habitats with native species were seen as important contributors to biodiversity. Meadows with high species richness were mentioned in several cities as either supporting biodiversity or lowering management costs of intensively managed parks. Special attention was given to urban biotopes such as forests and new urban biotopes such as wetlands by few cities. Botanical and community gardens as a part of city structure were commonly considered a place with high (native and non-native) species richness.

In addition, native species and non-native species were commonly mentioned as characteristics of biophysical manifestations. One reason for this is that city authorities were asked to consider if biodiversity conservation should incorporate both native and non-native species. Nine interviewees of 20 agreed that protection of species should include both. However, the reason for equal importance in biodiversity protection varied much. An official from a Nordic city looked at it from cultural heritage point of view:

“From a heritage perspective parks and green spaces have always contained a wide variety of native and non-native species”,

On the other hand, an official from a New Member State city considered the issue from a more pragmatic point of view:

“In the first case planted species should be chosen by their ability to survive in an urban environment”.

Conservation of native species was an important policy goal in most cities and native species were commonly preferred over non-natives. Very often conservation of native species was limited to specific sites such as wildlife corridors, natural habitats, protected sites or wilderness parks. Few cities, especially in Mediterranean area, considered ecological benefits of native species. On the other hand, they did not strongly support the idea that biodiversity protection should consider both native and non-native species. They pointed out that native species in public parks could increase resilience, because they were considered as better adapted to local environmental conditions than non-native species. Lower management costs by using native species instead of cultivated species were considered in many cities in every planning family. The view that biodiversity protection should incorporate both native and non-native species was most common in cities in Britain where average ranking value was the highest in this respect (Fig. 7).

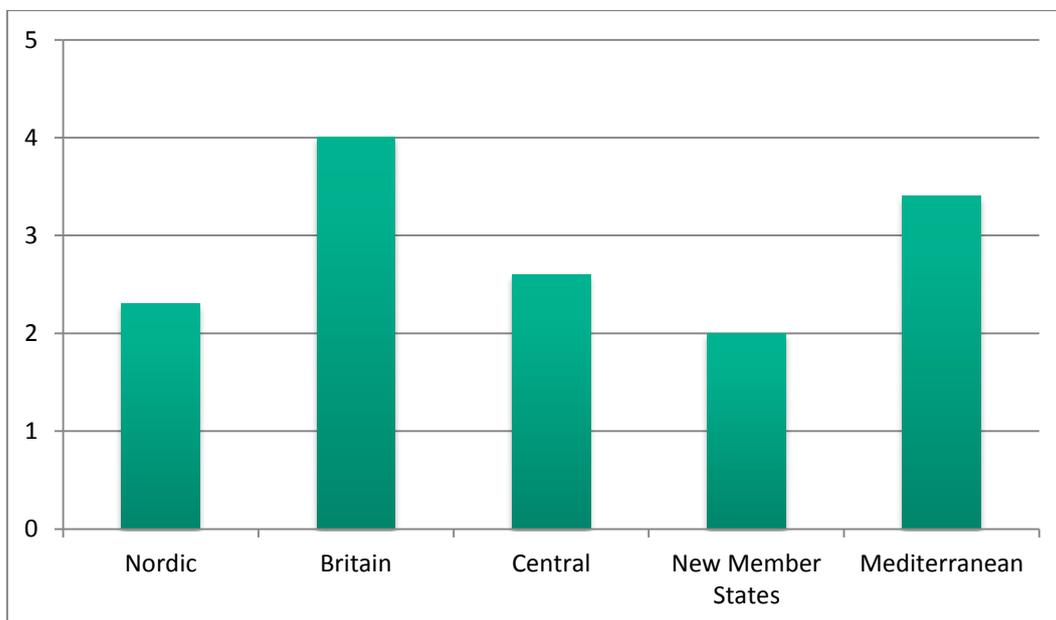


Figure 7. Average scored opinions (between 1-5) of city officials whether origin of species matter when protecting biodiversity divided into five planning families (n= 20). The higher the scored value the more city officials agreed with the statement “*biodiversity conservation should incorporate both native and non-native species*” (1= I strongly disagree, 5= I strongly agree).

The second type of manifestations, i.e. different kinds of biodiversity manifestations were commonly mentioned during the interviews and appeared in the city portraits. Species diversity,

in general, was mentioned more often than diversity of biotopes or habitats. Most commonly the focus was on plant diversity, but also fauna and especially bird diversity were mentioned by three cities, namely Helsinki, Linz and Malmö. Tree diversity was seen beneficial as it was held to increase disease resistance of tree assemblages. Three cities highlighted the importance of ecosystem functions and functional diversity to maintain adaption capacity and resilience. Multifunctionality as a characteristic of park or recreational area was commonly mentioned (discussed in more detail below).

The third identified type of manifestation was based on social values held by city officials or city policies for UGI. Overall, the scores are low as compared to some manifestations in the first two categories. Aesthetic characteristics of species were mentioned as an important factor to define species composition in urban green areas, and were acknowledged by five cities from different planning families: Almada, Bristol, Helsinki, Linz and Poznan. Historical species were valued by four cities as important characteristics of BCD especially in places that were central for cultural history of the city. Almada, Berlin and Helsinki highlighted the role of rare species when considering biodiversity in cities.

The fourth type of manifestations, i.e. policy-oriented manifestations hold more abstract, non-tangible characteristics of biological diversity in European cities, and were commonly related to other policy goals such as climate change, or common values held by local policy. For instance, half of the cities highlighted the importance of adaption capacity either of species or of green areas towards climate change (Fig. 7). Specific assemblages of urban diversity including cultivated non-native species were recognized by eight cities while three cities mentioned sustainability or resilience of green spaces as one characteristic here. A somewhat divergent approach to specific site characteristics was found in Amsterdam where the interviewed city official mentioned 'solid' green spaces and their importance for allowing species to distribute spontaneously without human involvement.

5.2 Manifestations of BCD - cultural diversity in European cities

In addition to how biodiversity was manifested as a part of planning and governance of UGI, we were interested in how cultural diversity related to green spaces was manifested in the 20 European cities. We identified 24 different ways of how cultural diversity was interpreted. We classified these into the six manifestation types (Fig. 8). Some elements of the identified cultural diversity can be linked to cultural ecosystem service but we also identified manifestations not necessarily directly linked to ecosystems or biodiversity. The six manifestation types are:

- *Culture* – refers to biophysical characteristics of places or landscapes that are constructed by humans (e.g. facilities, cafes, restaurants) or to landscapes that have been modified by humans and indicate a long-term interaction between culture and nature. Cultural manifestations are tangible in their nature, and easy to identify and measure.
- *Needs* – refers to the use of green spaces by different cultural groups and specific needs they have towards green spaces. Needs can be pragmatic ones based on, e.g. physical activity (jogging, picnicing) or more cultural or religious oriented that are not so easy to identify, and are more silent (tacit) information about cultural habits of using green spaces.

- *Identity* – refers to symbolic values, and is often difficult to measure for its salient and embedded nature. Identity can be at city level, or identity of a specific cultural group. Place identity and sense of place refers to an individual’s close bond to the environment and therefore considered as a part of involvement.
- *Actions* – refers social actions in green areas and hold values that different cultural groups have towards green areas. Typical for this type of cultural diversity is that it is strongly socially oriented, and cannot to be linked to a specific site or landscape as cultural manifestations can. However, nature is often a driving force of these actions.
- *Inclusion* – refers to interaction between different cultural groups, tolerance towards and social control of different social groups.
- *Involvement* – refers to local level attachment of individuals or communities to green areas (sense of place) or nature management. This type of cultural diversity is considered to strengthen bonds to green areas.

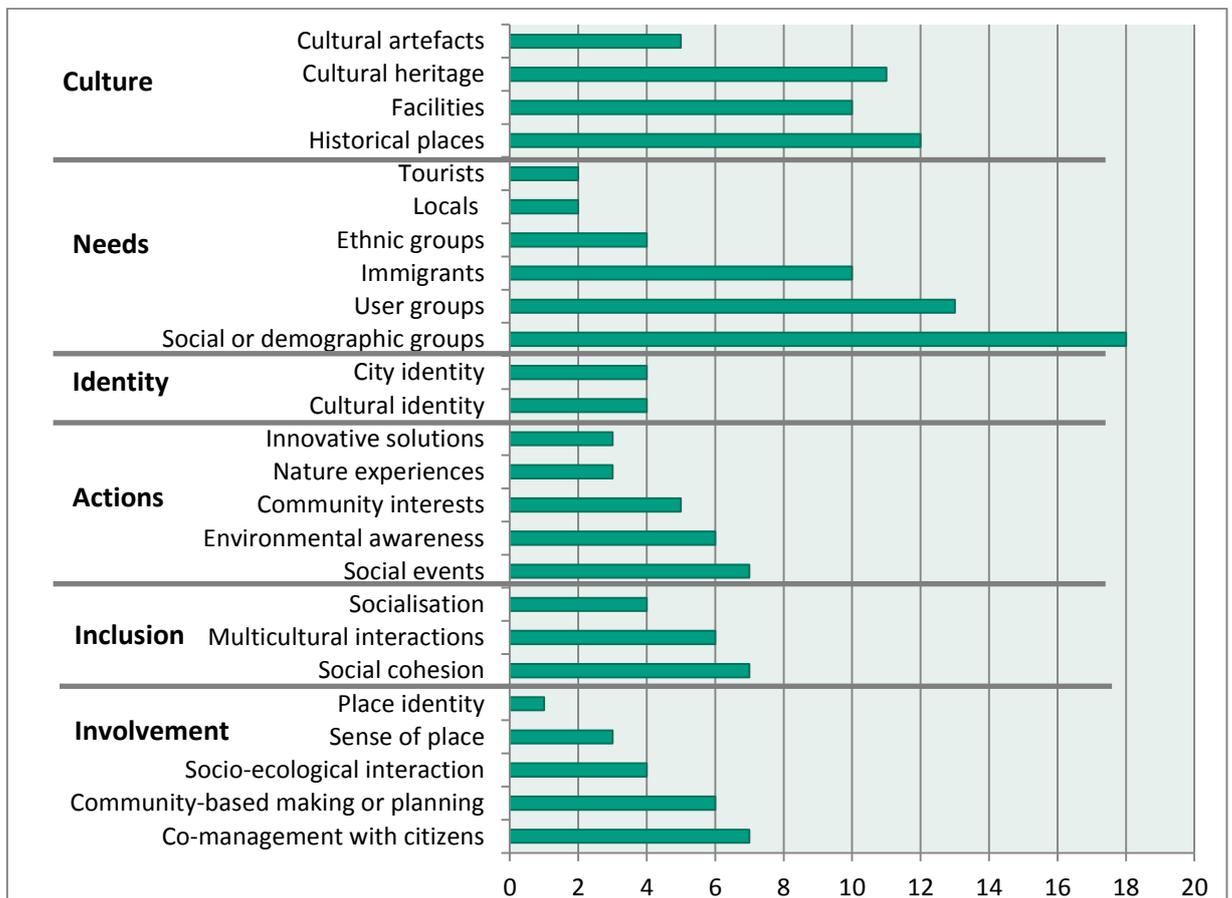


Figure 8. Six manifestation types for cultural diversity as identified in the 20 European cities and number of cities (n) mentioning the feature.

The first type of manifestations, i.e. cultural manifestations emerged from place-dependent characteristics, which either represented historically meaningful places or cultural heritage landscapes in the form of historic parks, estates, traditional farmlands or city fortification areas.

Sixteen cities in all planning family types considered historical sites or cultural landscapes as an important characteristic of cultural diversity and they were commonly considered to support high biodiversity. These are the most typical types of traditional BCD places representing long-term relationships between human and nature, internationally recognised sites as UNESCO heritage sites. Some cities especially in the Central European planning family, but also Bristol and Ljubljana mentioned former, redeveloped industrial sites as important sites to support cultural and biological diversity.

The most common manifestation in any of the six categories was in the ‘needs’ category and concerns the specific needs of different cultural/social groups (18 cities). Those groups could be demographic groups, user groups, immigrants or (minority) ethnic groups. Frequently, interviewees referred to recreational activities undertaken by people in public green spaces, such as hiking, cycling and picnic. The officials considered the provision of facilities for recreation to be important. A different interpretation was related to groups of people who might experience constraints in their leisure activities. More specifically, professionals referred to elderly and disabled people. Different ethnic groups’ needs were especially mentioned by cities with high diversity of ethnic groups such as Amsterdam and Malmö. Mediterranean cities like Bari and Milan that are struggling with challenges related to increasing number of refugees also highlighted needs of immigrants (Fig. 9).

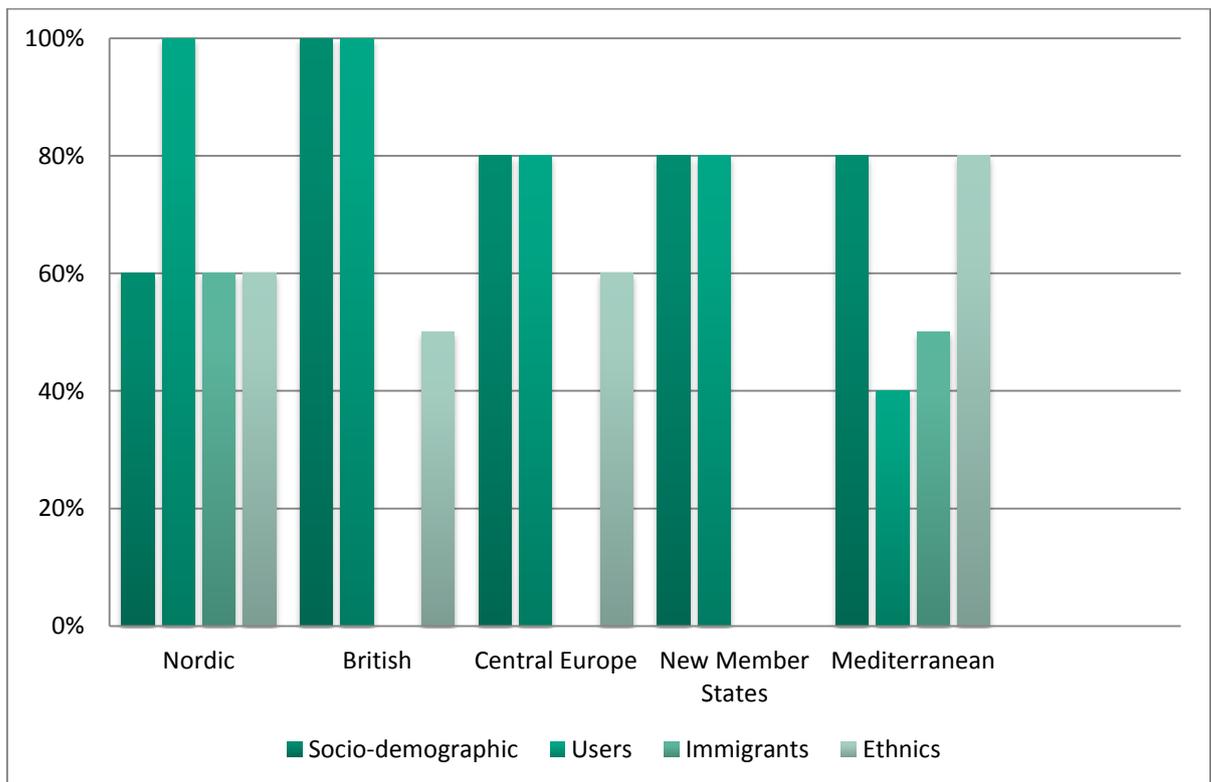


Figure 9. Needs of four different cultural groups and the proportion (%) of cities in different planning families that recognized them.

City identity as manifestations for cultural diversity was mentioned by four cities (Helsinki, Bristol, Lisbon and Ljubljana). Cultural identity referred to historical values (Poznan) of the city,

urban ways to use green areas (Helsinki) or sense of cultural identity among different cultural groups (Milan).

The fourth type of cultural diversity related to human activities or dynamic values (actions) related to green spaces. New Member State cities and Mediterranean cities mentioned social events such as concerts an important feature for cultural diversity, while Central or Nordic planning cities did not considered it as important for cultural diversity. Another social manifestation for cultural diversity that authorities in Mediterranean and Nordic cities wanted to promote was environmental awareness among their citizens.

As regards the ‘inclusion’ manifestation type green spaces could be regarded as important places for increasing or supporting social cohesion and multicultural interaction. Mediterranean cities that face increasing numbers of immigrants saw parks as “*multicultural melting-points*”; places where different ethnic groups, immigrants and locals meet and interact. In addition, green spaces were considered as a potential tool for improving social cohesion and supporting the quality of life for lower socioeconomic groups. In these cases, the value of green spaces originated from the socio-cultural interaction benefits they provide.

The last type of cultural diversity manifestation (involvement) was reflected in interaction between humans and nature (sense of place), or between people (co-management). Direct human-nature interactions incorporated community-based decision-making or planning where locals assumed a strong responsibility for maintaining or improving local green spaces. Typical circumstances for community-based activities were generated by urban gardens or neighbourhood friend-activities. Another involvement type was the co-management of green spaces among locals. Here policy makers saw a win-win situation in engaging locals in taking care of the environment and at the same time saving management costs. City officials were asked to score how important they consider that citizens involvement is in choosing plants in green areas. Interestingly, Mediterranean and British cities indicated highest support for public involvement for choosing species, while in other planning families city officials pointed out that expert knowledge is crucial when choosing species into parks (Fig. 10).

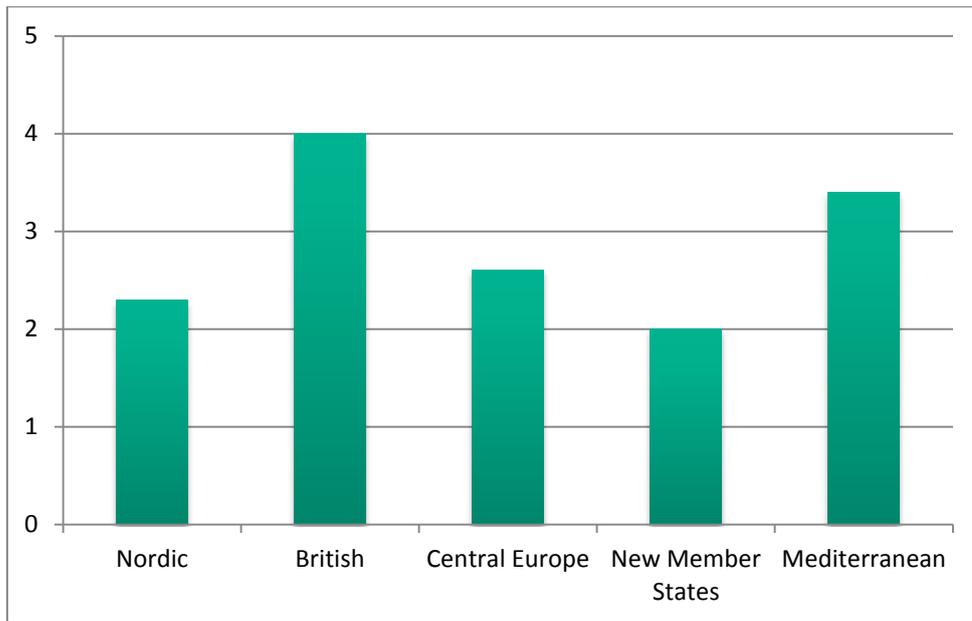


Figure 10. Scored opinions (Between 1 and 5) of city officials about whether local residents should be involved in choosing plant species to green areas (n= 20). The higher the value the more city officials agreed with the statement “*It is important to involve local citizens in decision-making about which plant species are to be used for public green space.*” (1= I strongly disagree, 5= I strongly agree).

In some cities, namely Edinburgh, Milan and Lodz interaction between residents and nature was important when planning and developing green spaces. In these cities interviewees reflected the ongoing co-evolutionary processes between ecological and social systems that contribute to the present identity of culturally dynamic cities. Also, the role of sense of place or place identity, to support engagement or attachment to green spaces, was considered an important issue for developing cultural diversity.

5.3 Maintaining BCD – biodiversity policy objectives in green spaces

During the interviews city officials were asked to choose the most important biodiversity policy related to green areas. Three different conservation methods were given to them: protection of (a) species diversity, (b) green network or (c) individual sites. In addition, one city in the New Member State category argued that it is about sustainability that drives management policy of their green spaces (Fig. 11).

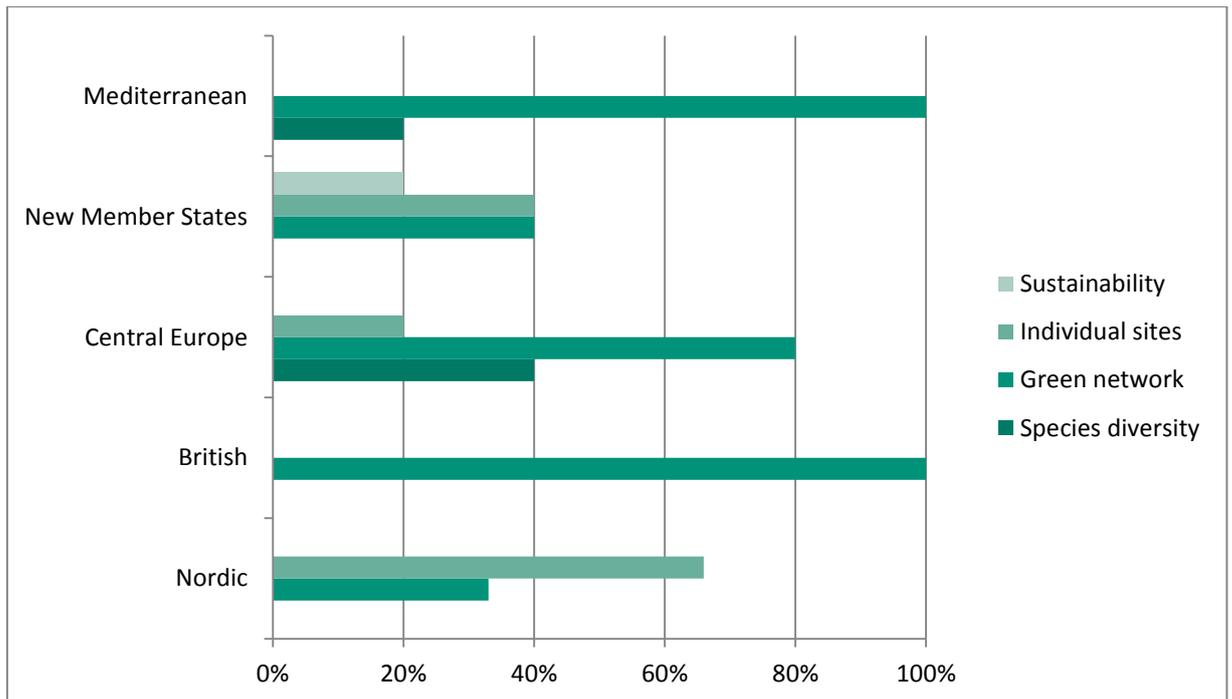


Figure 11. Four city policies for biodiversity protection identified by city officials, and the proportion (%) of cities in different planning families that acknowledged them.

Green network was the most commonly mentioned four planning families, and British and Mediterranean cities hardly considered other policy objectives. Individual sites, especially original habitats with native species, were considered an important way to protect biodiversity in Nordic cities. New Member States and Central European cities were more diverse with policy objectives. Cities have also other policy goals and management practices for green spaces that influence biodiversity. As a consequence, we can identify different kinds of management practices that aim to maintain, improve or create biodiversity in cities. We identified four different ways of influencing biodiversity (Fig. 12):

Creation of biodiversity in urban green spaces or settings – Compensatory measures to mitigate the negative effects of the compaction of the city structure and maintaining ecosystem functions and services, i.e. creating new green spaces and urban habitats such as storm-water ponds, wetlands, green roofs or walls with specific assemblages of species diversity were common in especially Central European cities where amount of green spaces is on the average low. Establishing novel urban protection areas on former industrial sites where species can establish spontaneously (including non-natives), and restoring habitats to improve ecosystem function and ecological quality, were two distinct approaches to protect and enhance biodiversity in cities (see also ‘improvement’ below).

Improvement of current biodiversity through restoration – Less effort has been invested into improving biodiversity in parks, and many city officials around Europe were concerned about the shrinking budget allocated for maintenance of park quality. Less intensive management, preferring native plant species and including more meadows in parks were often justified by using monetary arguments. Restoration of natural or semi-natural (e.g. meadows) biotopes, on the contrary, together with local residents were quite common way to improve local biodiversity.

Maintenance of current biodiversity either by protecting species or areas – Protecting native species was the most commonly mentioned practice to preserve biodiversity in cities, followed by preservation of current green areas, establishing new green areas and controlling invasive alien species. Often cities have adopted a policy to protect native species or maintain natural habitats such as wetlands, forests, seashores or single sites with high species richness.

Management of current species and their abundance – Species management is an active way to manipulate biodiversity, either targeting highly valued species because of their specific characteristics or their origin, or focusing on avoiding unwanted or unvalued species. Species management can be exclusive by controlling invasive alien species.

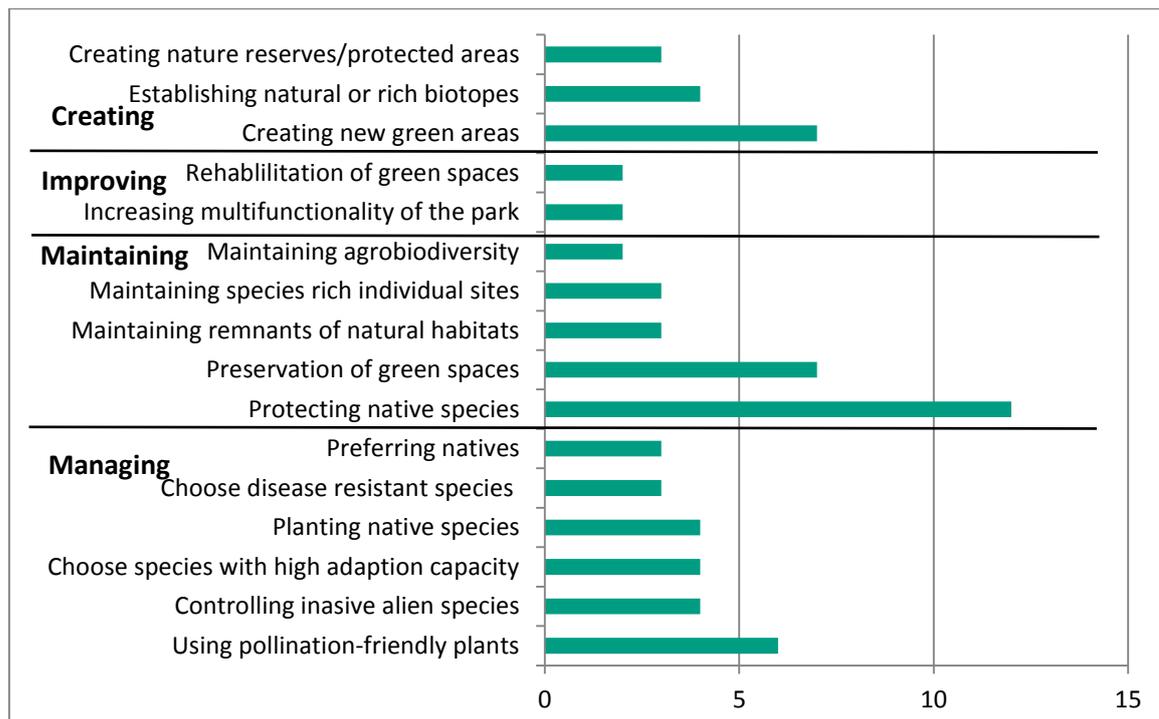


Figure 12. Cultural mechanisms of BCD adopted in the planning or managing biodiversity in 20 European cities and number of cities (n) mentioning the feature.

5.4 Policy objectives for BCD in European cities

Although city authorities hardly recognise the concept of BCD (see Table 5), the development goals and management practices adopted by cities reflect the many ways in which cities implicitly included and valued biodiversity and cultural diversity. Here we summarize how biological and cultural diversity have been simultaneously addressed in current policy by the cities. We identified 12 different policy objectives to support the interaction between biological and cultural diversity at the city and at local level in the 20 European cities (Fig. 13).

The most important policy objectives at the city level mentioned by almost every city (17 cities) was to maintain a green infrastructure that would support ecological connectivity and equal accessibility to green areas for citizens and enable recreational use of green areas. Population is increasing strongly in cities in the Nordic (growth rate 0.9) and British (0.4) planning families,

and these are facing densification challenges that threaten the ambition to preserve current green spaces. In these cities accessibility and connectivity were considered complementary and strongly supported by city policies. Meeting the needs of different cultural groups and supporting biodiversity at the city level were achieved by maintaining networks of different kinds of parks and green areas (12 cities). Green networks commonly linked urban to rural areas. Many cities aim to maintain or improve their green infrastructure. Such networks can be traditional ways of protecting current green areas with valued biodiversity, or innovative ways of producing new kind or urban biotopes with specific kind of biological diversity.

At the local (or site) level policy objectives to support biological and cultural diversity were commonly related to multifunctionality and quality of green spaces (Fig. 13). Biodiversity and cultural diversity of green spaces are simultaneously generated in multifunctional urban green areas. Local scale practises for cultural diversity were related to needs of different cultural groups such as facilities to support use of green spaces by diverse cultural groups. Management practices were often not only related to specific types of biodiversity, but also considered cultural objects such as fortresses or former industrial sites that closely incorporated specific green areas. Maintaining BCD at these sites did not only focus on the conservation of historically developed types of urban biodiversity characterised by Barthel et al. (2010) as the retaining of the social-ecological memory, but also on the conservation of specific man-made cultural heritage elements that contribute towards the identity of the green spaces. More dynamic way to promote biological and cultural diversity was co-managing biodiversity with locals to improve ecological resilience (e.g. restoration of urban stream, controlling invasive alien species with help of friends of parks).

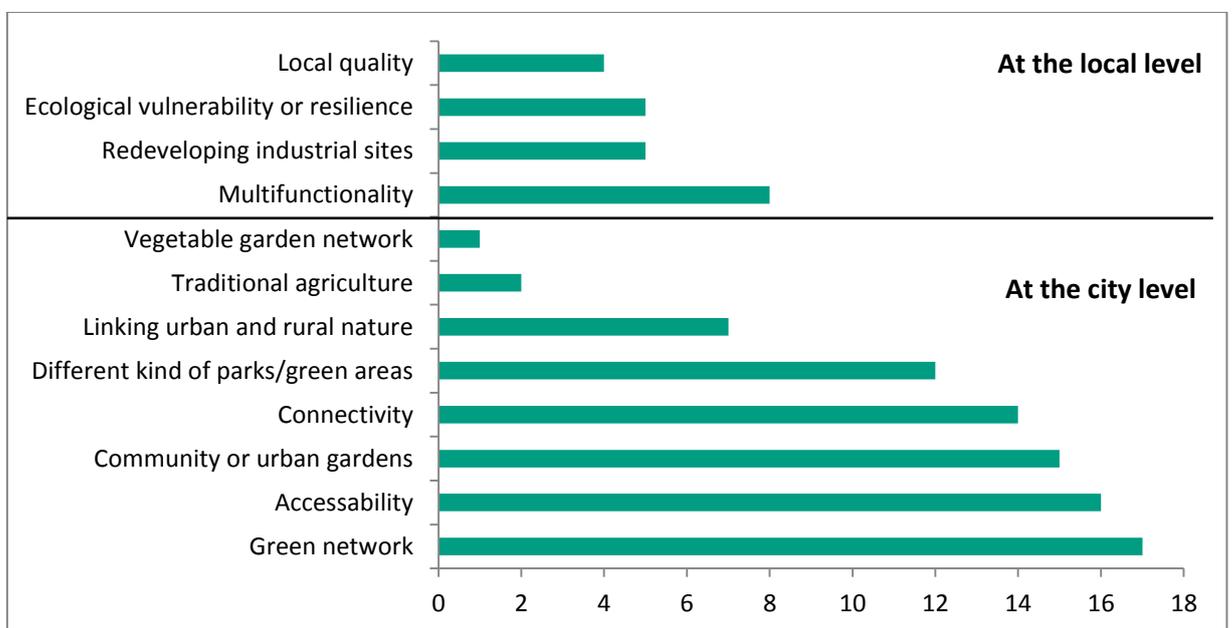


Figure 13. Planning objectives that were considered to support both biological and cultural diversity at local level within cities and at city level in the 20 European cities and number of cities considering objective important in their policy.

5.5 Complex dimensions of BCD in European cities: towards typology and indicators

So far we have discussed the different ways that biological and cultural diversity have been manifested and the kind of policy objectives there are for increasing mutual interaction between biological and cultural diversity. In this chapter the aim is to bring these diverse manifestations together into a contextual typology of BCD. This is our first step towards comprehensive typology and indicator development for urban BCD, which will be completed later during the project (task 2.3).

From the interviews it became clear that spatial scale mattered for interpreting biological and cultural diversity (see chapter 5.4.). In particular, two spatial scales were identified: (1) the scale of the city or urban region at large and (2) the scale of a locality or site. These scales are different in geographical reach but also in policy approaches so we discuss them separately. We will discuss these dimensions using Figure 14 that depicts the city level, and Figure 15 depicting the site level. With these figures we illustrate the dynamic interaction between different characteristics presented in the previous chapters.

At the city level we distinguished four main BCD dimensions (Fig. 14). City policies form on the one hand a continuum from recreational use of green spaces to conservation of biodiversity or ecosystem functions, and on the other hand there is a continuum from maintaining natural capital to securing cultural capital. At the city level, the most important goal mentioned for almost every city was creating and/or maintaining a green network that would support ecological connectivity and accessibility for recreational use. This network links different kinds of parks and green areas. In addition, ecological connectivity is commonly linked with accessibility and equal use of green spaces. Sometimes it was explicitly mentioned that the green network within the city should link up with the surrounding agricultural and rural areas.

Another distinction at the city level is whether policies expressed BCD with a focus on natural capital, such as reserve areas, wilderness parks and areas with high species richness or with a focus on cultural capital, such as city identity or cultural landscapes. Cultural heritage landscapes are examples of so called traditional biocultural systems with linkages to highly valued biodiversity such as historical species.

These two axes form a rough four-cell typology of cities. The four categories are not 'pure' as cities may be located at different places along the axes but the typology gives an idea of the types of policy options and arguments. Cities that had a strong focus on recreation and cultural capital protection often argued for "city identity" or "cultural landscapes", as expressed by a Mediterranean city:

"...the various ways in which the populations through the centuries, including the present, have made use of the landscape for farming to produce their main foods and to preserve popular traditions".

Policies that focused on biodiversity conservation and cultural capital often emphasized cultural historical elements in their argumentation, e.g. in a New Member State city:

“The areas within the ring around the centre of the city include the palaces and 19th century industrial factories which are surrounded by green space and often located next to rivers, cemeteries and parks. Some parks still have remnants of the old forest that grew here in pre-industrial times. These areas remind the inhabitants and visitors of the interactions between nature and culture – being a product of cultural and natural processes of the past”.

Policies that focused on conservation and natural capital were perhaps the most explicit in their argumentation within Master Development Plan of Mediterranean city:

“The plan gives specific attention to the development of an ecological structure linking urban green spaces and the surrounding natural environment and to promote native species. (...) on the city’s ecological vulnerabilities and resilience and the various ecosystem functions and services provided by green spaces in an urban environment”.

Policies that focused on recreation and natural capital are expressed by many cities. One of these was a new member state’s city, where the city official interviewed argued:

“The City Spatial Plan aims to maintain and complete such a well-structured network of evenly distributed green spaces across the entire city in order to not only create ecological connectivity, but also to ensure good and even accessibility for all residents”.

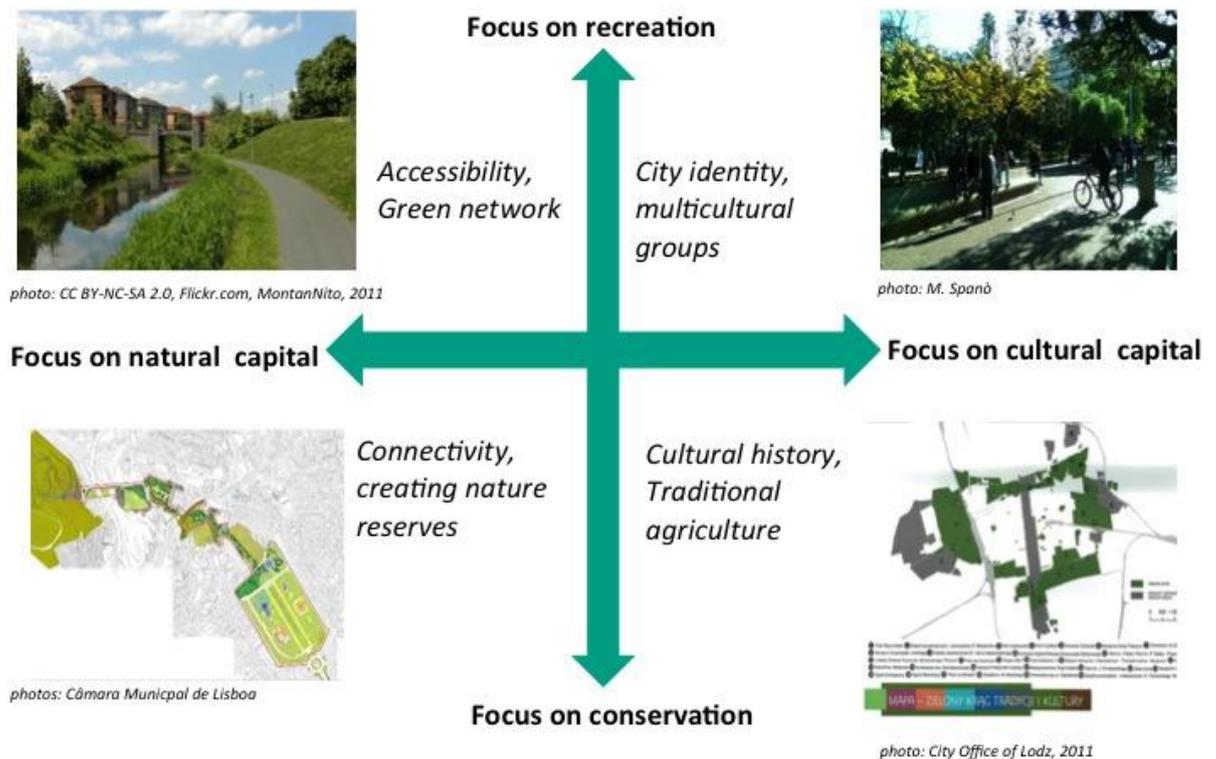


Figure 14. The four main focuses and dimensions of BCD for biological and cultural diversity at the city level.

Figure 15 represents BCD dimensions at the site/ local level and refers to the site characteristics and use of individual green spaces. The perspective of citizens becomes more prominent and the involvement of citizens took primarily place at the site level. There is a continuum from consuming or benefits of urban green (ecosystem services) to co-management of green spaces/biodiversity. In the case of consuming, activities can be culturally oriented events such as music festivals, or incorporating local biodiversity to support cultural diversity in terms of needs of different cultural groups (e.g. botanical gardens). In these cases place attachment of local residents, or their involvement into management, are not in the focus. In the case of co-managing or protecting biodiversity, and involvement of locals in their neighbourhood (e.g. developing sense of place) activities can take place either in green areas within the human domain such as green roofs, community/allotment gardens or in green areas with ecological domain i.e. with high biodiversity or ecological values.

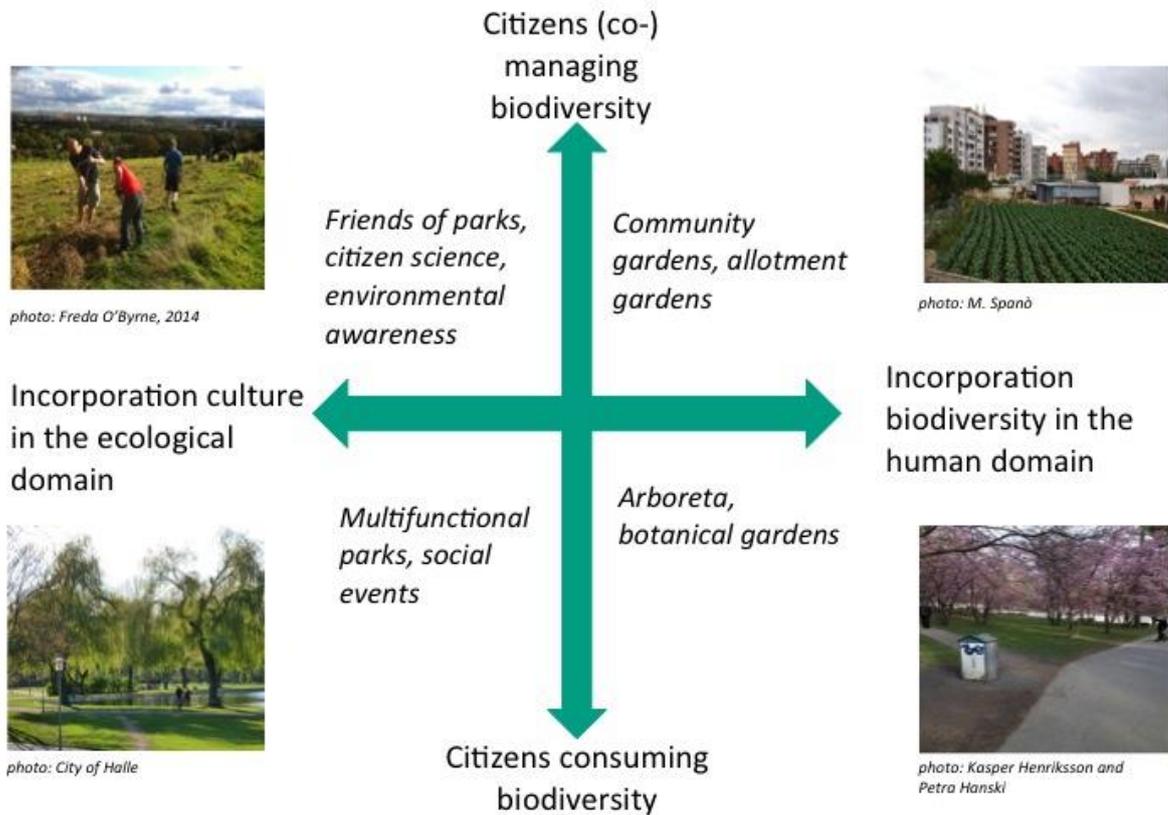


Figure 15. The four focuses and dimension of BCD and biological and cultural manifestations at the local/ site level.

5.6 Bioculturally significant places

During the interviews city officials were asked to mention specific green areas that could be considered bioculturally important places. In addition, local researchers could add places that were mentioned as important from biological and cultural point of view based on their own knowledge or local policy documents. Although only some of the actually existing BCD-significant green spaces were discussed during the interviews and in the city portraits, the key interpretations of BCD importance can be derived. However, the following statements should be interpreted cautiously and within the specific context of this project.

Incorporation of biodiversity in the human domain appears in at least one green space in each of the 20 cities (Table 6, column C). Many different kinds of green spaces such as parks, gardens, historical parks, green areas beside houses, green tram tracks, riverbanks, and squares, could be seen as places for incorporating biodiversity into the human domain. In many cases biodiversity is incorporated into urban areas through renewals or developments of specific areas. During the interviews many different types of green space restorations and developments were mentioned, such as creating temporary green spaces, redeveloping industrial sites, transforming derelict lands into green space, demolition of prefabricated houses and planting urban forest instead,

renewal of a former military base into a park, and brownfield regeneration. In some cases community gardens or allotment gardens are interpreted as cases of incorporating biodiversity into the human domain, for example in the case of city of Almada where urban agriculture was promoted as a way of territorial development and fostering the associated biodiversity, or in Malmö where gardens are seen as reflections of local citizens' interests in living with biodiversity. Green networks can also be included in this dimension in some cases.

Green spaces with special focus on nature protection appeared in eight cities in the form of botanical gardens, cultural heritage sites and parks, and green spaces especially established for biodiversity and bird species protection. Protected landscapes at coastlines and other kinds of landscape parks for the protection of natural environment, protected natural areas on riverbanks, meadows and urban forests were also mentioned. In the case of Helsinki much emphasis is placed on development of ecological networks for conservation of native species and natural ecosystem function, including controlling of invasive alien species.

In nine cities, green spaces were interpreted as incorporation of culture in the ecological domain. For example, in Edinburgh access to an ancient urban woodland has been improved through the development of a path network within it. There were some other similar cases where paths or different kinds of recreational instruments were created within a natural area to give better access to local residents. In some cases banks of rivers were altered somewhat to provide a better linkage to the local residents with the river itself.

It seems that focus on consuming and on the benefits of green areas are quite common (and appeared in 18 out of the 20 studied cities). In most cities parks and allotment gardens / community gardens were valued and created for consuming and different beneficial goals. Allotment gardens and community gardens are usually seen as diverse green space created for very specific purposes such as food production, strengthening local communities and users' environmental sensitivity.

Parks are usually created for multifunctional and multicultural recreational goals. Therefore, many different kinds of services and infrastructure can be found, such as skateboarding areas, artificial climbing walls, open-air fitness sites and many other kinds of sites developed for sport activities. Furthermore, playgrounds and coffee shops were also mentioned. Some historic parks are created for festivals and different kind of sport events as well.

Other important types of green spaces are green roofs and walls. These green areas are mainly created for their positive effects on the buildings (e.g. heat control), for enhancing the local urban environment and for aesthetic values. These areas are rarely used for recreational activities.

Table 6. BCD dimensions of bioculturally significant places in 20 European cities. Column A: bioculturally significant places where culture is integrated into biodiversity (BD) domain (e.g. forests), columns B (place attachment, environmental awareness) and D (needs, uses) refer to direct interaction between culture and nature, column C: places where biodiversity integrated into the human domain (e.g. lawns).

Planning family	City	A. Incorporation culture in BD domain	B. Co-management/ taking care	Both A and B	C. Incorporation BD in the human domain	D. Consuming/ benefits	Both C and D
Nordic	Helsinki						
	Malmö						
	Århus						
Britain	Bristol						
	Edinburgh						
Middle Europe	Amsterdam						
	Berlin						
	Halle						
	Linz						
	Utrecht						
New Member States	Ljubljana						
	Lodz						
	Oradea						
	Poznan						
Mediterranean	Szeged						
	Almada						
	Barcelona						
	Bari						
	Lisbon						
	Milan						

6 CONCLUSIONS

Our conceptual work on the use of BCD framework in the urban setting builds upon the view that the diversity of life in all its manifestations (biological, cultural, and linguistic) are interrelated within a complex socio-ecological system. The concept of BCD underlines the dynamic and constantly evolving nature of interactions between humans and nature. Thus, the concept of BCD offers a useful way of thinking about biodiversity conservation and management in constantly changing cities. In addition to the conservation of the original natural biodiversity, the creation of new manifestations of urban biodiversity can be studied by using the BCD concept. In exploring the relationship between BCD and the ecosystem services concept we came to the conclusion that in contrast with the idea of ecosystem services as a bridge *between* humans and nature, BCD integrates biological diversity and cultural diversity into an entity in which culture is an inherent part of producing ecosystem services.

As our explorative studies on BCD manifestations in 20 European cities revealed, biodiversity was understood in a variety of ways, although biodiversity policies were directed either for species protection, green networks or protecting individual sites. Biodiversity can be related to tangible biophysical characteristics or to value/policy oriented intangible features such as aesthetic species, or adaption capacity to climate change. This kind of diversity of BCD manifestations can be found especially in the urban context where biodiversity can provide multiple benefits for residents and the city. Our findings showed that species assemblages in cities and in different green spaces were influenced by local values. For instance, some cities preferred practicality when choosing species for green areas, while others underlined cultural or historic values of species selection. Although protecting native species in their original habitats was the most common policy objective shared by almost all cities, many other practices were mentioned such as choosing disease resistant species or creating new habitats or increasing multifunctionality of parks. These practises have direct influence on species assemblages or ecosystem functions, and not all of them maintain ecological sustainability of green areas. This should be the first criterion to seriously consider when developing indicators for BCD.

Some of the above mentioned practises can be beneficial for cultural diversity, while some are not. Positive or negative relationship between biological and cultural diversity is dependent on how these types of diversity are understood and promoted in the policy objectives. Place-dependent cultural diversity such as cultural heritage and historical places mentioned by several cities in our survey are typical examples of the positive relationship where culture and nature have co-existed for a long time resulting in areas with high biological and cultural values. But do these places support interculturalism or social inclusion?

In most cities manifestation for cultural diversity was considered as a functional need and use of green areas, such recreational activities by different cultural groups. Cultural groups could be delineated by use or by socio-demographic means, while ethnicity and migration status were only addressed in a marginal manner. The latter, however, is important as previous research has demonstrated that immigrants use urban green predominantly for social gatherings and food related activities, whereas native-born citizens use urban green more frequently for walking, sporting and cycling, both on an individual basis and in small groups (Peters et al. 2010). However, it has been argued that an exclusive focus on ethnicity can neglect intra-ethnic

differences such as age, gender and religion, which also play an important role in explaining recreational behavior.

Cultural diversity in urban BCD context is not just a proxy for diversity of different cultural groups, but it can offer a new way to evaluate social sustainability to explore if dynamic and inclusive relationships of socio-cultural systems are supported by the city's policy. Cultural diversity should also consider issues of equity and environmental justice and whether these have been taken into account in urban green area planning or policy (Low et al. 2005, p. 8). There is some empirical evidence that creating new high quality green areas can result in unequal use of the space, and blocking some cultural groups away (e.g. Jones et al., 2009; Kabisch and Haase, 2014). Thus, research should be directed towards analysing what kinds of planning objectives (at the city scale), and what practices (at the local scale) support interculturalism and equal use of green areas. This is another key issue that needs careful consideration when developing potential indicators for BCD.

We brought diverse manifestations together into a contextual typology of BCD. By looking at city level policy goals of the 20 cities through this typology of BCD presented in chapter 5.5 we can start to identify if policies have one focus only, or if all four aspects have been considered equally. What kind of situation or balance between focuses should be established in order to promote BCD? Should the city aim at win-win (high biological – high cultural diversity) situations in policy objectives to achieve high levels of BCD? These questions are very much city dependent: we first need to draw attention to how biological and cultural diversity is manifested in the policy context, and then draw a city-specific typologies for identified manifestations.

In some cities manifestations of cultural diversity focused on cultural history or city identity and in others more on interculturalism or multiculturalism. In both cases cultural diversity is supported, but in different ways. Interaction between biodiversity and culture is also different: in the former cases interaction is often “nicely established” and managed as cultural heritage sites, while in the latter case the interaction is more diverse and more dependent on sociocultural values of different groups. We referred to this issue as the incorporation of biodiversity into the cultural domain, with citizens “consuming” biodiversity. In several parks multifunctional lawns have been designed, which are good examples of how to embed diverse recreational uses (consuming biodiversity) within green areas that have simple ecological structures and often low species richness. In the same ecological domain, important BCD manifestations were considered to be those marked by a socially-inclusive approach, i.e. citizens (co-)managing biodiversity in biologically diverse places. The focus of such participatory conservation efforts is on restoring and conserving biodiversity or ecological values, but social values might be addressed as well. This managing role for citizens became visible in Edinburgh, where a local group manages a 2.5 ha area within the local green structure in order to engage in ecological habitat restoration, and to provide a high amenity recreational space for the community.

In this Deliverable 2.1 we have presented a conceptualisation of BCD into urban context as having three research pillars. The pillars represent three research aspects of BCD in urban context that can be tied into the research objectives in the GREEN SURGE project. Our assessment of BCD interpretations and manifestations in 20 European identified four different

manifestation types for biodiversity and six for cultural diversity that were considered important in the policy context. We were able to identify two main spatial scales for the urban BCD that differs in terms of their focus and interrelationships between cultural and biological diversity. At the city level, BCD is often considered in a more traditional and static way through developing green space networks, while at the site level citizens' participation in decision-making and management of green spaces becomes more common and cultural dynamics were mostly welcomed by planners. The main objective of the urban BCD studies is to contribute towards a better understanding of the multiple manifestations of BCD in European cities, and to find a way of working towards strategies to live sustainably with nature in cities (Fig. 17).

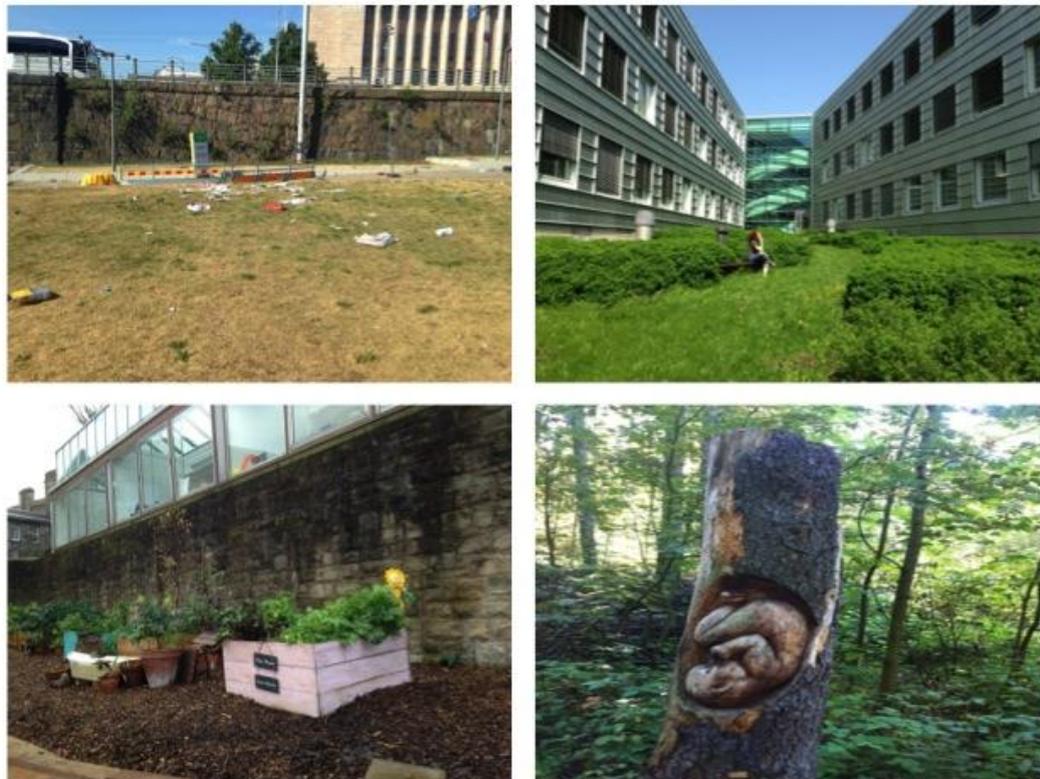


Figure 17. Explorative studies on BCD assessment in 20 European cities revealed that the interaction between biodiversity and culture varies from “consuming” (e.g. recreational needs) towards more close bonding in place making or in urban gardening (Buizer et al., 2015; Vierikko et al., 2015). Finally, co-management of nature by public agencies together with citizens can result in novel biocultural creatives who mix biological and cultural diversity.

ACKNOWLEDGEMENTS

We are grateful for the contributions of Alexandra Botzat, Leonie Fisher, Dagmar Haase, Jasmin Honold, Cecil Konijnendijk van den Bosch, Christina Branquinho, Paula Conçalves, Ingo Kowarik, Jakub Kronenber, Maja Møller, Mike Smith, Arturo Santos, Margarida Santos-Reis in the development of the BCD concept to be applied within GREEN SURGE. We also acknowledge WP5 and WP6 researchers for their contributions in developing and organizing the first round of empirical survey of planning and governance in the 20 cities (Tier 1). In addition, we want to thank all interviewees from the 20 cities. We also thank our scientific adviser Freerk Wiersum (WU) for his valuable comments and contributions in the development work of the BCD concept. Finally, words of gratitude go to our internal reviewers Cecil Konijnendijk van den Bosch and Erik Andersson for their valuable comments that have helped improve this deliverable.

7 REFERENCE LIST

- Altman, I.A. and Low, S.M., (Eds.) 1992. Place attachment. Plenum, New York, NY, 314 p.
- Aronson, M. F. J., La Sorte, F.A., Nilon, C.H. , Katti, M., Goddard, M.A., Lepczyk, C.A., Warren, P.S., Williams, N. S.G., Cilliers, S., Clarkson, B., Dobbs, C., Dolan, R., Hedblom, M., Klotz, S., Kooijmans, J.L., Kuhn, I., MacGregor-Fors, I., McDonnell, M., Mortberg, U., Pysek, P., Siebert, S., Sushinsky, J., Werner, P. , Winter, M. 2014. A global analysis of the impacts of urbanization on bird and plant diversity reveals key anthropogenic drivers. *Proceedings of the Royal Society B* 2014, 281:20133330-20133330
- Barthel, S., Folke, C., Colding, J., 2010. Social-ecological memory in urban gardens – Retaining the capacity for management of ecosystem services. *Global Environmental Change* 20, 255-265.
- Berkes, F., Folke, C. (Eds.), 2000. *Linking Social and Ecological Systems. Management practices and social mechanisms for building resilience.* Cambridge University Press, Cambridge etc., 459 p.
- Berkes, F., Colding, J., Folke, C. (Eds.), 2003. *Navigating social-ecological systems. Building resilience for complexity and change.* Cambridge University Press, Cambridge.
- Braat , L., de Groot, R., 2012. The ecosystem services agenda: bridging the worlds of natural science and economics, conservation and development, and public and private policy. *Ecosystem Services* 1, 4-15.
- Buijs, A. E., 2009. Lay people’s images of nature: framework of values, beliefs and value orientations. *Society and Natural Resources* 22, 417-432.
- Burkhard, B., Kroll, F., Müller, F., Windhorst, W. 2009. Landscapes’ Capacities to Provide Ecosystem Services – A Concept for Land-Cover Based Assessment. *Landscape Online* 15, 1-22. DOI:10.3097/LO.200915.
- Chan, K. M. A., Guerry, A. D., Balvanera, P., Klain, S., Satterfield, T., Basurto, X., Bostrom, A., Chuenpagdee, R., Gould, R., Halpern, B. S., Hannahs, N., Levine, J., Norton, B., Ruckelshaus, M., Russell, R., Tam, J., Woodside, U., 2012. Where are Cultural and Social in Ecosystem Services? A Framework for Constructive Engagement. *BioScience* 62(8), 744-756.
- Cocks, M.L., 2006. Biocultural diversity: Moving beyond the realm of ‘indigenous’ and ‘local’ people. *Human Ecology* 34, 185–200.
- Cocks, M.L., Wiersum, F., 2014. Reappraising the Concept of Biocultural Diversity: a Perspective from South Africa. *Human Ecology* 42,727–737. DOI 10.1007/s10745-014-9681-5.
- Daily, G.C., Matson, P.A., 2008. Ecosystem Services: From theory to implementation. *Proceedings of the National Academy of Sciences of the USA* 105(28), 9455-9456. DOI:10.1073/pnas.0804960105.
- Elands, B., van Koppen, C.S.A., 2013. Biocultural diversity in the Netherlands: from ecologically noble savages towards biocultural creatives. Chapter 11. In: Arts, B., van Bommel, S., Ros-Tonen, M., Verschoor, G. (Eds.), *Forest People Interfaces.* Wageningen Academic Publishers, Wageningen, pp. 181-193.

Elmqvist, T., Fragkias, M., Goodness, J., Güneralp, B., Marcotullio, P.J., McDonald, R.I., Parnell, S., Schewenius, M., Sendstad, M., Seto, K.C., Wilkinson, C. (Eds.), 2013. *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities*. Springer Open, 755 p. DOI 10.1007/978-94-007-7088-1.

Farnum, J., Hall, T., Kruger, L.E., 2005. *Sense of place in natural resource recreation and tourism: An evaluation and assessment of research findings*. Recreation and Tourism Initiative, Gen. Tech. Rep. PNW-GTR-660. Department of Agriculture, Forest Service, Pacific Northwest Research Station, USA, 59 pp.

Fisher, B., Turner, R.K., Morling, P. 2009. Defining and classifying ecosystem services for decision making. *Ecological Economics* 68(3), 643-653. DOI: 10.1016/j.ecolecon.2008.09.014.

Florence Declaration, 2014. *Florence declaration on the links between biological and cultural diversity*, 1st European Conference for the Implementation of the UNESCO-SCBD Joint Programme on Biological and Cultural Diversity. Florence, Italy, 11 April 2014.

Folke, C., Hahn, T., Olsson, P., Norberg, J., 2005. Adaptive governance of social-ecological systems. *Annual Review of Environment and Resources* 30, 441-473. DOI: 10.1146/annurev.energy.30.050504.144511.

Folke, C., 2006. Resilience: The emergence of a perspective for social-ecological systems analyses. *Global Environmental Change*, 16(3), 253-267.

Gallopín, G. C., 2006. Linkages between vulnerability, resilience, and adaptive capacity. *Global Environmental Change* 16:293-303.

Gaston, K.J. (Ed.), 2010. *Urban Ecology*. Ecological Reviews. Cambridge University Press, Cambridge etc., 318 p.

Gee, K., Burkhard, B., 2010. Cultural ecosystem services in the context of offshore wind farming: A case study from the west coast of Schleswig-Holstein. *Ecological Complexity* 7, 349-358.

Gómez-Baggethun, E., Barton, D.N., 2013. Classifying and valuing ecosystem services for urban planning. *Ecological Economics* 86, 235-245. DOI: 10.1016/j.ecolecon.2012.08.019.

Haase, D., N. Larondelle, E. Andersson, M. Artmann, S. Borgström, J. Breuste, E. Gomez-Baggethun, Å. Gren, et al., 2014. A Quantitative Review of Urban Ecosystem Service Assessments: Concepts, Models, and Implementation. *AMBIO* 43. Springer Netherlands: 413–433. doi:10.1007/s13280-014-0504-0.

Haines-Young, R., Potschin, M., 2010. The links between biodiversity, ecosystem services and human well-being. In: Raffaelli, D.G., Frid, C.L.J. (Eds.), *Ecosystem Ecology: A New Synthesis*. Cambridge University Press, pp. 110-139.

Hansen, R., Lorance Rall, E. 2014. Overview of analytical framework, selected cases and planning documents. Milestone 34. Internal report of the GREEN SURGE project.

Horlick-Jones, T., Sime, J., 2004. Living on the border: knowledge, risk and transdisciplinarity. *Futures* 36 441-456.

- Hubacek, K., Kronenberg, J., 2013. Synthesizing different perspectives on the value of urban ecosystem services. *Landscape and Urban Planning* 109(1), 1–6.
- Jones A, Brainard, J., Batman, I.J., Lovett, A.A., 2009. Equity of access to public parks in Birmingham, England. *Environmental Research Journal* 3, 237-256.
- Kabisch, N., Haase, D., 2014. Green justice or just green? Provision of urban green spaces in Berlin, Germany. *Landscape and Urban Planning* 122, 129-139.
- van Koppen, C.S.A., 2002. *Echte Natuur: Een sociaaltheoretisch onderzoek naar natuurwaardering en natuurbescherming in de moderne samenleving*. PhD thesis, Wageningen University, Wageningen,.
- Kontogianni, A., Luck, G.W., Skourtos, M., 2010. Valuing ecosystem services on the basis of service-providing units: A potential approach to address the 'endpoint problem' and improve stated preference methods. *Ecological Economics* 69, 1479-1487.
- Kremen, C., 2005. Managing ecosystem services: what do we need to know about their ecology? *Ecology Letters* 8, 468–479.
- Kühn, I., Brandl, R., Klotz, S., 2004. The flora of German cities is naturally species rich. *Evolutionary Ecology Research* 6, 749-764.
- Larondelle, N., Haase, D., Kabisch, N., 2014. Mapping the diversity of regulating ecosystem services in European cities. *Global Environmental Change* 26, 119-129.
- Lele, S., Springate-Baginski, O., Lakerveld, R., Deb, D., Dash, P., 2014. Ecosystem services: Origin, contributions, pitfalls and alternatives. *Conservation and Society* 11(4), 343-358.
- Low, S., Taplin, D., Scheld, S., 2005. *Rethinking Urban Parks. Public space and cultural diversity*. The University of Texas Press, 226 pp.
- Loh, J., Harmon, D., 2005. A global index of biocultural diversity. *Ecological Indicators* 5, 231–241.
- Luck, G.W., Daily, G.C., Erlich, P.R., 2003. Population diversity and ecosystem services. *Trends in Ecology and Evolution* 18(7), 331-336.
- Maffi, L. 2004. Maintaining and restoring biocultural diversity: The evolution of a role for ethnobiology. In: Carlson, T.J.S and Maffi, L. (Eds.) *Ethnobotany and Conservation of Biocultural Diversity*. *Advances in Economic Botany* vol. 15. The New York Botanical Garden Press, pp. 9-36.
- Maffi, L., Woodley, E., 2010. *Biocultural Diversity Conservation: A Global Sourcebook*. Earthscan Publications, London.
- McKinney, M.L., 2008. Effects of urbanization on species richness: A review of plants and animals. *Urban Ecosystems* 11:161-176. DOI 10.1007/s11252-007-0045-4.

Millennium Ecosystem Assessment (MEA), 2005. Ecosystem and human well-being: synthesis Island Press, Washington DC.

Moreno-Penaranda, R., 2013. Biodiversity and culture, two key ingredients for a truly green urban economy: learning from agriculture and forestry policies in Kanazawa City, Japan. In: Simpson, R., Zimmermann, M. (Eds.), *The economy of green cities: a world compendium on the green urban economy*. Springer, Dordrecht, the Netherlands, *Local Sustainability Vol 3*, p. 337-349.

Müller, F., de Groot, R., Willemsen, L., 2010. Ecosystem services at the landscape scale: the need for integrative approaches. *Landscape Online* 23, 1-11. DOI:10.3097/L0.201023.

Nadin, V., Stead, D., 2008. European spatial planning systems, social models and learning. *disP-The Planning Review*, 44(172), 35-47.

Niemelä, J., Saarela, S-R., Söderman, T., Kopperoinen, L., Yli-Pelkonen, V., Väre, S., Kotze, J., 2010. Using the ecosystem services approach for better planning and conservation of urban green spaces: A Finland case study. *Biodiversity Conservation* 19, 3225-3243.

Niemelä, J. Breuste, J.H., Elmqvist, T., Guntenspergen, G., James, P., McIntyre, N. (Eds.), 2011. *Urban Ecology. Patterns, processes and applications*. Oxford University Press, 374 p.

Opdam, P., 2013. Using ecosystem services in Community-Based Landscape Planning: Science is not ready to deliver. In: B. Fu and K.B. Jones (eds.), *Landscape Ecology for Sustainable Environment and Culture*, Springer Science+Business Media Dordrecht.

Persic, A., Martin, G. (Eds.), 2008. *Links between biological and cultural diversity; Report of International Workshop*. UNESCO, Paris.

Pilgrim, S., Pretty J., 2010. *Nature and Culture Rebuilding lost connections*. Earthscan Publications, London.

Posey, D.A., 1999. Cultural and spiritual values of biodiversity. A complementary contribution to the global biodiversity assessment. In: Posey, D.A. (Eds.) *Cultural and spiritual values of biodiversity*. UNEP and Intermediate Technology Publications, London, pp. 1-19.

Pretty, J., Adams, B., Berkes, F., Ferreira de Athayde, S., Dudley, N., Hunn, E., Maffi, L., Milton, K., Rapport, D., Robbins, P., Sterling, E., Stolton, S., Tsing, A., Vintinner, E., Pilgrim, S., 2009. The intersections of biological diversity and cultural diversity: Towards integration. *Conservation and Society* 7(2), 100-112.

Pungetti, G., 2013. Biocultural Diversity for Sustainable Ecological, Cultural and Sacred Landscapes: The Biocultural Landscape Approach. In: Fu, B., Jones, K.B. (Eds.), *Landscape Ecology for Sustainable Environment and Culture*. Springer Science+Business Media, pp. 55-76.

Puppim de Oliveira J.A., Balaban, O., Doll, C.N.H., 2011. Cities and biodiversity: perspectives and governance; challenges for implementing the convention on biological diversity (CBD) at the city level. *Biological Conservation* 144, 1302-1313.

Rapport, D., Maffi, L., 2010. The dual erosion of biological and cultural diversity: implications for the health of ecocultural systems. In: Pilgrim, S., Pretty, J. (Eds.), *Nature and culture, rebuilding lost connections*. Routledge and Earthscan, London/New York.

Seppelt, R., Dormann, C. F., Eppink, F. V., Lautenbach, S., Schmidt, S., 2011: A quantitative review of ecosystem service studies: approaches, shortcomings and the road ahead. *Journal of Applied Ecology* 48, 630–636. doi: 10.1111/j.1365-2664.2010.01952.x.

Spangenberg, J., 2013. Ecosystem Services in the Societal Context. *Ecosystem Services. Global Issues, local practices*, p. 91-95. DOI:10.1016/B978-0-12-419964-4.00009-3.

Stephenson, J., 2008. The Cultural Values Models: An integrated approach to values in landscapes. *Landscape and Urban Planning* 84(2), 127-139.

Turner, N. J., Davidson-Hunt, I. J., O’Flaherty, M., 2003. Living on the Edge: Ecological and Cultural Edges as Sources of Diversity for Social–Ecological Resilience. *Human Ecology* 31(3), 439-461.

Turnhout, E., Waterton, C., Neves, K., Buizer, M., 2013. Rethinking biodiversity: from goods and services to ‘living with’. *Conservation Letters* 6,154-161.

Urban Atlas, 2014. <http://www.eea.europa.eu/data-and-maps/data/urban-atlas#tab-methodology>. Retrieved 14/12/2014.

Urban Audit Data Collections, 2014.

http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/city_urban/urban_audit_data_collection. Retrieved 14/12/2014.

APPENDIX 1. QUESTIONS RELATED TO BCD IN TIER 1 RESEARCH

PART III – BIOCULTURAL DIVERSITY

Urban biocultural diversity is a relatively recent concept emphasizing the links between biological diversity and cultural diversity in cities or city regions. Biodiversity describes the species richness of plant and animal species on different levels (genetic, species and habitat level). Cultural diversity describes the variety of values, beliefs and ideas, and associated practices of different social groups. Examples of links between biological diversity and cultural diversity in an urban setting are: urban agricultural practices and their impact on biodiversity, distinct cultural groups and their specific uses of urban green spaces, derelict industrial sites referring to historical cultural practices and the biodiversity that these sites host.

In the GREEN SURGE project, we explore how relationships between biological diversity and cultural diversity become manifest in European cities and may contribute to sustainable city planning and governance.

III.A) Views about biodiversity

The following statements are about biological diversity and urban green spaces. Please rate your personal view between 1 (strongly disagree) and 5 (strongly agree).

1) Biodiversity conservation should incorporate both native and non-native species.	<i>Strongly disagree</i>	1	2	3	4	<i>Strongly agree</i>
			5			
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
			<input type="checkbox"/>			

Please justify your answer.

Raimo: "I think both! I think we should conserve native species in their natural habitats, but we need also to find and prefer tolerant species that can adapt to climate change. We should not only prefer native species if they are very vulnerable for climate change. We can introduce alien, new species into the green areas in Helsinki if they are tolerant. We should really consider carefully tolerant species that species richness would be high in the next twenty years."

2) It is important to involve local citizens in decision-making about which plant species are to be used for public green space.	<i>Strongly disagree</i>	1	2	3	4	<i>Strongly agree</i>
			5			
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
			<input type="checkbox"/>			

Please justify your answer.

3) In the policies for urban green space in our city/urban region, I see:

Please check only one.

- a focus on a diversity of species
- a focus on the establishment of a green space network
- a focus on species rich or well preserved individual sites that are, or are not part of a network
- other:

Please explain your answer.

4) Have you, over the past decade, seen changes in the types of plant species chosen for your parks and green spaces? What kind of changes? What were the main reasons for these changes?

5) When it comes to the process of actual species-selection for a certain green space, what kind of factors restrict the number of species selected?

III.B) Policies and approaches addressing biological and cultural diversity

Biodiversity protection is a key policy target at the EU level. Urban green areas are important for maintaining or promoting biodiversity at different scale levels (for example, from the level of a park for some species to the level of a city region for other species). Promoting cultural diversity is also an important policy target of the EU. The following questions concern the policies, programs, measures and official guidelines (summarized here as “policies”) that your city implements in relation to biological and cultural diversity.

1) Does your city/urban region apply policies to explicitly recognize and accommodate the uses, needs and values of different cultural groups in the planning and management of urban green space and infrastructures? If yes, what kind of policies?

2) Other than through formal policies, does your city in any way take into account cultural diversity in the planning and maintenance of urban green space and infrastructures? How?

III.C) Urban green spaces and cultural practices

Place characteristics (in the form of biophysical elements or species, or built elements such as heritage objects and monuments or recreational facilities) can have a considerable influence on how a place is used and experienced. Some green spaces may be more suitable than others for specific uses whilst other green spaces may facilitate a wide variety of uses.

1) Is there a green space in your city that is particularly inviting for users and visitors with different needs, interests and cultural backgrounds? Who are the users and what are the key characteristics of this area?

2) Does your city have urban green spaces that are predominantly used by one particular social group? For example, by older or younger people, by people with disabilities, or by people from different ethnic communities? Could you name and describe the area coming to mind first, the activities taking place in it and the special characteristics of the site?

Place:

Activities:

...

...

Special characteristics:

...

3) In your city/urban region, are green spaces equally available for all people?

4) If your answer was no to the previous question, can groups be distinguished that are particularly deprived of urban green spaces?

5) Do you think your city should focus more on distributing green spaces in such a way that all groups obtain equal access?

6) What are your ideas on how this can be achieved?

III.D) Perceived problems and opportunities

Some policies promote management options that are supportive of both biological and cultural diversity. However it can be challenging to achieve this.

1) Are there specific kinds of problems or missed opportunities that you see in achieving biocultural diversity?

...

2) Do you know any examples (in your own city/urban region or elsewhere) exhibiting diversity-encouraging approaches that you find inspiring? Could you name and briefly describe them?

...

III.E) Further comments (optional)

...
