GREEN SURGE

June 2017

URBAN GREEN INFRASTRUCTURE PLANNING

A GUIDE FOR PRACTITIONERS

Practitioners' guide to urban green infrastructure planning, based on research in European cities as part of the EU FP7 project GREEN SURGE.

SEVENTH FRAMEWORK PROGRAMME

URBAN GREEN INFRASTRUCTURE PLANNING – A GUIDE FOR PRACTITIONERS

Suggested citation:
Hansen, R., Rall, E., Chapman, E., Rolf, W., Pauleit, S. (eds., 2017). *Urban Green Infrastructure Planning: A Guide for Practitioners.* GREEN SURGE. Retrieved from http://greensurge.eu/working-packages/wp5/

GREEN SURGE Deliverable 5.3
Work Package 5: Green Infrastructure Planning and Implementation
Partners Involved: TUM, UNIBA, FFCUL, MRI, UCPH, UH, WU, SRC, FCRA, ICLEI, ULOD, UL, PROF (see List of Contributors, pages 94-95 for full names of organisations)
The content of this report is based on the results of research on green infrastructure planning and implementation in Europe as part of the EU FP7 project GREEN SURGE (ENV.2013.6.2-5-603567; 2013-2017)

See more at **www.greensurge.eu**

Editors: *Rieke Hansen, Emily Rall, Eleanor Chapman, Werner Rolf, Stephan Pauleit (TUM)*
Review: *Bianca Ambrose-Oji (FCRA), Barbara Anton (ICLEI)*
Layout: *Eleanor Chapman, Rieke Hansen (Basic Layout: Scandinavian Branding)*

Principal Contributors:
Rieke Hansen, Emily Rall, Stephan Pauleit, Werner Rolf, Sandra Fohlmeister and Sabrina Erlwein (TUM)
Artur Santos, Ana Catarina Luz, Margarida Santos-Reis, Cristina Branquinho (FFCUL)
Éva Gerőházi, Luca Száraz, Iván Tosics (MRI)
Daniel Brinkmeyer (TUB)
Alexander van der Jagt (FCRA)
Ole H. Caspersen, Anton Stahl Olafsson, Sandra Gentin (UCPH)
Clive Davies, Yole DeBellis and Raffaele Lafortezza (UNIBA)
Kati Vierikko (UH)
Erik Andersson (SRC) and Jakub Kronenberg (ULOD)
Rozalija Cvejić, Špela Železnikar, Mojca Nastran, Marina Pintar (UL)
Tim Delshammar (City of Malmö)

Freising / Munich, June 2017

URBAN GREEN INFRASTRUCTURE PLANNING

A GUIDE FOR PRACTITIONERS

PREFACE

There has been much research in recent years focusing on how green space can contribute to health, quality of life and economic growth in cities. Emerging from some of this research is a new concept: urban green infrastructure (UGI) planning – an integrated approach to strategically planning green spaces. This guide presents this new approach as well as offering guidance and inspiration for the planning and governance of cities around the world.

The content of this guide is based on the results of research on current knowledge and practice of green infrastructure planning and implementation in Europe, as part of the project Green Infrastructure and Urban Biodiversity for Sustainable Urban Development and the Green Economy (2013-2017) – GREEN SURGE for short. The project is a collaboration between 24 partners in 11 countries and is funded by the European Commission's Seventh Framework Programme (FP7). Overall, GREEN SURGE aims to identify, develop and test ways of linking green spaces, biodiversity, people and a green economy, in order to meet major urban challenges related to land use conflicts; climate change adaptation; demographic changes; and human health and wellbeing.

This guide is a product of GREEN SURGE Work Package 5 'Green infrastructure planning and implementation' and is the result of three consecutive phases of research: 1) analysis of the current state-of-the-art in planning practice across 20 European cities, 2) analysis of good practices in 10 of those cities, and 3) tool and strategy development in selected Urban Learning Labs. The research included literature reviews, analysis of planning documents and other written material, field visits, observation of meetings, stakeholder workshops, interviews with municipal officials and other experts, as well as theme-specific research. Scientific reports detailing the first two phases of this work can be found on the project website at http://greensurge.eu/working-packages/wp5/.

A first draft edition of this guide was shared with GREEN SURGE partners in different European cities for review and field testing in 2016. This edition incorporates their feedback. We would like to warmly thank all those who shared their experience and ideas as part of this process!

The GREEN SURGE project team in Edinburgh, 2014. Many of the people pictured were involved in developing this guide.
Credit: GREEN SURGE

TABLE OF CONTENTS

LIST OF CASE STUDIES

HIGHLIGHTS

WHAT IS URBAN GREEN INFRASTRUCTURE PLANNING?

Urban Green Infrastructure (UGI) planning is a strategic planning approach that aims to develop networks of green and blue spaces in urban areas, designed and managed to deliver a wide range of ecosystem services and other benefits at all spatial scales.

WHY IS URBAN GREEN INFRASTRUCTURE SO IMPORTANT?

UGI is capable of addressing a broad range of urban challenges, such as conserving biodiversity, adapting to climate change, supporting the green economy and improving social cohesion. To capture this potential, local governments need to plan carefully and holistically.

CORE PRINCIPLES

A sound UGI planning approach is based on four principles:

- *Green-grey integration – combining green and grey infrastructures*
- *Connectivity – creating green space networks*
- *Multifunctionality – delivering and enhancing multiple functions and services*
- *Social inclusion – collaborative and participatory planning*

Barcelona has plans to invest considerably in urban green infrastructure. The city's 'Green Infrastructure and Biodiversity Plan' is an ambitious strategic tool to increase connectivity in the densely-built Mediterranean metropolis. Available in English www.barcelona.cat
Credit: Rieke Hansen

HIGHLIGHTS

KEY MESSAGES

For best results, UGI planners should:

- *Embrace the full diversity of urban green – and blue! All types of green and blue spaces, regardless of ownership or origin, can be considered part of a UGI network.*
- *Consider the full spectrum of benefits: ecological, social AND economic.*
- *Use a mix of assessment tools to raise awareness of the diverse values of UGI and its related benefits, and to gain support for these.*
- *Seek support to develop UGI planning strategies, for example, through mandates or advocates, or by identifying windows of opportunity.*
- *Coordinate plans, policies and instruments at multiple scales, ranging from metropolitan regions to individual sites.*
- *Cooperate with other departments and external experts.*
- *Collaborate with civil society groups, citizens and the private sector.*
- *Develop strong, but flexible, frameworks and mix 'hard' and 'soft' instruments for planning and implementation, adopting a long-term outlook.*
- *Start with pilot projects to test strategies and build support.*
- *Unlock additional resources by collaborating, pooling knowledge and accessing external funding.*
- *Identify less vocal groups and use appropriate tools and strategies to engage them, recognising skill and resource barriers for participants.*
- *Look for potential links, synergies and/or conflicts between planning objectives.*

Self-evaluation and tools:

- *Complete the checklists (Part D) to evaluate your organisation's current UGI planning efforts and see the Toolbox for ways to put UGI planning into practice.*

WANT TO KNOW MORE?

Reports from other work packages referred to in this guide are listed below and available on the **GREEN SURGE website**.

Deliverable 3.1
Cvejić, R., et al., 2015. A typology of urban green spaces, ecosystem services provisioning services and demands. Functional linkages. GREEN SURGE D3.1

Deliverable 4.1
Andersson, E., et al., 2015. Integrating Green Infrastructure Ecosystem Services into Real Economies. GREEN SURGE D4.1.

Deliverable 5.1
Davies, C., et al., 2015. Green Infrastructure Planning and Implementation. The status of European green space planning and implementation based on an analysis of selected European city-regions. GREEN SURGE D5.1.

Deliverable 5.2
Hansen, R., et al., 2016. Advanced Urban Green Infrastructure Planning and Implementation: Innovative Approaches and Strategies from European Cities. GREEN SURGE D5.2.

Deliverable 6.1
Buizer, M., et al., 2015. The governance of urban green spaces in selected EU-cities: Policies, Practices, Actors, Topics. GREEN SURGE D6.1

Deliverable 6.2
Buijs, A., et al., 2016. Innovative Governance of Urban Green Spaces: Learning from 18 innovative examples around Europe. GREEN SURGE D6.2

Milestone 32
Kronenberg, J., Andersson, E., 2016. Integrated Valuation: Integrating Value Dimensions and Valuation Methods. GREEN SURGE Milestone MS32.

HOW TO USE THIS GUIDE

Who should use this guide?

This guide is designed primarily for planners and local government decision-makers who are interested in ways to better plan and maintain urban green space networks. Allied professionals working in the broader field of urban planning, land management or sustainable urban development may also find it of use.

Although this publication is focused on European cities, much of it may be useful for practitioners in other parts of the world, too. All guidance needs to be considered in light of its applicability to local conditions, such as the planning system, available resources, relevant actors, and the most pressing social, environmental and economic challenges.

What's inside?

This guide offers inspiration and advice to support local green space planning, based on the findings of GREEN SURGE research. It includes 25 brief overviews of case studies from 13 different European cities. Most cases are examples of good practice and all provide lessons for practitioners across Europe (also see Deliverable 5.2). Six are based on cooperative tool and strategy development with three of the GREEN SURGE Urban Learning Labs (Berlin, Malmö and Ljubljana), as well as research undertaken in Lisbon.

Navigating the guide

The guide is divided into seven parts, designed for easy navigation between them. Parts A, B and C correspond to the context, core principles and practice of UGI planning, including case studies related to each theme. Part D looks at next steps, and Part E contains additional case studies that cut across a range of the themes presented.

A	*What is UGI planning - and why do it?*	***Introduces UGI planning and its importance for tackling global urban challenges.***
B	*Core principles of UGI planning*	***Unpacks the four inter-linked principles that underpin best practice UGI planning.***
C	*Making it happen!*	***Zooms in on ways to better plan for UGI on the ground.***
D	*Conclusion and next steps*	***Sums up and provides checklists to take the next step and kickstart your own UGI planning evaluation.***
E	*Cross-cutting case studies*	***Presents in detail additional, cross-cutting case studies that span several themes.***
	Toolbox	***Provides an overview of tools and methods for implementing UGI planning.***
	Appendix	***Lists contributors to the guide.***

LEGEND

Indicates a cross-link between the key themes and case studies explored in Parts A, B, C and E.

Indicates a clickable hyperlink to a resource available online.

Directs you to the toolbox, where you can find practical tools and methods to implement UGI planning.

A WHAT IS UGI PLANNING - AND WHY DO IT?

An overview
Green space typology
Urban challenges

AN OVERVIEW

Planning Urban Green Infrastructure

A

URBAN GREEN INFRASTRUCTURE (UGI) PLANNING – A DEFINITION

UGI planning is a strategic planning approach that aims to develop networks of green and blue spaces in urban areas, designed and managed to deliver a wide range of ecosystem services and other benefits at all spatial scales.

Due to its integrative, multifunctional approach, UGI planning is capable of addressing a broad range of urban challenges, such as conserving biodiversity, adapting to climate change, supporting the green economy and improving social cohesion.

We are in the middle of an urban era. Worldwide, more than half of us live in cities, and the number is rising – making urbanisation a fundamental reality of our common future. There can be little doubt that cities are where 'our struggle for global sustainability will be won or lost[1]'.

Meanwhile, in the urban context and beyond, concerns have grown regarding loss of biodiversity and degradation of natural resources – giving rise to recognition of the central role that green space networks have to play in cities and city-regions. In May 2013, the European Commission published a strategy to promote *green infrastructure* – essential to the functioning of cities and regions – and mainstream it in EU policy areas[2]. The strategy notes the potential for green spaces to make a major contribution to sustainable development, by enhancing social cohesion, supporting the economy, and adapting to a changing climate, and highlights the importance of green infrastructure solutions in cities, where more than 60% of the EU population lives[3].

To harness the full potential of urban green spaces, however, a carefully conceived, evidence-based approach is required. This guide aims to support such an approach by providing advice on how to plan for and develop urban green infrastructure (UGI).

The Schöneberger Südgelände in Berlin is part of an urban green corridor and exemplifies an innovative green space combining recreation, art installations, urban wilderness and biodiversity protection. *Credit: Rieke Hansen*

REFERENCES

1 United Nations, 2012. Our Struggle for Global Sustainability Will Be Won or Lost in Cities,' Says Secretary-General, at New York Event [Press release]. Available from: un.org/press/en/2012/sgsm14249.doc.htm

2 European Commission, 2013. Building a Green Infrastructure for Europe. Luxembourg. Available from: http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52013DC0249

3 See European Commission, 2013.

Urban Green Infrastructure planning…

…can help to tackle key urban challenges that cities face

Here in Part A, we explore how UGI planning, taking into account the potential of a range of green space types (see Green Space Typology on page 6) can address four important urban challenges:

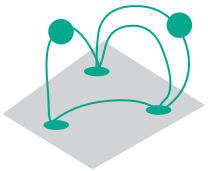
1. ***Adapting to climate change***
2. ***Protecting biodiversity***
3. ***Promoting a green economy***
4. ***Increasing social cohesion***

These are explored in more detail here in Part A.

…is based on four core principles

1) Green-grey integration – combining green and grey infrastructure

UGI planning seeks the integration and coordination of urban green spaces with other infrastructure, such as transport systems and utilities.



2) Connectivity – creating green space networks

UGI planning for connectivity involves creating and restoring connections to support and protect processes, functions and benefits that individual green spaces cannot provide alone.

3) Multifunctionality – delivering and enhancing multiple functions and services

UGI planning aims at combining different functions to enhance the capacity of urban green space to deliver multiple benefits – creating synergies, while reducing conflicts and trade-offs.

4) Social inclusion – collaborative and participatory planning

UGI planning aims for collaborative, socially inclusive processes. This means that planning processes are open to all and incorporate the knowledge and needs of diverse parties.

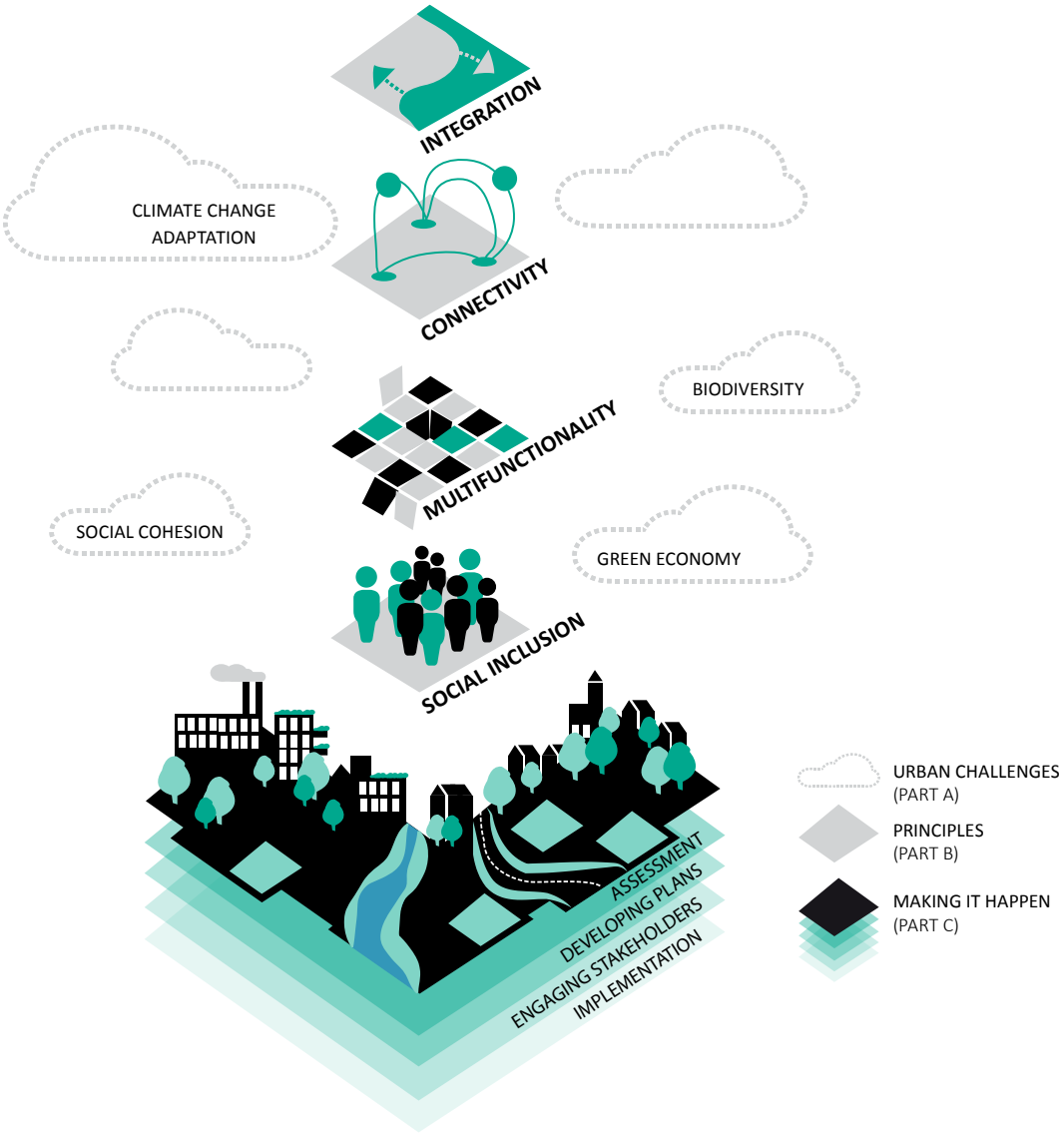
All four principles are explored in Part B.

…must be translated to practical actions on the ground

Such actions concern all phases of the planning process, involving engaging stakeholders, early assessment, developing plans, and implementation. They are explored in Part C.

Framework for UGI planning

UGI planning offers a conceptual framework to be adapted to your local context, as illustrated below. This framework is driven by the four core principles. Combined, the principles act in two directions: 1) to respond to the particular urban challenges your city faces and 2) to underpin practical actions on the ground.



SUPPORTING PRINCIPLES

While the four core principles provide a fundamental basis for UGI planning, certain supporting principles should be also taken into account:

- *Multi-scale: UGI planning aims to link different spatial levels, ranging from metropolitan regions to individual sites.*
- *Multi-object: All types of urban green and blue spaces, regardless of ownership and origin, can be considered as part of a green infrastructure network.*
- *Inter- and transdisciplinary: UGI planning aims at linking disciplines, as well as science, policy and practice. It integrates knowledge and demands from different fields, such as landscape ecology, urban and regional planning, and landscape architecture, and is ideally developed in partnership between local authorities and other stakeholders.*

GREEN SPACE TYPOLOGY

Urban green (and blue) spaces are incredibly diverse, ranging from urban forests to rooftop gardens. Some of these spaces are already typically considered in planning practice, but others (particularly private green spaces such as gardens, but also urban farmlands) have received less attention in research and practice. Often, their contribution to UGI networks is not so well understood.

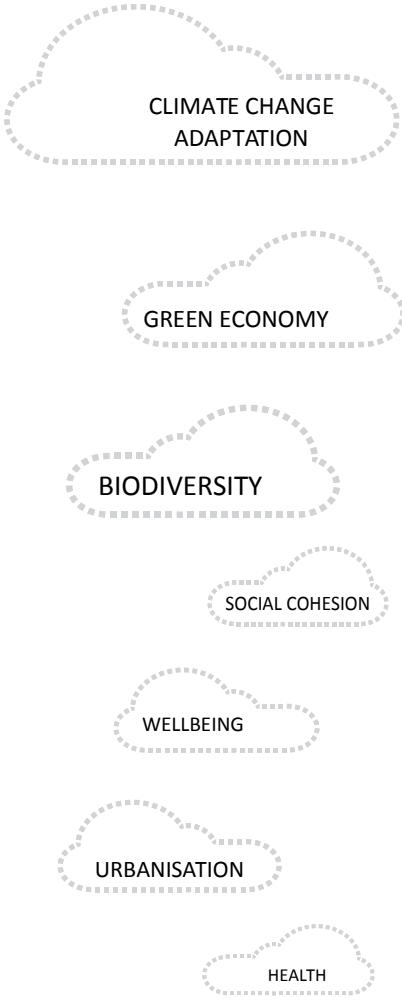
GREEN SURGE has contributed to this knowledge gap by developing a green space typology made up of 44 elements, in eight groups, and linking them to scientific evidence on their corresponding ecosystem services (see Deliverable 3.1). This provides an important basis for understanding the functional connections between green spaces and the surrounding built environment. An overview of the elements is provided below.

While all these elements can and should be considered in UGI planning, urban green infrastructure is more than simply a new name for existing green space elements. Using the principles of connectivity and multifunctionality, it is possible to determine which of these spaces form part of the city's UGI network (see Part B) and where it is necessary either to improve the quality of existing elements, or invest in new ones and strengthen linkages (see Part C).

Green space typology, made up of 44 green space types clustered in eight groups.
Image credits: Rieke Hansen

URBAN CHALLENGES

A



Green space planners are typically well aware of the potential of urban green spaces to contribute to challenges such as human health, species protection and adaptation to climate change. When understood as part of a UGI planning framework, these and other emerging challenges and trends are not just obstacles to be overcome, they can also form important drivers for investing in green space – especially when a challenge is high on the political agenda.

For instance, urban growth can present a threat to urban green spaces, but also a chance to recognise UGI's importance for human welbeing and develop corresponding planning strategies. Economic crises and environmental hazards, such as severe flood events, also open the door to testing new ways of planning and managing UGI (see Deliverable 5.2). In this way, adopting a UGI planning approach can assist practitioners to productively link urban challenges with the unrealised potential of green spaces, in the interest of gaining support for planned measures and achieving policy objectives.

In the following pages, we look at the potential contribution of UGI to two well-known challenges – biodiversity protection and climate change adaptation. In addition, we explore two that tend to be lesser-known in planning circles – increasing social cohesion and promoting a green economy (see Deliverable 5.2 for more details).

Parco Nord Milano is a regional park within Milan's metropolitan green belt. Protecting such green spaces on the city outskirts can be part of a strategy to counter urban sprawl.
Credit: Courtesy of ERSAF - Regional Agency for Agriculture and Forestry Services, Milan

Urban Challenge: Adapting to Climate Change

UGI planning can play a significant role in adaptation to climate change, for example, by regulating the urban climate or reducing stormwater flooding.

Cities are increasingly facing the risks and consequences of climate change; among them, coastal erosion, flooding from heavy rainfall, heat extremes, drought, effects on health, higher energy demand for heating and cooling, and reduced availability of water and food[1]. This situation presents an urgent imperative to both mitigate the effects of climate change and adapt to them.

Climate change adaptation involves making changes to existing systems – whether natural, built or social. This means anticipating adverse effects and taking appropriate action to prevent or minimise the corresponding damage, as well as seizing opportunities that may arise. Adaptation differs from mitigation, which concerns efforts to reduce current and future greenhouse gas emissions and enhance carbon storage[2]. Both mitigation and adaptation strategies are needed to address the impacts of climate change, however, it is important to be aware that they do not always work in harmony with one another. For instance, increasing green space may reduce overall urban density and thus create less energy-efficient cities, whereas urban densification may reduce the adaptive capacity of cities.

UGI can play a key role in strategies for climate change adaptation and – to a lesser degree – mitigation, by delivering ecosystem services (↖Multifunctionality). Importantly, planned adaptation is more cost effective than emergency measures and retrofitting (↖Green Economy).

Their importance will increase in the future: trees offer shade to buffer the urban heat island effect in Munich. *Credit: Stephan Pauleit*

BOX A1: CLIMATE CHANGE ADAPTATION STRATEGY, ALMADA

Almada is a dense city in the Lisbon Metropolitan Area, Portugal. Its extensive coastline attracts about 8 million visitors annually, but the area also faces many challenges related to climate change, such as landslides, rising sea levels, drought, flash floods, salinisation, forest fires, and biodiversity loss. In response, Almada has developed an adaptation strategy that aims to create a healthier, safer and more resilient city.

Strategy development

In 1999, the municipality of Almada established the Department of Sustainable Environmental Strategy and Management (DEGAS) to address existing environmental problems. Additional funds were secured in 2012 from the 'EU Cities Adapt' project, which enabled further integration of its adaptation strategies into other departments' plans and projects. DEGAS led the strategy development and implementation and invited selected stakeholders to collaborate, including university research groups and the Energy Agency of Almada, which assessed vulnerabilities, monitored climate change impacts, and modelled scenarios.

Success factors

The establishment of DEGAS, its clear focus and its multi-skilled team have been key to Almada's success so far. A multiscale and multifunctional approach was also important, using the concepts 'ecosystem services' and 'urban resilience' to assess and reduce vulnerabilities related to climate change. In practice, this involved mapping and visualising the range of functions (existing and potential) provided by green spaces throughout the city and their capacity to reduce risks. Moreover, participation in EU Cities Adapt and other EU projects catalysed efforts through funding, capacity building and knowledge exchange.

The strategy has resulted in a range of implemented projects that incorporate adaptation measures across mobility, urban agriculture, coastal restoration, and reducing the heat island effect. Funding and human resource constraints are, however, considered a potential bottleneck for its further development.

Example project: Dune restoration on the S. João da Caparica beaches, increasing sand capture and retention capacity and enhancing resilience to erosion.
Credit: Almada City Council

Find out more...

Estratégia Local para as Alterações Climáticas no Município de Almada (in Portuguese). Câmara Municipal de Almada, 2007.

Coastal hazard mapping as an adaptation planning tool: Almada's Local Strategy for Climate Change. Lopes, N. et al, 2014. 5th Global Forum on Urban Resilience and Adaptation. Bonn.

EU Cities Adapt - Adaptation Strategies for European Cities: Final Report. Ricardo-AEA, 2013.

Urban climate regulation

The intensity, frequency and length of summer heatwaves is expected to increase in the future. Urban areas are hit particularly hard due to their high concentration of impervious surfaces. There is evidence that increasing the quantity of UGI elements can play a role in countering the urban heat island effect[3]. However, as individual parks have limited cooling capacity on their own, they should ideally form part of a network, including green corridors that allow cool, unpolluted air to penetrate the city from the surrounding countryside (↖Connectivity).

Control of riverine flooding and local stormwater floods

Intense rainfall events are likely to increase in frequency and magnitude because of climate change[4] and lead to a demand for improved stormwater management. Here, 'greening' grey infrastructure can play a role, e.g., utilising bioswales or rain gardens in lieu of conventional stormwater disposal systems (↖Integration).

Adaptation to sea-level rise

Cities in low-elevation coastal zones face the threat of rising sea-levels, with associated risks of submergence and coastal erosion and flooding. Among possible solutions are the maintenance and restoration of coastal landforms and ecosystems, including increasing vegetation so as to stabilise sand dunes[5] (↖Box A1 Almada).

KEY MESSAGES: UGI FOR ADAPTING TO CLIMATE CHANGE

Identify windows of opportunity

Where urban challenges are widely recognised, and the need to act upon them has gained legitimacy among decision-makers, they can be useful triggers for transforming the status quo. Identifying issues of a high political priority, reviewing corresponding plans and policies, and highlighting the range of benefits UGI is capable of delivering in this context can support a case for investing in UGI. For instance, the prominence that climate change has gained in many cities has helped some cities to secure support for related initiatives, such as green-grey integration (↖Box B4 Malmö, A1 Almada, and B3 Berlin).

Assess vulnerabilities to increase resilience

Effective strategies for climate change adaptation require continuous monitoring of the urban system in focus and an understanding of its specific vulnerabilities[6] (↖Assessing UGI networks). Therefore, UGI planning needs to draw on an integrated vulnerability assessment, targeting the reduction of risks and strengthening of resilience. Such an assessment should also take into account the synergies and potential conflicts between mitigation and adaptation strategies, as well as issues of distributional justice, given that socio-economically disadvantaged areas are often most vulnerable to climate change effects (↖Social Cohesion).

Coordinate efforts

While mitigation strategies often focus on specific sectors such as housing, transport or industries, adaptation strategies are cross-sectoral. This creates a particular imperative for collaborative strategy development and implementation processes that actively include relevant stakeholders[7] (↖Integration, ↖Social Inclusion). Universities and other research institutions can support assessment and monitoring processes (↖Box A1 Almada and B1 Szeged).

REFERENCES

1 Wilby, R. L., 2007. A review of climate change impacts on the built environment. Built Environment 33, 31–45.

2 IPCC – Intergovernmental Panel on Climate Change, 2014. Summary for policymakers. In: Field, C.B., et al. (eds.). Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Gr oup II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, New York, 1–32.

3 Shaw, R., et al., 2007. Climate change adaptation by design: a guide for sustainable communities. TCPA, London.

4 Tebaldi, C., et al., 2006. Going to the extremes – an intercomparison of model-simulated historical and future changes in extreme events. Climatic Change 2006, 79 (3–4), 185–211.

5 See IPCC, 2014.

6 United Nations Human Settlements Programme (UN-Habitat), 2014. Planning for Climate Change: A Strategic, Values-based Approach for Urban Planners – Toolkit. UN-Habitat, Nairobi, Kenya. Available from: https://unhabitat.org/books/planning-for-climate-change-a-strategic-values-based-approach-for-urban-planners-cities-and-climate-change-initiative/

Urban Challenge: Protecting Biodiversity

Biodiversity can be understood as the variation among living organisms and the ecological complexes of which they are part. UGI planning seeks to enhance opportunities to protect biodiverse environments and bring people into contact with them.

Loss of biodiversity is a major threat worldwide, requiring attention from policy-makers at the local, regional, national and global levels. Support for halting biodiversity loss has gained increasing attention since the release of the United Nation's Convention on Biological Diversity in 1992. Major recent initiatives include the UN's Strategic Plan for Biodiversity 2011-2020[1] and its Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Service (IPBES)[2], as well as the EU's Biodiversity Strategy to 2020[3], in addition to hundreds of plans at the local and regional levels.

Biodiversity includes diversity within and between species, the variety of original, semi-natural and man-made biotopes (such as forests, dry meadows or private gardens) and, at a larger scale, the diversity of ecosystems themselves[4]. Although urbanisation often negatively impacts upon biodiversity, urban areas can also harbour significant numbers of species and habitat types, thus offering opportunities both for biodiversity protection and for people to experience nature. Through strategic, integrated coordination and management, UGI planning seeks to enhance these opportunities and others. For instance, setting aside areas for 'wild nature' may result in lower management costs, while people in regular contact with species-rich environments may experience fewer allergies[5].

Tools and indicators for biodiversity assessment

Tools for assessing and valuing biodiversity can generally be divided into two categories: a) eco-spatial indicators and b) certification systems. The indicator approach tends to be expert-oriented and rely on remote sensing and field observations for verification, but some measures are useful for planners. For instance, at the site level, green area factors[6] can be a useful tool to calculate green space requirements for new developments. A range of other tools and indicators is outlined in ↖Toolbox T1.

Forests are important native habitats in Helsinki. Fiddlehead ferns awakening in a seashore wetland in early spring, on Helsinki's Vartiosaari island. Credit: Kati Vierikko

BOX A2: A UGI NETWORK FOR FOREST BIODIVERSITY, HELSINKI

The proportion of original natural green spaces in Helsinki, Finland, is one of the highest among European capitals. However, they are under increasing pressure from population growth. This threat has given rise to a combination of grassroots and governmental efforts to protect and enhance the city's biodiversity.

Formal and informal efforts

Biodiversity support has evolved in Helsinki along two largely independent paths: a formal one led by the city council, and another led by local conservation NGOs. The formal process resulted in an update of the Nature Conservation Programme (2015-2024), proposing 47 new forest areas to be conserved – almost double the total area currently protected. The plan was integrated with the broader City Master Plan, however, it was not fully supported by local conservation NGOs, who outlined their own proposal for a forest conservation network[7]. They prepared field inventories identifying endangered species, documented each proposed site according to standardised criteria (consistent with METSO The Forest Biodiversity Programme for Southern Finland[8]), and gathered supporting material, including GIS data.

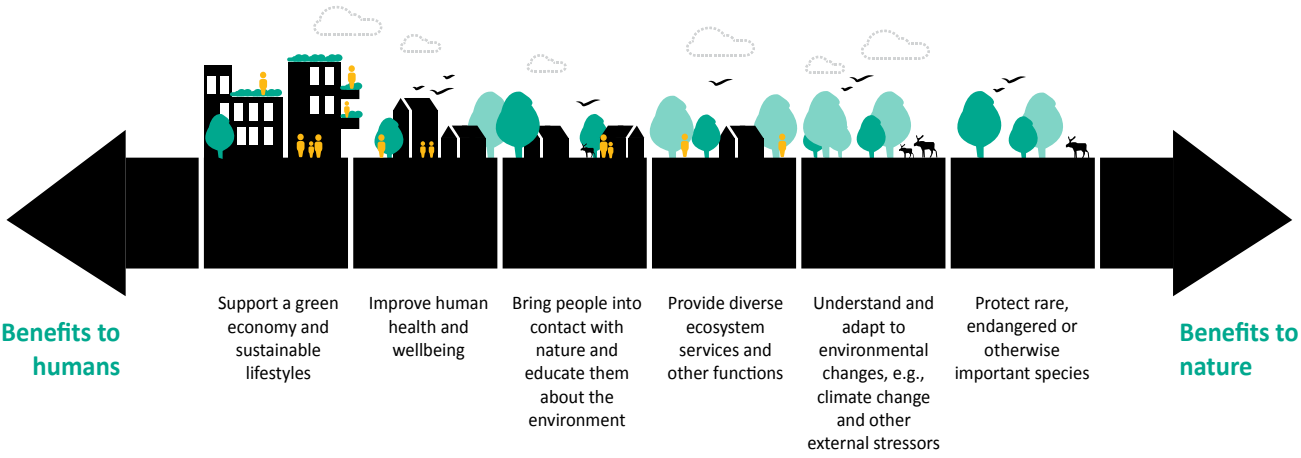
Lessons learnt

Both the formal and informal processes drew upon research provided by the University of Helsinki, and the NGOs' proposal influenced parts of the official Nature Conservation Programme. Overall, this is a successful example of the ability of bottom-up and top-down processes to interact. Yet it also indicates the limits of these interactions. Two-directional communication between the parallel processes was relatively low and the influence of local conservation groups remains fragile. The City Master Plan does not include quantitative green space targets or guidance on how to integrate biodiversity with grey infrastructure, and more work is needed to improve long-term management of natural habitats, as well as to raise awareness among residents of the importance of biodiversity.

Field inventories undertaken by local NGO experts produced valuable information on biodiversity and identified several endangered species to support a forest conservation network proposal.
Credit: Kati Vierikko

Find out more...

Sustainable green infrastructure of Helsinki – urban ecological research report and recommendations for the Helsinki master plan 2014. Vierikko et al., 2014 (in Finnish with English summary).



There are many motives for protecting urban biodiversity, with benefits for both nature and humans.
Credit: Design by Eleanor Chapman, adapted from Kati Vierikko, 2015, based on Dearborn and Kark, 2009[9].

KEY MESSAGES: UGI FOR PROTECTING BIODIVERSITY

Consider the full spectrum of urban biodiversity
Efforts to promote biodiversity need to be designed based on local conditions and consider the variety of urban biodiversity. In some cases it might be more appropriate to protect or enhance biotopes for locally-evolved and introduced flora and fauna (↖Box E5 Lisbon) rather than (or as well as) habitats for native species (↖Box A2 Helsinki).

Plan at multiple scales and beyond administrative boundaries
The spatial scale and boundaries relevant for biodiversity are often not the same as those that inform the planning and management of cities. This means planning decisions can inadvertently disrupt ecosystem processes and functions such as nutrient flow and evapotranspiration, reducing ecological resilience and impeding the operation of ecosystem services (↖Connectivity, ↖Multifunctionality). This obstacle can be reduced or overcome by multi-scale planning that reaches beyond city boundaries and links site development to city-wide UGI planning strategies.

Involve and promote benefits to locals to gain support
Local residents often benefit from living in or near species-rich environments, but this is not necessarily widely understood. Municipalities can take a more active role in raising awareness of the benefits of biodiversity, and in turn involving citizens in contributing to its protection.

↖Toolbox T1 for a range of criteria and indicators to evaluate biodiversity.

"Nearly all urban green infrastructure has some benefit to biodiversity. Developments can and should incorporate elements suitable for wildlife: in addition to birds and plants, mammals, insects, fungi and fish can all benefit from well-designed green infrastructure."[10]

REFERENCES

1 United Nations Environment Programme, n.d. Strategic Plan for Biodiversity 2011-2020. Available from: www.cbd.int/sp

2 See more on the IPBES website at www.ipbes.net

3 European Commission, 2011. Our life insurance, our natural capital: an EU biodiversity strategy to 2020. Communication from the Commission to the European Parliament, the Council, the Economic and Social Committee and the Committee of Regions. 3 May 2011, Brussels. Available from: http://ec.europa.eu/environment/nature/biodiversity/strategy/index_en.htm#stra

4 Convention on Biological Diversity, 1992. Section I. 3rd Edition. Available from: www.cbd.int/convention/ refrhandbook.shtml

5 Hanski, I., et al., 2012. Environmental biodiversity, human microbiota, and allergy are interrelated. PNAS.

6 See more at: www.integratedstormwater.eu/content/green-area-factor-and-other-tools

7 Helsingin luonnonsuojeluyhdistys, 2014. Arvometsäaloite 17th June 2014. Proposal for forest conservation network in Helsinki made by five nature conservation organizations. Available from: http://helsinginmetsat.fi/about/#

8 See more on the Ministry of Agriculture and Forestry website at http://mmm.fi/en/forests/biodiversity-and-protection/metso-programme

9 Dearborn, D. C., Kark, S., 2010. Motivations for Conserving Urban Biodiversity. Conservation Biology 24, 432–440

10 Forest Research n.d. Evidence Note: Ecological benefits of urban green infrastructure, p1.

Urban Challenge: Promoting a Green Economy

UGI planning can contribute to a green economy that aims to improve human well-being and social equity, while significantly reducing environmental risks and depletion of natural resources[1].

The recent global economic crisis and ongoing environmental challenges, such as climate change, have sparked a renewed interest in alternative economies and forms of growth. Of these, green growth and the transition to a green economy are the most widely discussed[2].

A holistic approach to sustainability underpins the green economy concept, which aims for simultaneous environmental, social and economic benefits. Alongside the conventional fiscal goals of avoiding costs and fostering economic efficiency, competitiveness and business opportunities, a green economy seeks to improve the quality of urban environments, reduce resource consumption by creating synergies between functions, and provide opportunities for people to engage with each other and with their environment. It is an emerging concept yet to be fully embraced by green space planners, although many cities already have planning objectives tied to related concepts like sustainable planning, green jobs, a low carbon economy, or attractive public spaces.

Making the case for a green economy[4]

Economic benefits

UGI planning can benefit cities' economies in a range of ways, both directly and indirectly.

Attractive urban green spaces can not only improve a city's competitiveness as a destination for new residents, businesses and tourists, but also help generate income, e.g., in the food and service industries, through leisure activities and special events[5]. For local business owners, greenery has been linked to positive shopper perceptions, lower stress levels and increased foot traffic: encouraging sales, while also increasing staff motivation. UGI can also support local food production and sale at farmers markets. Importantly, a green economy would see all such economic benefits weighed up against their corresponding social and environmental impacts in evaluating their net effect.

Economic efficiency – avoided costs

In addition to generating income, UGI planning can also help to avoid costs, e.g., by creating healthier communities or avoiding the damage caused by natural disasters. A cost-benefit analysis demonstrating such costs avoided through UGI can make a compelling case for investment in green space (↖Box B1 Copenhagen). One study estimated the average avoided costs from flood damage to housing in a 100 mile-long greenway along the Meramec River in the USA to be $7.7 million per year[6] (↖Integration).

Community gardening can help to avoid costs through increased self-sufficiency, but also offers potential for social encounters and improved wellbeing. Raised beds at Lochend Community Growing Project, Edinburgh.
Credit: Edible Edinburgh 2015

BOX A3: EDIBLE EDINBURGH

In 2014, the City of Edinburgh Council, Scotland, launched the Edible Edinburgh Sustainable Food City Plan, with a vision for good food available to all, healthy, thriving communities and a sustainable environment.

The plan emerged from a cross-sector partnership. It aims, among other things, to achieve sustainable food procurement in the three largest public sector organisations of the city so as to: develop the local, independent food sector, support skills training, make more land available for food production, minimise the city's ecological footprint, improve health and wellbeing, and strengthen communities and their relationship to food.

Developing the strategy

The impetus for the plan emerged in 2011, after consultation for another strategic plan 'Sustainable Edinburgh 2020' revealed food to be a major community concern. A coalition of 12 organisations from the public, private and civil society sectors (including nonprofits, universities, restaurants and business associations) formed to explore possibilities for a local food strategy. Initially, monthly seminars were organised for a one-year period, where aims, objectives, actions and ways of working together were discussed. At the final session, the coalition agreed that there were sufficient synergies to formally endorse 'Edible Edinburgh'. By autumn 2013, a common vision had been formulated and was released for consultation. Over 400 responses were taken into account in the final version.

The coalition is independent, yet linked to existing governance structures, since it is chaired by a councillor, and aims to influence political agendas. It encountered two main challenges: firstly, coming to an agreement about the aims and objectives of the initiative, with broad support from the range of actors and interests present, and secondly, getting buy-in from councillors and key organisations in order to influence decision making. Today, both these hurdles have been overcome – for example, the group successfully petitioned the leaders of Edinburgh and Glasgow City Councils to issue a joint pledge on food poverty. These achievements have been supported by a policy framework that requires local authorities to collaborate with other departments and the third sector, as well as the objective of the Community Empowerment Act (passed in 2015) to strengthen community influence over development decisions.

Find out more...

A Sustainable Food City Plan. Edible Edinburgh, 2014.

Joint Statement on Food Poverty. Published by the Leaders of Edinburgh and Glasgow City Councils, 2015.

Picky Eaters Workshop at Lochend Community Growing Project.
Credit: Edible Edinburgh 2015

Health benefits

Access to green space in cities has been shown to positively affect health in a range of ways, among them longer lives, quicker recovery from surgery, reduced stress, mental health benefits and improved self-reported perceptions of health – all of which translate into greater well-being and reduced health care costs. Employee health is also relevant for businesses. A significant relationship has been found to exist between access to green space in and around the workplace and the attitudes and stress levels of employees.

The social impetus for a green economy

A green economy can also be a powerful tool to support more socially engaged and equitable communities[7]. Where people feel attached to their local urban green spaces, they may be inspired to become more actively involved in related planning processes. Green spaces are also generally free and open to all, encouraging a mix of people with varied backgrounds to interact (↖Social Cohesion). Lastly, green spaces can provide opportunities for direct engagement with the environment, whether through farming, gardening, volunteering, or informal creative ventures. These experiences can contribute to individual wellbeing, learning and the development of social and professional skills (↖Box A3 Edinburgh, C6 Milan, and E6 Berlin).

KEY MESSAGES: UGI FOR PROMOTING A GREEN ECONOMY

Collaborate with non-governmental actors

Promoting a green economy usually requires engaging with a wide range of actors (↖Box A3 Edinburgh and E6 Berlin). The challenges introduced by a diverse range of interests may also be offset by costs saved through reduced municipal management expenditure and a healthier, more socially cohesive community.

Balance private and public interests

A green economy must consider the distribution of benefits, for example by implementing measures to prevent residents from being displaced through gentrification (↖Social Cohesion). When engaging the private sector as a partner, it is particularly important to ensure that incentives and regulations are carefully balanced between private profit, on the one hand, and public needs and benefits on the other[8].

Consider the full spectrum of benefits: ecological, social AND economic

Accounting for the social and ecological benefits of green spaces, alongside their potential to generate income and indirect economic benefits, demands an integrated approach to planning. While priorities will vary depending upon the context, a green economy seeks to maximise each of these three dimensions to the degree possible in the interest of long-term sustainability, rather than prioritising monetary gains.

↖Toolbox T2 for approaches to mapping and assessing economic benefits.

For a detailed study on the economic and health benefits of UGI, see **Integrating green infrastructure ecosystem services into real economies.** Deliverable 4.1.

REFERENCES

1 UNEP, 2012. Measuring Progress towards an Inclusive Green Economy. Nairobi, Kenya.

2 Simpson, R., 2013. 'Introduction: A Green Economy for Green Cities', in Simpson, R. and Zimmermann, M. (eds.). The Economy of Green Cities. Springer Netherlands, 13–16.

3 UNEP, 2011. Green Jobs: Towards a green economy: pathways to sustainable development and poverty eradication. Kenya, p16.

4 A detailed literature review on the economic benefits of UGI can be found in Andersson, E., et al. (eds.), 2015. Integrating green infrastructure ecosystem services into real economies. Report of the GREEN SURGE project (Deliverable 4.1), Copenhagen

5 Rolls, S., Sunderland, T., 2014. Microeconomic Evidence for the Benefits of Investment in the Environment 2 (MEBIE2), Natural England Research Reports. Natural England, Bristol. Available from: http://publications.naturalengland.org.uk/publication/6692039286587392

6 Kousky, C., Walls, M., 2014. 'Floodplain conservation as a flood mitigation strategy: Examining costs and benefits', Ecological Economics 104, 119–128.

7 Dunn, A.D., 2010. Siting green infrastructure: Legal and policy solutions to alleviate urban poverty and promote healthy communities, Boston College Environmental Affairs Law Review 37, 41–66.

8 Merk, O., et al, 2012. Financing Green Urban Infrastructure (OECD Regional Development Working Papers). OECD, Paris. Available from: www.oecd.org/cfe/regional-policy/WP_Financing_Green_Urban_Infrastructure.pdf

Urban Challenge: Increasing Social Cohesion

Social cohesion can be understood as the capacity of a society to ensure the welfare of all its members, minimising disparities and avoiding inequality. UGI can play an important role in fostering interactions between different social groups, and in turn improving social cohesion.

While ethnic and cultural diversity are on the rise throughout Europe, local governments also have to respond to aging populations and growing social inequalities. All of these factors are expected to increase social exclusion. Countering this trend, and its associated negative effects, is a key priority on European, national, and local political agendas. Social cohesion is based on the principle that people from different backgrounds should have similar life opportunities and access to services, including green spaces[1].

At highest risk of social exclusion are those who are different from the majority of the population, whether through income level, ethnicity, nationality, language, religion, age or health status; or who are otherwise vulnerable[2]. For a variety of reasons, such people tend to both be concentrated in specific areas of cities, and to experience limits in the extent to which they can travel beyond these areas[3]. This means that the quality of their neighbourhoods, and the interpersonal relationships within them, are of vital importance. In addition, since many urban areas (such as malls or pedestrian zones in commercial districts)carry the expectation that users will spend money, cost-free green spaces are of particular importance to lower-income groups[4].

UGI can counter social exclusion, and likewise build social cohesion, in different ways, such as by being free and accessible to all, providing space for social interaction, and fostering opportunities for volunteerism. Evidence also exists that UGI can relieve stress and fatigue, and facilitate attachment to specific places, promoting feelings of comfort and further adding to social cohesion[5,6].

Urban green spaces offer opportunities for relaxation, social contact and interaction. Get-together at an intercultural garden in Freising, Germany. Credit: Emily Rall

Improved social cohesion through UGI can result in a range of avoided costs and other economic benefits. For instance, around high-rise apartment buildings, numerous studies have linked UGI to higher levels of social interaction and less crime and vandalism. A 2009 study in the UK estimated that a 1% reduction in crime as a result of increased social cohesion in England and Wales would save between €267-733 million7. Using monetary assessments of this kind to demonstrate the crime-reduction potential of UGI could convince governments struggling with limited financial resources to invest in UGI planning and implementation for social cohesion. (↖Green Economy, Assessing UGI networks). A range of assessment tools exists (↖Toolbox T3).

The Highline in New York City is a well-known example of an unusual green corridor on an elevated former railroad spur. It became a major tourist attraction within just a few years of opening. On the downside, it tends to be crowded and has been criticised for boosting property prices in the area – contributing to gentrification and displacing poorer residents.
Credit: Rieke Hansen.

Counterbalancing exclusionary effects

Improving neighbourhood character through UGI can result in gentrification, with rising housing costs and property values ultimately displacing the disadvantaged social groups who were targeted as beneficiaries in the first place. Here, supporting 'anti-gentrification' policies such as rent stabilisation, housing trusts and local employment quotas have an important role to play. Another strategy that planners can adopt is the 'just green enough' approach[8], where UGI projects are shaped by local community concerns rather than market-driven urban design conventions, and are modest enough not to attract speculative investment[9]. Striking this balance requires community involvement in design and planning (↖Social Inclusion).

BOX A4: GRANTON COMMUNITY GARDENERS

Granton Community Gardeners (GCG) is a grassroots community gardening initiative in a disadvantaged part of northern Edinburgh. It was started in 2010 by locals living in flats without gardens who wanted to grow vegetables close to home.

GCG operates largely independent of grant funding, and as a result is not bound by externally-imposed requirements. The City of Edinburgh Council does, however, provide ongoing, in-kind support in the form of land, and has given the group a letter of comfort approving their ongoing management of the spaces.

Since starting out, the group has gradually expanded activities from a single garden to nearly ten, involving people from a large range of cultural backgrounds who work together, sometimes across different plots, and share the produce.

Success factors include powerful community buy-in, an explicit focus on intergenerational and intercultural cooperation; a flexible, independent approach; and use of various communication channels and events (such as workshops and community meals) to engage local residents.

Volunteers in a GCG street corner garden.
Credit: Granton Community Gardeners 2015

Find out more...

Community Gardening overview and map on the Edinburgh & Lothians Greenspace Trust website

KEY MESSAGES: UGI FOR INCREASING SOCIAL COHESION

Access

Access to UGI includes both geographic proximity to green space (e.g., Natural England's Accessible Natural Greenspace Standard recommends a distance of no more than 300 metres from one's home, ⇱Toolbox T3) and access to it via public transport, especially for vulnerable residents (⇱Connectivity).

Welcoming places

Visitors must feel safe and welcome, and find green spaces attractive and of interest for use. Careless planning and management may neglect the many gender-based, ethnic, and disability-related barriers to use. For instance, ethnic minorities and women may feel more threatened or unsafe in secluded spaces[10]. Planners need to take into account the needs, motivations and preferred uses of a range of groups (⇱Multifunctionality). To ensure these interests are represented, different user groups need to be engaged in UGI planning (⇱Social Inclusion). Communication with and outreach to local communities can be decisive factors for attracting people from a range of socio-economic backgrounds (⇱Box A4 Edinburgh and C6 Milan).

Space for social encounters

Urban green spaces can provide a platform for social contact and interaction, which helps to prevent loneliness and to extend social networks[11], and may reduce social tensions[12]. To really be successful, however, UGI must provide adequate amenities in connection to existing economic and social networks, instead of being limited to design. Local attachments to existing spaces should also be considered, instead of trying to solve perceived 'anti-social' behaviour by displacing it elsewhere[13].

Fostering engagement and self-regulation

Bringing people together for a common purpose, whether through cultural events, volunteer activities, or even by providing some basic amenities, can catalyse social interactions. Active engagement in the design and/or management of UGI can help to build local skills and lead to cleaner, safer, active spaces[14]. Local governments can act as facilitators and support bottom-up initiatives by promoting self-management and defining framing conditions (⇱Box C3 Utrecht). UGI designs should be flexible, leaving room for self-organisation and initiative (⇱Box E6 Berlin). Urban gardening is a good example (⇱Box A4 Edinburgh and B5 Ljubljana).

See Toolbox T3 for exemplary methods and tools to increase social cohesion

REFERENCES

1 Council of Europe, 2004. Strategy for Social Cohesion (Revised). European Committee for Social Cohesion, p1.

2 Kazmierczak, A.E., James, P., 2007. The role of urban green spaces in improving social inclusion. Presented at the 7th International Postgraduate Research Conference in the Built and Human Environment, University of Salford, Manchester.

3 Kemperman, A., Timmermans, H., 2014. Green spaces in the direct living environment and social contacts of the aging population. Landscape and Urban Planning 129, 44-54.

4 Ward Thompson, C., 2002. Urban open space in the 21st century. Landscape and Urban Planning 60, 59-72.

5 See Kazmierczak et al., 2007.

6 Peters, K., et al., 2010. Social interactions in urban parks: Stimulating social cohesion? Urban For Urban Green. 9, 93-100.

7 Department for Communities and Local Government: Annual Report 2009. Community, opportunity, prosperity. Available from: www.gov.uk/government/uploads/system/uploads/attachment_data/file/228792/7598.pdf

8 Curran, W., Hamilton, T., 2012. Just green enough: Contesting environmental gentrification in Greenpoint, Brooklyn. Local Environment 17, 1027-1042.

9 Wolch, J. R., et al., 2014. Urban green space, public health, and environmental justice: The challenge of making cities "just green enough". Landscape and Urban Planning 125, 234–244., p241.

10 See Ward Thompson, 2002.

11 Kaźmierczak, A., 2013. The contribution of local parks to neighbourhood social ties. Landscape and Urban Planning 109, 31-44.

12 Oliver, J.E., Wong, J., 2003. Intergroup Prejudice in Multiethnic Settings. American Journal of Political Science 47, 567-582.

13 Worpole, K., Knox, K., 2007. The social value of public spaces. Joseph Rowntree Foundation, York.

14 Forest Research, n.d. Social interaction, inclusion and community cohesion (Evidence Note). Available from: forestry.gov.uk

FURTHER READING

PRACTICAL GUIDANCE

CLIMATE CHANGE

Urban adaptation to climate change in Europe: Challenges and opportunities for cities together with supportive national and European policies. European Environment Agency (EAA), Copenhagen. EEA Report No 2/2012. EEA, 2012.

Climate change adaptation by design: a guide for sustainable communities. London. Shaw, R., Colley, M., and Connell, R., 2007.

Planning for Climate Change: A Strategic, Values-based Approach for Urban Planners – Toolkit. UN-Habitat, Nairobi. United Nations Human Settlements Programme (UN-Habitat), 2014.

BIODIVERSITY

The Green Leap. A Primer for Conserving Biodiversity in Subdivision Development. University of Californian Press. Hostetler, M. E., 2012.

biodiverCities: A Primer on Nature in Cities. ICLEI—Local Governments for Sustainability (Management) Inc., Toronto. ICLEI, Toronto and Region Conservation Authority, 2014.

Biodiversity by Design: A guide for sustainable communities. Town and Country Planning Association (TCPA), London. URBED (the Urban and Economic Development Group), the TCPA and ALGE for the TCPA, 2004.

GREEN ECONOMY

Financing Green Urban Infrastructure (OECD Regional Development Working Papers). OECD, Paris. Merk, O. et al., 2012.

Microeconomic Evidence for the Benefits of Investment in the Environment 2 (MEBIE2), Natural England Research Reports. Natural England, Bristol. Rolls, S., Sunderland, T., 2014.

SOCIAL COHESION

The social value of public spaces. Joseph Rowntree Foundation, York. Worpole, K., Knox, K., 2007.

B CORE PRINCIPLES OF UGI PLANNING

Green-grey integration
Connectivity
Multifunctionality
Social inclusion

PRINCIPLE **GREEN-GREY INTEGRATION** B

Combining green and grey infrastructure

"Integration concerns the interaction and links between urban green infrastructure and other urban structures. [...] the new approach means that these are increasingly viewed as integrated partners."[1]

KEY OBJECTIVES

Green-grey integration...

...aims at physical and functional synergies between urban green space and other kinds of infrastructure.

...not only targets primary infrastructural needs, but also seeks to provide wider environmental, social and economic benefits.

...is based on sound knowledge from different disciplines and sectors, and on cooperation between them.

UGI planning seeks to integrate and coordinate urban green spaces with other infrastructure, such as transport systems and utilities.

In contemporary cities, many urban issues, including mobility and the management of storm- and wastewater are addressed through engineered or 'grey' infrastructure, such as canals, pipes or asphalted streets. UGI planning for integration considers urban green spaces as another kind of infrastructure, with the potential to complement or even replace this grey infrastructure.

Integrating infrastructure can lead to multifunctional solutions which provide various benefits simultaneously (↖Multifunctionality). For example, vegetated road buffers can improve aesthetics and reduce noise and air pollution, while dispersed planting strips or rain gardens in high flood-risk neighbourhoods can enhance the stormwater management capacity of conventional grey systems and buffer climate change effects (↖Climate Change Adaptation).

Green-grey integration in UGI planning is most prominently related to stormwater systems. However, it can also apply to other kinds of infrastructure, e.g., bike paths along rights-of-way below powerlines, gardens along railways, and street trees that reduce the heat island effect. While there are other possible applications of integration, this guide focuses on two major areas: stormwater management and sustainable mobility.

The Water Square Benthemplein in Rotterdam looks much like a conventional plaza for playing sports and hanging out, but doubles as a water collection system during rain.
Credit: Rieke Hansen

UGI in stormwater management

Managing stormwater is one of the biggest challenges faced by cities around the world. Due to the high amount of impervious surfaces, stormwater cannot infiltrate and is sent straight to the sewage system. Depending on the age, design and capacity of this system, there is a risk of overflows during heavy rain events. The potential consequences are not only local flooding and pollution of nearby lakes, rivers and streams, but also longer-term negative effects on water quality, human health and ecosystems.

Both centralised and decentralised green-grey solutions are available: the former using large, singular elements such as wet or dry ponds adjacent to development, the latter seeking to capture, detain and filter runoff at the source, through elements such as pervious paving and bioswales (↖Box E1 Malmö).

BOX B1: COPENHAGEN CLOUDBURST PLAN

Copenhagen's Cloudburst Management Plan (2012) demonstrates an integrated approach to intermediary stormwater storage in streets and conveyance to the main sewage pipes, offering substantial long-term cost savings.

Redesigning the streets offers opportunities to enhance their aesthetic and recreational quality as well as to promote biodiversity by introducing trees and other vegetation. A cost-benefit-analysis showed that the costs for implementing these measures in the inner city between 2013 and 2033 would be approximately €500 million, compared to €800 million of flooding damage caused by a single major rainstorm in 2011. Implementation of the plan is underway.

Find out more...

Copenhagen Cloudburst Management Plan. City of Copenhagen, 2012.

KEY TERMS [2,3]

Bioswales, Biofiltration swales: shallow conduits/trenches filled with vegetation resistant to erosion and flooding, designed to slow stormwater runoff and improve water quality through infiltration.

Low Impact Development (LID): land development strategy for managing stormwater at the source with decentralised micro-scale control measures.

Stormwater Control Measures (SCM): measures such as bioretention systems (structural approach) and programmes to disconnect residential downpipes (non-structural approach).

Sustainable Urban Drainage Systems (SUDS): technologies for sustainable stormwater drainage, usually organised to work together in sequence.

The 1.5km-long linear Hans-Baluschek-Park in Berlin is popular for biking and inline skating. It belongs to Berlin's city-wide bike network and is also part of the long-distance Leipzig-Berlin bike trail.
Credit: Emily Rall

BOX B2: INTEGRATION DURING URBAN RENEWAL, SZEGED

In the City of Szeged, Hungary, integration of grey and green infrastructure is reflected in everyday urban planning practice rather than formalised in planning documents. The Dugonics Square renewal (2009-2013) involved a major upgrade of existing utilities, integrated with greenery to calm traffic and improve both the quality of public space and the city's micro-climate.

A range of challenges emerged in the course of the project, including constraints imposed by outdated building regulations, a lack of data on the location of underground utilities, conflicts between the interests of local residents, tourists and businesses, and a public procurement process reliant on the lowest-price principle.

Some of these issues were partly overcome by good cooperation between departments within the municipality. Other issues provide lessons that will be useful for future projects. For instance, the municipality has now created a checklist of stakeholders to guide which of them should be involved at each stage of a redevelopment process. Further, it has actively engaged a local university department to prepare a tree cadastre, supporting future monitoring of the micro-climate city-wide. In 2014, the project was awarded a Public Space Renewal Award of Excellence by the Hungarian Urbanistic Association and UNESCO.

Children playing in fountain, following the urban renewal (Árpád Square, adjacent to Dugonics Square).
Credit: Luca Száraz

Retention ponds and bioswales can retain heavy rainfall over short periods and are usually most effective at managing stormwater, although individual elements such as trees may also have an impact. In regard to stormwater management overall, UGI can offer:

- ***Not only aesthetic, but also functional value over grey infrastructure, e.g., improved urban climate through increased evapo-transpiration, reduced material corrosion through removal of pollutants from water runoff, and less hydrological strain on receiving water bodies in dry periods.***
- ***Substantial longer-term cost savings for city authorities (↖Green Economy, ↖Box B1 Copenhagen).***
- ***Significant reductions in stormwater runoff, from anywhere between 7 and 56% depending upon context, quality and maintenance of UGI systems[4].***

UGI in sustainable mobility

Integrating vegetation and green spaces into transportation networks is not a new concept, however, it has experienced a resurgence around the world in the past few decades. Increasingly, local governments are seeking to draw on the approach to create more attractive and environmentally sustainable mobility routes, e.g., pedestrian-friendly urban spaces (↖Box B2 Szeged).

At the community and neighbourhood level, too, interest is growing in green, walkable streets that integrate transit, safe pedestrian access and stormwater management – known as 'green streets' or 'complete streets'. There is evidence that even simple measures such as landscaping along roadsides can help to calm traffic, block wind, increase driver alertness and lower stress[5].

Green-grey integration in planning practice

In general, the need to shift towards more efficient and integrated systems, incorporating UGI, has been globally recognised[6] and in some cases translated into legislation, e.g., the US Environmental Protection Agency's Clean Water Act or the EU Water Directive. The challenge is to translate these high-level agendas to the local level and into concrete measures. Barriers to implementation exist in many cities, including a lack of funding, lack of access to land, low levels of citizen engagement, and administrative fragmentation. Nonetheless, there are good examples of municipal policies for green-grey integration available (↖Box B1 Copenhagen and E1 Malmö). If such 'hard' instruments are absent, incentives, voluntary rating schemes (e.g., Leadership in Energy and Environmental Design, LEED for short[7]) or guidelines can also encourage integrated approaches.

KEY MESSAGES FOR GREEN-GREY INTEGRATION

Good cooperation

Cooperation among urban planners, green space planners and grey infrastructure planners is an important factor of success for green-grey solutions. Since government administration is often fragmented across many departments, overcoming uncooperative or even adversarial departmental relationships is an important starting point. Political leadership, early departmental involvement, use of a common terminology, and an emphasis on synergies and shared goals can help.

Learn from local pilot projects

Pilot projects can promote awareness of green-grey measures and their potential, as well as cooperation between departments, enabling continuous learning and paving the way to implement similar solutions in other parts of the city (↖Box E1 Malmö).

Combine 'hard' and 'soft' instruments for implementation

Legislation can provide a powerful mandate and fiscal support to green-grey integration. Examples are provisions in building and planning legislation (↖Box Malmö) or using environmental impact charges to landowners to fund green-grey measures. In the absence of sufficient legislation, and where municipal budgets are constrained, 'soft' instruments like incentives or voluntary rating schemes can provide a way forward.

Multifunctional UGI designs

If UGI designs are to capture the full potential of integration, multiple functions and the specific context of designs should be taken into account (↖Multifunctionality). A substantial evidence base of benefits (including often overlooked social benefits), and UGI performance is still in development, but some guidance is available[8].

↖Toolbox T4 for methods and tools to help integrate green and grey infrastructure.

REFERENCES

1 Pauleit, S., et al., 2011. Multifunctional Green Infrastructure Planning to Promote Ecological Services in the City, in: Breuste, J.H., et al. (eds.), Urban Ecology: Patterns, Processes, and Applications. Oxford University Press, p272.

2 Ahiablame, L.M., et al., 2012. Effectiveness of Low Impact Development Practices: Literature Review and Suggestions for Future Research. Water Air and Soil Pollution. 223, 4253–4273.

3 Fletcher, T.D., et al., 2014. SUDS, LID, BMPs, WSUD and more – The evolution and application of terminology surrounding urban drainage. Urban Water Journal. 0, 1–18.

4 Autixier, L., et al., 2014. Evaluating rain gardens as a method to reduce the impact of sewer overflows in sources of drinking water. Science of the Total Environment. 499, 238–247.

5 Dixon, K., Wolf, K., 2007. Benefits and Risks of Urban Roadside Landscape: Finding a Livable, Balanced Response, in: Proceedings of the 3rd Urban Street Symposium, Washington D.C.

6 UNEP, 2014. Green Infrastructure Guide for Water Management. Ecosystem-based management approaches for water-related infrastructure projects.

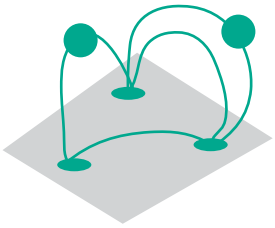
7 See more at www.usgbc.org/leed

8 See Ahiablame et al., 2012.

PRINCIPLE **CONNECTIVITY**

Creating green space networks

B



"The strategic connection of ecosystem components – parks, preserves, riparian areas, wetlands, and other green spaces – is critical to maintaining the values and services of natural systems."[1]

KEY OBJECTIVES

Connectivity…

…involves both structural and functional connections between green spaces, in order to create added value from an interlinked system.

…targets clearly defined functions and benefits for humans and wildlife, recognising the different kinds of connectivity (ecological, social and abiotic) and the potential for synergies between them.

…matches aims and strategies to different spatial scales – regional, city and local – and ideally is integrated across them.

UGI planning aims to create a well-connected green space network that serves humans and other species. This involves creating and restoring connections to support and protect processes, functions and benefits that individual green spaces cannot provide alone[2].

Landscape connectivity can be broadly defined as the extent to which movement and flow is enabled or inhibited by the landscape[3]. It has played a central role in the field of landscape conservation for some time, for instance in countering the negative impacts of wildlife habitat fragmentation[4]. Yet connectivity is also of relevance to more direct human benefits, such as improved movement between homes and recreational spaces, e.g., via safe and attractive bicycle paths, and other modes of sustainable mobility. UGI networks are not just important for enabling the movement of people and wildlife, they can also support abiotic flows, such as of energy, water and air[5]. Ventilation corridors improve the supply of fresh air and reduce pollution, while the cooling effect of urban parks is enhanced when these form part of a network. In this way, interconnected green spaces can minimise environmental risks and the impacts of climate change (⇖Climate Change Adaptation).

The Isar river in Munich serves as a central urban recreation space and an important regional ecological corridor. The riverbanks also act as a green corridor for walking and biking. *Credit: Rieke Hansen*

Structural and functional connectivity

Common approaches to connectivity emphasise its 'structural' dimension, i.e., the spatial structure of the landscape and physical relationships between green spaces[6]. However, such an emphasis fails to take into account the 'functional' dimensions of the landscape, i.e., the attributes and behaviour of the wildlife and humans that interact with the overall landscape structure. Functional connectivity considers these behavioural aspects, including habitat preferences, patterns of movement and ability to adapt to changes in the environment[7].

While structural impacts on connectivity, e.g., a road through a nature reserve, tend to be visible and readily understood, wider social and ecological effects can only be fully grasped by considering functional connectivity, too[8]. Failing to do so may result in inappropriate planning strategies[9]. This means that successful planning for connectivity relies on a holistic consideration of functional and structural aspects.

In addition, the kind of connectivity purposes must be clearly defined, ideally encompassing ecological, social and abiotic movement, and seeking synergies between them[10] (↖Multifunctionality).

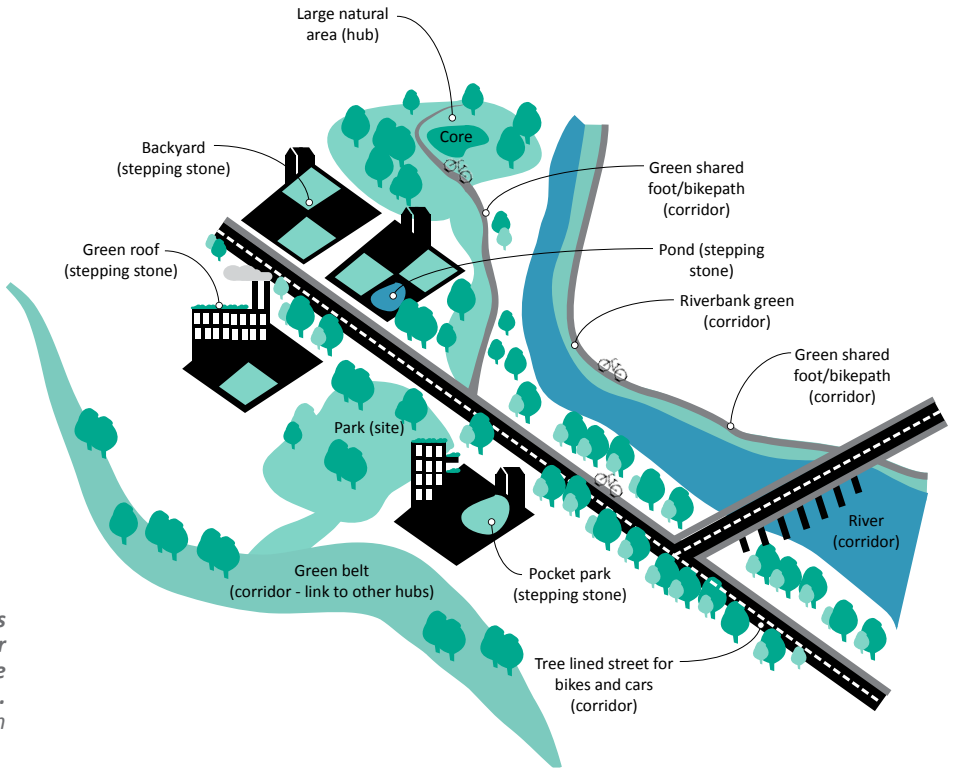
Connectivity in planning practice

The value of linking green spaces is already widely recognised in European planning (see Deliverable 5.1). However, the level of understanding of connectivity's objectives and benefits differs between cities. Structural connectivity issues tend to be more prominent than functional ones, while ecological and social connectivity objectives in local and regional plans are not always directly integrated with another, with some exceptions (↖Box B3 Berlin). Still, some municipalities are recognising the importance of coordinating connectivity plans at multiple scales and according to a long-term timeframe (↖Box E2 Milan and B3 Berlin).

Measuring and assessing connectivity

Numerous quantitative approaches have been developed to measure and map connectivity. Measures of structural connectivity are often based on concepts such as presence or absence; or the size, form and shape of corridors and stepping-stones (see illustration below). Connectivity can be calculated using various indices such as distances, frequency, density, or cost distance analysis (based on graph theory principles). Aerial photography archives and GIS software can assist in visualising changes to green corridors over time.

Often, such data is used as a surrogate for the functional elements of connectivity, based on assumptions. However, there are additional measures to assess functional connectivity that consider the probability of organism movement between patches; dispersal ability and rate; and the permeability of the landscape/urban matrix. Overall, a range of measurement and assessment tools are available (↖Toolbox T5).



An urban green infrastructure network is made up of many elements that together facilitate movement through the city landscape.
Design: Eleanor Chapman

BOX B3: INCREASING CONNECTIVITY AT THE CITY LEVEL, BERLIN

Against a backdrop of rapid population growth, the city-wide Landscape Programme (LaPro) has been an important strategic instrument for promoting social and ecological connectivity in Berlin, Germany.

The LaPro is a binding plan for the public administration and closely linked to the city's land use plan. Its objectives are tied to four key themes: natural environment including urban climate, habitat and species protection, recreation, and landscape aesthetics. These are supported by the 'General Urban Compensation Plan' (GAK). The GAK identifies gaps in the city's green space network and suggests priority measures, while funding for implementation is provided through mandatory impact mitigation and compensation regulations for development projects. If environmental impact mitigation is not possible within a given site, developers pay for compensatory measures in other places.

Achievements and lessons

Combining strategic planning with legislation for impact compensation has helped to continuously improve connectivity in Berlin's green space network. In addition, a major success factor has been good cooperation between different units within the (former) Senate Department for Urban Development and the Environment, and the related building of linkages between policies and projects. There has also been successful cooperation with non-state actors within the '20 Green Walks' project: a collaboration between the state of Berlin, multiple NGOs and over 100 volunteers to better link neighbourhoods with green areas, resulting in about 550km of networked green corridors for recreation and everyday mobility on foot or bike.

The LaPro has been updated at broadly ten year intervals since it was established in the 1980s, with the current version from 2016 drawing on new scientific findings and Berlin's changing character to refine strategies and targets. For instance, the accessibility of recreation areas has been identified as a more relevant target in dense areas, since the previously-determined minimum standard for green area per inhabitant cannot realistically be met. Further, growing awareness of the limits of corridors for urban cooling has stimulated a shift to focus also on targeted greening in the dense areas. However, implementation of these objectives still often relies on external funding as municipal budgets are limited.

The Schöneberg Loop

One celebrated outcome of Berlin's efforts to increase connectivity is the 'Schöneberger Schleife', a seven km-long, car-free green corridor, which connects Potsdamer Platz with Südkreuz train station, as well as with existing parks in-between. The project was funded mainly by Federal programme 'Urban Renewal West' and aims for greater supply of, and connectivity to, green and recreational areas, for the benefit of both residents and tourists. The corridor has been heavily used since phased works began.

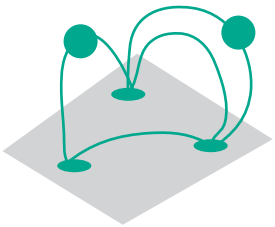
Finalised part of the Schöneberg Loop.
Credit: Rieke Hansen

Find out more...

Landscape Programme for the City of Berlin (in German)

Article 'A project celebrates its 25th birthday: The Landscape Programme including Nature Conservation for the City of Berlin'. Cloos, 2004.

20 Green Walks in Berlin



KEY MESSAGES FOR CONNECTIVITY

Clearly define the kind of connectivity, functions and aims

Increasing connectivity requires planning on large spatial scales and consideration of different kinds of connectivity, such as for humans, for biodiversity, or for urban climate. Practitioners should clearly define these functions and relevant actors in developing a plan for connectivity.

Think long-term and integrate objectives at multiple levels

Connectivity objectives are best achieved when a long-term outlook is adopted, combined with regular monitoring and updates to incorporate new scientific knowledge and implementation strategies. Planning guidance at a particular spatial scale should additionally be 'nested' with related policies and instruments (including incentives and regulations) at multiple scales and across sectors (⇱Box E2 Milan and B3 Berlin).

⇱Toolbox T5 for tools to evaluate social and ecological connectivity.

REFERENCES

1 Benedict, M. A., McMahon, E. T., 2006. Green infrastructure: Linking landscapes and communities. Washington, D.C. Island Press, p37.

2 Ahern, J., 2007. Green Infrastructure for cities: The spatial dimension. In: Novotny, V. (ed). Cities of the future: Towards integrated sustainable water and landscape management. London. IWA Publications.

3 Taylor, P.D., et al., 2006. Landscape connectivity: a return to the basics. In: Crooks, K.R., Sanjayan, M. (eds). Connectivity Conservation. Cambridge. Cambridge University Press.

4 Jongman, R.H.G., et al., 2004. European ecological networks and greenways. Landscape and Urban Planning 68 (2-3), 305-319.

5 Bagstad, K.J., et al., 2014. From theoretical to actual ecosystem services. Mapping beneficiaries and spatial flows in ecosystem service assessments. Ecology and Society, 19(2), art. 64.

6 Tischendorf, L., Fahrig, L., 2000. On the usage and measurement of landscape connectivity. Oikos 90, 7-19.

7 Baudry, J., Merriam, G., 1988. Connectivity and connectedness: functional versus structural patterns in landscapes. In: Schreiber, K.F. (ed). Connectivity in landscape ecology, 2nd International seminar of the International Association for Landscape Ecology. Münstersche Geogr. Arbeiten 29, 23-29.

8 Auffret, A. G., et al., 2015. The spatial and temporal components of functional connectivity in fragmented landscapes. AMBIO 44 (Suppl 1). 51-59.

9 See Taylor et al., 2006.

10 Fumagalli, N. & Toccolini, A., 2012. Relationship between greenways and ecological network: A case study in Italy. International Journal of Environmental Research 6(49), 903-916.

PRINCIPLE **MULTIFUNCTIONALITY**

Delivering and enhancing multiple functions and services

B

"Multifunctionality can apply to individual sites and routes, but it is when the sites and links are taken together that we achieve a fully multifunctional green infrastructure network."[1]

KEY OBJECTIVES

Multifunctionality...

...aims to secure and increase the multiple ecological, socio-cultural and economic benefits of UGI.

...considers interrelations between different functions and services and the capacity of different urban green spaces to provide them, while avoiding trade-offs.

...targets the social questions of demand for and access to UGI and its benefits.

UGI planning aims at intertwining or combining different functions to enhance the capacity of urban green space to deliver multiple benefits. Planning for multifunctionality seeks to create synergies between functions, while reducing conflicts and trade-offs.

Multifunctionality concerns the ability of UGI to provide several ecological, socio-cultural, and economic benefits concurrently. A UGI planning process expressly considers how to deliver these benefits instead of leaving it to chance. This is not simply a case of 'the more functions the better'. Potential trade-offs and conflicts between functions need to be assessed, as well as the capacity of different UGI elements[2]. For instance, using land for intensive recreation may conflict with the protection of species sensitive to disturbance. These kinds of conflicts can sometimes be avoided by physically separating incompatible uses (e.g., through zoning, visitor management or agreements with land users), or by planning them so as not to happen at the same time (e.g., when breeding or flooding is expected). This means it is not only the functions themselves and the associations between them that are important, but also their spatial and temporal dimensions.

Further, the benefits of multifunctionality should be considered in relation to who needs them and who has access to them. Otherwise, UGI planning could deliver benefits only relevant or accessible to certain groups in society[3] (↖Social Cohesion). To avoid this trap, a strong element of public participation is critical (↖Social Inclusion).

Park Transwijk, Utrecht is a redesigned public park that supports structural diversity and many recreational uses, including learning facilities such as an urban farm and educational garden.
Credit: Sabrina Erlwein

Multifunctionality and ecosystem services

An important concept that has emerged in relation to multifunctionality is ecosystem services. Broadly speaking, ecosystem services are the benefits that functioning ecosystems deliver to people[4]. They can be classified in four general categories: provisioning, regulating, habitat (biodiversity), and cultural services[5], which together represent the ecological, socio-cultural, and economic dimensions of multifunctionality.

Yet, in urban areas these different services are usually provided not only by natural elements, but also man-made ones, e.g., paths and benches; sports facilities and playgrounds; historic monuments; or sewer systems that combine green spaces and technical elements for stormwater control (↖Integration).

Additionally, green spaces provide a number of important functions that cannot strictly be categorised as ecosystem services, such as supporting mobility (↖Connectivity), structuring the urban surroundings or conserving local flora and fauna(↖Biodiversity). This means that the full spectrum of green space functions and services is much broader than conventional definitions of ecosystem services allow, encompassing more than 30 possibilities (see illustration below).

Priority functions and services

In urban green space planning, recreational and other cultural functions and services are usually in focus, as well as functions that contribute to biodiversity. Those ecosystem services with a direct impact on people's health and wellbeing, such as air purification, noise reduction, urban cooling and runoff mitigation are also of particular relevance[6].

Of course, the types of functions and services that UGI can provide, and their relevance, largely depend on the environmental and socio-economic characteristics of a city or region. The spatial scale that is considered also matters. For instance, it is more relevant to evaluate provisioning services such as supply of food and raw materials from a city-regional perspective, rather than at the level of a densely built-up neighbourhood.

Multifunctionality in planning practice

Though municipalities often consider the multiple ecological and social benefits that UGI provides, enhancing multifunctionality has so far received less explicit attention (see Deliverable 5.1). In general, there seems to be uncertainty about how to actively plan and design for multifunctional green infrastructure[7]. A more proactive approach to multifunctionality is likely to be needed in light of trends such as climate change and urbanisation, both of which are increasing the pressure on UGI.

Urban green spaces provide a range of functions and services which can be grouped into four broad types.
Credit: Rieke Hansen

BOX B4: MULTIFUNCTIONAL URBAN GREEN SPACES IN MALMÖ

As part of a GREEN SURGE Urban Learning Lab in Malmö, Sweden, the multifunctionality of the city's green spaces was discussed in workshops and meetings between researchers and city staff. Through strategic planning, the city is aiming to increase the quality of its UGI in terms of social benefits, biodiversity and regulating ecosystem services (mainly water management) as well as provisioning services (taking into account surrounding farmland). Four examples of different green spaces and their functions and services are outlined below.

Pildammsparken: classic park

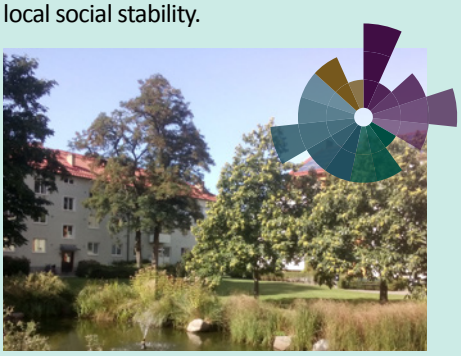
At a size of 45ha, this roughly 100 year old park is the city's largest. It includes several ponds, meadows, an amphitheatre for cultural events, and woodland areas, and is popular for picnics and running, as well as hosting many bird species. Due to its size and path network, the park provides ample space for recreation and biodiversity. Some activities have resulted in minor impacts on the environment, include trampled vegetation and reduced water quality from visitors' enjoyment of feeding the ducks.

Skogholms ängar: semi-natural green space

This 45ha industrial area in south-eastern Malmö has been developed as a semi-natural green space as part of an EU LIFE+ Project. To reduce the flooding of the Riseberga Creek, Skogholms ängar has been developed into an area with open storm water retention ponds. The site has been designed to host high structural and plant diversity and the retention facilities contribute to the water balance of the wetland biotopes. While not all parts of the site are easily accessible, paths for walking and horseback riding bring people into contact with the area's rich biodiversity.

Ekostaden Augustenborg: eco-district

The Ekostaden Augustenborg housing area has been progressively redeveloped since the late 1990s with the objective of improving social, ecological and economic sustainability (↖Box E1 Malmö). Measures have included renovation of buildings and redesign of parks and traffic areas, including an open stormwater system and green roofs. This has improved the usability, aesthetics and biodiversity of the site, as well as local social stability.



Robotfältet: grassland

With a size of about 110ha, the Robotfältet area is located east of the city. It is partly still in use as a military zone and also acts as a recreation corridor between Malmö and the proposed Almåsa nature reserve. The vegetation is characterised by grasslands formed through traditional pasturing and hay production, which provide a habitat for many species. Several land uses are accommodated on the site, including nature conservation, recreation and low-intensity grazing.

Credit: Werner Rolf (all others, Rieke Hansen)

Assessment of selected services

Cultural

- Recreation (active)
- Nature contemplation (passive)
- Aesthetics
- Social encounters
- Mobility

Biodiversity

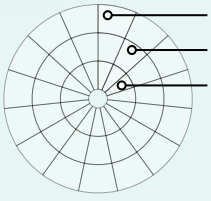
- Habitat for rare species
- Structural diversity
- Native biodiversity

Regulating

- Urban temperature regulation
- Noise mitigation
- Run-off mitigation
- Flood control (water retention)
- Pollination

Provisioning

- Farming/Gardening products
- Consumable wild plants



One initial step can be to develop a city-wide planning strategy that highlights the different functions and services provided by UGI (↖Box C4 Malmö). Such a strategic plan needs to ensure that UGI services contribute to an array of policy objectives (such as ↖Climate Change Adaptation, ↖Biodiversity). Two further components are also important. First, taking into account the interests and needs of all citizens (↖Social Inclusion), and second, promoting collaboration with experts from different fields. The latter 'multifunctional thinking' approach is important to counter the 'silo thinking' that can be a barrier to cross-departmental collaboration. It may also open the door to synergies, for example, between recreation, climate change adaptation, and biodiversity conservation (↖Integration, Box E3 Aarhus).

Gathering knowledge on local citizens' needs requires time, resources and an array of carefully selected participatory methods to make sure that the voices of all relevant groups are considered (↖Box E4 Edinburgh).

Assessing multifunctionality

A systematic spatial assessment, providing knowledge about UGI's different functions and services, can be helpful to communicate the multiple values of UGI to decision-makers. Mapping and assessment tools can be used to quantify functions and services and reveal their spatial distribution within a city (↖Assessing UGI networks, Toolbox T6).

The provision of and demand for different functions and services can be analysed to identify areas where multifunctionality needs to be enhanced. It is not always essential that all elements deliver a broad array of benefits, as long as the UGI network as a whole provides a sufficient level of all important services, and in those areas where they are needed.

Developing multifunctional green spaces

Alongside knowledge of multiple functions at the city level, it is crucial to consider the site level, since trade-offs or conflicts usually occur when functions within the same area are not compatible. The capacity to deliver multiple services on one site often depends on its size. While larger sites tend to have greater capacity than smaller ones, several functions and services can usually be provided by the same area, even on small sites. Good design can help to avoid conflicts and increase synergies (↖Box B4 Malmö).

Tanner Springs is a small city park in downtown Portland, Oregon, that provides multiple benefits. It collects and cleans stormwater, offers space for recreation, and provides a habitat for wetland species.
Credit: Rieke Hansen

KEY MESSAGES FOR MULTIFUNCTIONALITY

Support multifunctionality at different planning levels
Increasing multifunctionality should be included as an objective in strategic green space plans, supported by the assessment of different functions and services, including demand for them and their spatial distribution. Clever design and visitor management can help to maximise synergies at the site-level.

Use tools to identify functions and benefits
Tools such as multifunctionality inventories or ecosystem services assessments are useful to identify multiple green space functions and benefits (⇱Toolbox T6). However, they should be supported by a sound understanding of the kind of interrelations, synergies and trade-offs that exist between these.

Support participation to raise awareness of demands and needs
Actively involving a diverse group of local residents in UGI planning makes it more likely that outcomes will increase UGI benefits and their accessibility for a wide range of people (⇱Social Inclusion).

Foster inter- and transdisciplinary collaboration
Multifunctional thinking and planning requires cross-sectoral and cross-departmental cooperation to integrate expertise from different professions. Thus, silo-thinking must be overcome to successfully plan for multifunctionality, e.g., by sharing tools and outputs between departments and communicating the benefits of working together (⇱Engaging Stakeholders).

⇱Toolbox T6 for exemplary methods and tools to identify and assess multiple green space functions and benefits.

REFERENCES

1 Natural England, 2009. Green Infrastructure Guidance, p22. Available from: http://publications.naturalengland.org.uk/publication/35033

2 Hansen, R., Pauleit, S., 2014. From Multifunctionality to Multiple Ecosystem Services? A Conceptual Framework for Multifunctionality in Green Infrastructure Planning for Urban Areas. AMBIO 43, 516-529.

3 Rodriguez, J.P., et al, 2006. Trade-offs across space, time, and ecosystem services. Ecology and Society 11 (1), art. 28.

4 TEEB – The Economics of Ecosystems and Biodiversity, 2011. TEEB Manual for Cities: Ecosystem Services in Urban Management. Available from: www.teebweb.org

5 Kumar, P., 2010. The economics of ecosystems and biodiversity. Ecological and economic foundations. In: TEEB: The Economics of Ecosystems and Biodiversity. Earthscan, London.

6 Gómez-Baggethun, E., et al, 2013. Urban Ecosystem Services, 175–251. In: T. Elmqvist, et al (eds). Urbanization, biodiversity and ecosystem services: challenges and opportunities. Springer, Dordrecht.

7 Sussams, L. W., et al, 2015. Green infrastructure as a climate change adaptation policy intervention: Muddying the waters or clearing a path to a more secure future? Journal of Environmental Management 147, 184-193.

PRINCIPLE **SOCIAL INCLUSION**

Collaborative and Participatory Planning

KEY OBJECTIVES

Social inclusion…

…aims at including all social groups in the planning process of UGI, while putting a special emphasis on the most vulnerable ones.

…seeks not only to ascertain the interests of different stakeholders but also to balance them.

…intends to facilitate more equitable access to green space services.

"In many countries the main tendency in recent years has been to shift the balance between government and society away from the public sector towards doing things together instead of doing them alone."[1]

UGI planning aims for collaborative, socially inclusive processes. This means that planning processes are open to all and incorporate the knowledge and interests of diverse parties.

Social inclusion in general refers to the involvement of a wide range of social groups (including vulnerable ones that are often excluded) in all spheres of life. Making UGI planning socially inclusive demands attention to the needs of these different groups. Of particular concern are those with the most difficulties accessing information and articulating their interests, such as immigrants or ethnic minorities; or people who are homeless, unemployed or poor. If not carefully managed, initiatives to involve citizens in planning produce results that favour some and not others, by further empowering those in advantaged positions, or encouraging resistance from narrow interest groups to policies designed for the public interest[2]. In order to avoid these pitfalls, it is essential that governing institutions are capable of not only listening to a range of interests, but also channelling and balancing them.

Social inclusion is related to social cohesion, yet these are not the same. The latter concerns the *outcome* of UGI planning with regard to its social effects (↖Social Cohesion), while socially inclusive UGI planning is instead a *process* of including all social and cultural groups people in decision-making – one end goal of which is UGI that is equally accessible to them and meets their various needs (↖Multifunctionality).

Working group at the XII. Kunbábonyi Summer University, Hungary, exploring spatial development from the community perspective.
Credit: Hajnal Fekete

BOX B5: BEYOND THE CONSTRUCTION SITE, LJUBLJANA

Beyond the Construction Site (BCS) is a project facilitating local resident involvement in planning and governing an abandoned urban construction site in Ljubljana, Slovenia.

Grassroots beginnings

BCS was kick-started in 2010 by neighbourhood activists from the NGOs KUD Obrat and Bunker Institute as well as voluntary facilitators with backgrounds in sociology and design. Initiators called for the public to 'co-create' the site. An offer of urban gardening proved successful in attracting interest, appealing to an existing Slovenian cultural attachment to community gardens. A socially inclusive planning process was then facilitated using methods such as interviews and focus groups to determine the site's use as a community garden and event space.

As the development process went on, facilitators encouraged users to take on increasing levels of responsibility by ensuring that all contributions were valued. In this way, coordinating roles were gradually transferred to the users, demonstrating that citizens are capable of taking on responsibility for both the planning and the ongoing management of an urban green space.

Actors and support channels

The site is used by immediate neighbours and residents from other parts of the city. The city council enables use of the land at no cost, through a yearly contract with KUD Obrat. Council also provides some material support (e.g., water supply), while other small donations have come from the European Fund for Regional Development, the national Ministry for Culture, and a seed company.

Success factors

The project's success was aided by the facilitators' good working relationship with the city council (based on experience with similar initiatives) as well as ongoing political support for participatory urban planning and governance. Other factors have been the commitment of local citizens, as well as the practical aspect of land availability. In Ljubljana, abandoned sites can remain unused for lengthy periods – sometimes up to 20 years – creating a particular opportunity (and imperative) for locally-driven uses.

Results

The process has brought new value to a derelict site, improved neighbourhood relationships and, importantly, been carried *beyond the site*. As a result of the project's successful engagement with the city council, a temporary use amendment has been introduced to local planning regulations: paving the way for the possibility of similar initiatives to take off in the future.

Find out more...

Project summary in English. KUD Obrat, 2010.

Beyond the Construction Site facilitators used various methods to encourage project participants to co-create the site. *Credit: KUD Obrat Archive*

The place of social inclusion in planning

Social inclusion is often talked about in association with the term 'governance', a concept entailing a widening of focus from state-centric government, to further include the role of non-state actors. The concept of governance has emerged in a context where the distinction between 'top-down' and 'bottom-up' is becoming increasingly harder to see. Instead, both approaches are often in play at the same time, e.g., when a local government authority moves to institutionalise a grassroots initiative (see Deliverable 6.1).

Even though governance is emerging across Europe, recognition of the concept does not automatically lead to the involvement of all population groups and equal consideration of their interests, nor does it mean that social considerations are always given high priority. Recent studies on peri-urban development in Europe found that economic growth motives continue to dominate land use planning decisions, and, while ecological protection is of growing policy interest, social justice concerns receive very little attention[3]. Local authorities have a crucial role to play in mainstreaming social inclusion in UGI planning, working together with members of civil society who are empowered not only to participate, but also to take action[4].

WHY GOVERNANCE?

For more on UGI governance, see **Innovative Governance of Urban Green Spaces – Learning from 18 innovative examples across Europe.** Deliverable 6.2.

BOX B6: TELEKI SQUARE, BUDAPEST AND HELMHOLTZ SQUARE, BERLIN

Two public space redevelopments in Berlin, Germany and Budapest, Hungary, reveal the dramatically different outcomes that can result from a participatory planning process. Both originated in disadvantaged parts of each city.

Advocacy planning in Budapest

The redesign of Teleki Square, Budapest, was initiated by a group of young planners, who, with the consent of the local government, successfully engaged residents in the process. As a result, a residents' association formed to manage the square's ongoing maintenance. However, the new design and operation of Teleki Square clearly reflect the aspirations of some residents, while excluding others. Street furniture was designed to prevent sleeping; eating and drinking are forbidden; guards monitor the space and remove anyone who disobeys the rules. The result can be interpreted as a new exclusion for already-disenfranchised groups (such as the Roma, homeless people and alcoholics).

Equity planning in Berlin

The regeneration of Helmholtz Square was initiated in the early 2000s, as part of a district funding program for deprived neighbourhoods (↖Box C6 Berlin). The funding paid for a community office, which initiated a planning process involving representatives of all groups using the square, and resulted in a genuinely inclusive design. Since then, however, the impact of gentrification has threatened these achievements. The area lost its funding priority status, and likewise its community office. Some marginalised groups who had occupied central parts of the square are now facing less tolerance from middle class groups, whose voices are growing increasingly dominant. How this mounting conflict will be solved is not yet clear.

While the two approaches differ (the first being a good example of advocacy planning, and the second of equity planning – see Key Terms Box over page), their shortcomings highlight the distinction between inclusion and cohesion.

A participatory planning process is a good start, but will not in itself foster a socially cohesive public space. Actively identifying and engaging all user groups and supporting their ongoing coexistence in the same space are important further steps.

The redesigned Teleki Square is an attractive place, yet some groups no longer feel welcome there.
Credit: Iván Tosics

Find out more...

URBACT article 'Participation or Inclusion?' Tosics, 2015.

Levels of participation: from information to empowerment

Many levels of participation in planning are possible and these have often been represented along a spectrum, starting at one end with simply informing citizens, all the way to complete citizen control in decision-making at the other end – with several steps in between (e.g., see the IAP2 Public Participation Spectrum[5]).

In European cities, information and consultation processes are usually dictated by laws or regulations. Despite their formality, these processes can help to reveal citizens' concerns and ideas. However, ensuring that they sufficiently reflect all residents' interests requires different efforts to engage people. Further, trust is built when participants feel that their voices are actually being considered instead of just heard.

Consultation tends to be less formal in cities where citizens' demands are part of the public policy culture and strengthened by bottom-up initiatives. To promote collaborative decision-making, some cities, such as Aarhus, have agreed on guidelines for citizen involvement from the outset of all municipal plans, strategies and projects[6].

Co-governance

Another way to think about participation is in terms of co-governance, where power is distributed between authorities and citizens (see Deliverables 6.1 and 6.2). Citizens can be rewarded with increased influence over decision-making processes and outcomes, while governments may benefit from building trust with citizens and accessing non-traditional forms of local knowledge. Examples in practice have included participatory budgeting or public-led priority green space projects for neighbourhood plans (↖Box E5 Lisbon and C3 Utrecht).

Allowing for and considering citizens' concerns and ideas in the planning process is a step towards more socially inclusive planning, especially if included in a co-governance framework. Yet, there is more a practitioner can do to improve inclusivity in the planning process. In recent decades, even more radical approaches to citizen participation have been formulated, such as advocacy, empowerment or equity planning (see Key Terms Box, ↖Box B6 Budapest and Berlin)[7].

When it comes to realising social inclusion in UGI planning practice, there are many ways to increase the willingness of citizens to express their preferences and participate in different stages of the planning process (↖Toolbox T7, Box E3 Aarhus).

KEY TERMS[8]

Advocacy planning: attempts to offer residents opportunities to take part in negotiations with private developers. and public authorities.

Empowerment planning: seeks to enable community organisations to influence investment decisions by bringing together the concepts of participatory action research, direct action organising (where those affected by a problem mobilise to find a solution), and popular education (raising critical consciousness among disadvantaged groups) as part of a process to redress power relations and bring about social change[9].

Equity planning: involves planners working inside government who use their position and expertise to influence views, mobilise groups that are underrepresented, and advance policies with the aim of redistributing resources to the poor.

One of Berlin's most well-known community gardens, the Prinzessinnengarten is co-managed by a small team of employees and hundreds of volunteers on land rented from the Friedrichshain-Kreuzberg municipality. *Credit: Rieke Hansen*

BOX B7: PPGIS AS A TOOL FOR PARTICIPATION, LISBON

Although urban planning has traditionally been top-down in practice, many cities are moving to adopt more participatory methods: gathering residents' knowledge, ideas, values, and needs to inform decision-making processes. It is also increasingly recognised that information about citizens' perceptions, experience and use of spaces can help to achieve better planning outcomes, especially when spatially-focused methods are employed.

To meet this demand, a group of tools has emerged in the last two decades, known as Public Participatory Geographic Information Systems (PPGIS). In essence, PPGIS integrates geospatial technologies with public knowledge (belonging to individuals, local groups or communities) to produce spatial assessments and help planners to make better decisions about land-use, management and resource allocation. Such tools can also support greater citizen involvement in assessing and planning urban green spaces, e.g., through mapping the uses of such spaces, their perceived environmental quality or ecosystem services (⇱Box C1 Berlin). PPGIS can be used at different planning stages: during a visioning exercise or baseline assessment (e.g., to determine the existing or preferred uses of a place), or to evaluate or monitor a project upon implementation.

Low-tech and high-tech options

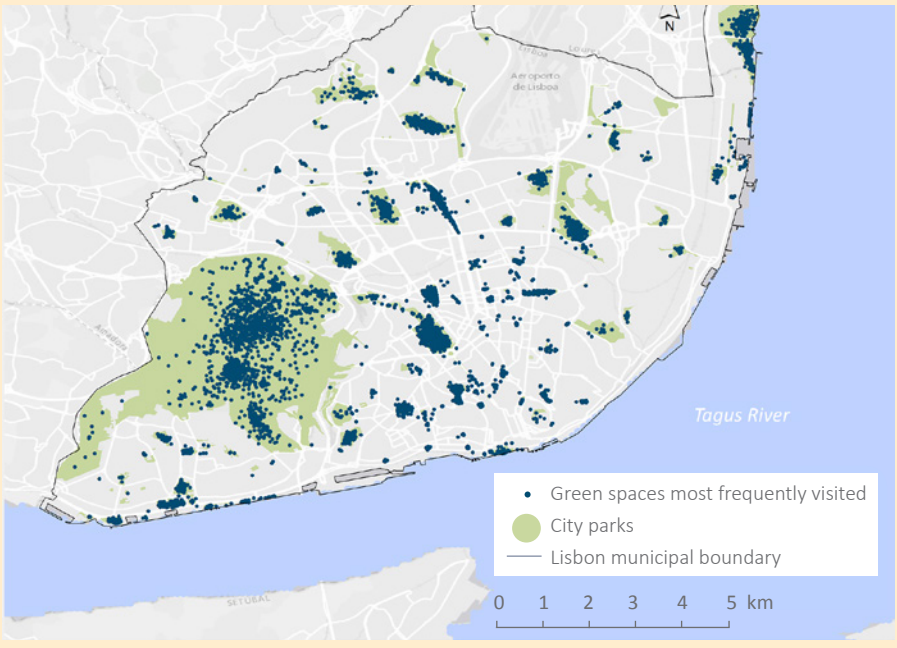
There are two main types of approach: 1) hardcopy maps or aerial images, where participants mark points or areas of interest with pens, markers or stickers, and 2) digital mapping, typically using web-based mapping software (including many free programs, ⇱Toolbox T7). Some platforms also combine PPGIS with web-based survey tools, so that the spatial information can be complemented with information about survey participants.

"Do you have ten minutes to evaluate Lisbon's green spaces?"

In 2017, as part of GREEN SURGE research, a PPGIS survey was conducted in Lisbon, Portugal, with the aim of supporting local UGI planning and management (see map below). The survey assessed those green spaces frequently visited, those avoided, and those perceived as having high levels of cultural diversity or biodiversity. It was led by the Centre for Ecology, Evolution and Environmental Changes (cE3c) at the University of Lisbon, in collaboration with the municipality of Lisbon. At the time of writing, analysis of the survey responses was still in progress. Preliminary results showed that about 70% of respondents were not aware of the municipality's strategies and plans for its green infrastructure, indicating more work is needed to raise local awareness of UGI planning.

Advantages of PPGIS in promoting public participation

1. *Enables many residents and stakeholders to more easily participate in planning processes, especially those without the time or confidence to attend traditional forums.*
2. *Can promote dynamic interaction between stakeholders.*
3. *Is relatively inexpensive and easy to conduct.*
4. *Offers maps as a tangible outcome to support planning and management decisions.*



Map showing the results of the PPGIS survey in Lisbon.
Credit: Ana Catarina Luz

KEY MESSAGES FOR INCREASING SOCIAL INCLUSION

Match the level of participation to the scale, context and intended outcome

A voluntary, bottom-up initiative can empower local people and, in some cases, result in local residents taking responsibility to manage an urban green space (↖Box B5 Ljubljana). However, this approach may not be suitable at a much larger-scale, where participatory methods need to complement, rather than supplant, conventional planning approaches.

Identify under-represented groups and appropriate tools and strategies to engage them

Participatory approaches can easily lead to an unbalanced level of involvement, excluding less powerful groups. These groups need to be identified and a bundle of dedicated tools and strategies employed to involve them, such as special participatory offers for young people, women, or ethnic minorities (↖Box E3 Aarhus). One of the easiest ways is to increase citizen involvement is to decrease the burdens of participation, i.e., to make it as simple as possible for people to get involved. ↖Toolbox T7 provides a range of tools that can help.

Address skill and resources barriers

To move from formal consultation to strategic involvement, barriers to efficient public participation need to be dealt with. These might be lack of financial and human resources, time constraints, insufficient representation of interest groups, lack of social facilitation skills among city officials and/or non-governmental actors, or the limitations of policy frameworks. To this end, possible strategies are engaging a dedicated facilitator, or advocating to higher political levels and other departments for more policy mechanisms and resources to support participatory planning.

Social inclusion goes beyond the planning process

After plans are developed and implemented with an inclusive approach, ongoing investment is needed to ensure that green spaces continue to be available for the use of all groups. This may include physical maintenance programmes, but also social work (↖Social Cohesion).

↖Toolbox T7 for methods and tools to help foster social inclusion.

REFERENCES

1 Kooiman, J., 1993. Modern Governance: New Government-Society Interactions. Sage, London.

2 Cook, B., Kothari, U. (eds), 2001. Participation: the new Tyranny? Zed Books Ltd. New York.

3 Aalbers, C., Eckerberg, K., 2013. Governance and Sustainability of Peri-Urban Areas: A Comparative Analysis of the PLUREL Case Studies. In: Nillson, K., Pauleit, S., et al. (eds). Peri-urban futures: Scenarios and models for land use change in Europe. Springer, p367.

4 Baker, S., Eckerberg, K. (eds). 2008. In Pursuit of Sustainable Development, New governance practices at the sub-national level in Europe. Routledge, p91.

5 IAP2 International Federation, 2012. IAP2 Spectrum of Public Participation. Available from: www.iap2.org/?page=A5

6 See more at City of Aarhus website: https://www.aarhus.dk/sitecore/content/Subsites/CityOfAarhus/Home/The-City-Council/The-Aarhus-model.aspx?sc_lang=da

7 Bratt, R.G., Reardon, K.M., 2013. Beyond the Ladder: New Ideas About Resident Roles in Contemporary Community Development in the United States. In: Carmon, N., Fainstein, S. (eds.). Policy, Planning, and People. Promoting Justice in Urban Development. University of Pennsylvania Press, p359.

8 See Bratt et al., 2013.

9 Reardon, K.M., 2000. An Experiential Approach to Creating a Community/University Partnership That Works: The East St. Louis Action Research Project. Cityscape: A Journal of Policy Development and Research 5-1, 59-74.

FURTHER READING

PRACTICAL GUIDANCE

Enhancing Sustainable Communities With Green Infrastructure. EPA, 2014.

Green Infrastructure Case Studies: Municipal Policies for Managing Stormwater with Green Infrastructure. EPA, 2010.

Green Infrastructure Guidance (No. NE176). Natural England, 2009.

The Multifunctionality of Green Infrastructure. Science for Environmental Policy, In-depth Report. DG Environment, 2012.

TEEB Manual for Cities: Ecosystem Services in Urban Management. TEEB – The Economics of Ecosystems and Biodiversity, 2011.

Consultation and community involvement in forest planning. Forest Research Agency, UK. Tabbush, P., 2005.

The URBACT II Local Support Group Toolkit. URBACT, 2013.

SCIENTIFIC TEXTS

Green Infrastructure for Landscape Planning: Integrating Human and Natural Systems. Abingdon, UK: Routledge. Austin, G., 2014.

An Integrated Framework for the Development of Green Infrastructure: A Literature Review. European Journal of Sustainable Development 2, 1-24. Beauchamp, P., Adamowski, J., 2013.

Establishing green roof infrastructure through environmental policy instruments. Environmental Management 42, 151–164. Carter, T., Fowler, L., 2008.

Effectiveness of Low Impact Development Practices: Literature Review and Suggestions for Future Research. Water, Air and Soil Pollution. 223, 4253-4273. Ahiablame, L.M. et al., 2012.

The aesthetic performance of urban landscape-based stormwater management systems: a review of twenty projects in Northern Europe. Journal of Landscape Architecture, 8(2), 52-63. Backhaus, A., Fryd, O., 2013.

Design, implementation and cost elements of Green infrastructure projects. Final report to the European Commission. DG Environment, Ecologic institute and GHK Consulting. Naumann, S., et al., 2011.

Greenways as a planning strategy. Landscape and Urban Planning 33, 131-155. Ahern, J., 1995.

Relationship between greenways and ecological network: A case study in Italy. International Journal of Environmental Research 6(49), 903-916. Fumagalli, N. & Toccolini, A., 2012.

Ecological Networks and Greenways: Concept, Design, Implementation. Cambridge University Press, New York, N.Y. Jongman, R.H.G., Pungetti, G., 2004.

C MAKING IT HAPPEN!

Embedding UGI in the planning process
Assessing UGI networks
Developing plans
Engaging stakeholders
Implementation

EMBEDDING UGI IN THE PLANNING PROCESS

C

This section is about the practicalities of embedding the UGI approach in the planning process, in other words, making it happen on the ground!

Although the social, environmental and regulatory context varies from city to city, GREEN SURGE findings offer some clues about where and how it might be possible to influence planning processes, regardless of where they take place, in order to support urban green infrastructure.

So far, we have looked at UGI planning in relation to urban challenges and four core principles. Importantly, these are fundamentally inter-linked with one another. Each of the UGI planning principles can, to varying degrees, contribute to addressing the urban challenges investigated for GREEN SURGE (see matrix below). Green-grey integration, whether for stormwater management or urban cooling, is directly connected to climate change adaptation; while enhancing ecological connectivity relates closely to protecting biodiversity. Finally, a socially inclusive planning process might not guarantee a socially cohesive community – but it is an important step towards one.

The next pages offer further insights across a range of practical planning aspects – assessing a UGI network, developing plans, engaging stakeholders and implementation.

INTEGRATION

CONNECTIVITY

MULTIFUNCTIONALITY

SOCIAL INCLUSION

LINKING UGI PRINCIPLES WITH URBAN CHALLENGES			
CLIMATE CHANGE	Green-grey measures for flood retention or urban cooling.	Connected green structures that enhance natural ventilation and cooling.	Regulating services that contribute to climate change adaptation as an integral part of planning for multifunctionality.	Inclusion of groups vulnerable to climate change impacts in UGI planning.
BIODIVERSITY	Habitat provision, supporting native plants as one of the co-benefits of green-grey solutions.	Networks for ecological connectivity.	Protecting ecological functions and habitat as an integral part of planning for multifunctionality.	Fostering awareness among all groups of the value of biodiversity.
GREEN ECONOMY	Reduced management costs through integrated green-grey systems; avoided costs through risk mitigation.	Promotion of sustainable transport systems, e.g., walking and biking to lessen environmental impacts.	Cost effective UGI solutions through providing multiple benefits in the same space.	Promotion of a green economy, through co-creation, co-management and co-governance of urban green spaces.
SOCIAL COHESION	Consideration of the usability and amenity values of integrated UGI measures to promote social cohesion.	Provision of equitable access to urban green spaces.	Provision of UGI to meet identified demands and needs of all groups.	Consideration of vulnerable and less-vocal groups' needs and their empowerment through collaborative planning.

The four core principles of UGI planning can each help to address a range of challenges, including those examined in GREEN SURGE.

ASSESSING UGI NETWORKS

Uncover value and opportunities

Systematic assessment of existing UGI is an essential precursor to the development of any sound UGI plan, but assessments are also tools to raise awareness of UGI's multiple benefits. Quantifying these benefits can be an effective strategy to promote investment in UGI, if communicated well to the public and decision-makers.

KEY MESSAGES

Assessing UGI, including quantity, quality, supply and demand, is critical for defining action areas.

Use assessment to raise awareness for the value of UGI and related benefits, as well as to create investment opportunities.

A multitude of assessment tools exist for different aspects of UGI planning – it is best to use a mix of them.

Quantity AND quality

Identifying and quantifying a broad range of UGI elements (↖Green Space Typology, Part A) is a first step in understanding the shortcomings and potential of a UGI network, but it is also important to assess the quality of these elements and their connections to each other (↖Connectivity). Quality in its simplest form can be assessed by gathering data on the benefits provided by different UGI elements. Any qualitative assessment as a basis for UGI planning should first consider a broad spectrum of functions and services before identifying priorities (↖Multifunctionality). An ecosystem services approach is one means of doing so. The TEEB (The Economics of Ecosystems and Biodiversity) initiative suggests a stepwise procedure to identify and assess benefits and stakeholder needs in a given urban area (↖ TEEB Box on page 48).

Supply and demand

Alongside information about existing green and blue spaces, both demand for and access to them need to be considered. Top-down assessments can also help determine priority actions, such as a green space audit, which assesses and maps city green spaces along with their shortcomings, potential and accessibility for residents in different parts of the city (↖Box E4 Edinburgh).

To develop a city's green infrastructure, planners need to identify not only the valuable green spaces but also those areas that hold hidden potential for improvement. The city of Lisbon, for example, is turning wastelands into green corridors.
Credit: Rieke Hansen

BOX C1: ASSESSING THE SOCIAL VALUE OF GREEN SPACE WITH PPGIS, BERLIN

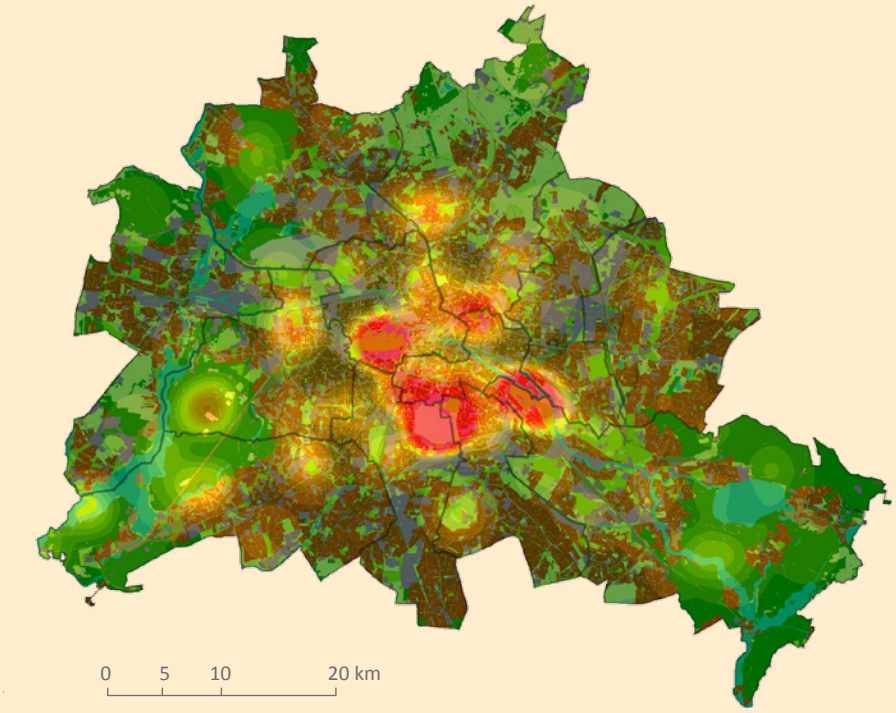
Ways to assess resident perceptions and uses of green space are of growing interest in many cities, where municipalities often need to balance limited resources with resident satisfaction. In this context, Public Participatory Geographic Information Systems (PPGIS) can improve on traditional surveying methods, capturing the social value of green spaces.

Advantages over traditional surveys

Resident satisfaction has traditionally been assessed either through postal surveys inquiring about resident use of and satisfaction with parks in the city in general, or through on-site, one-on-one questionnaires. These same methods have also been used to assess cultural ecosystem services such as recreation, aesthetic appreciation, social and educational opportunities and inspiration. While both methods can provide much useful information, PPGIS allows cities to obtain this data across entire districts or city-wide. Results from a PPGIS survey can greatly enhance the ability of planners and managers to understand how parks are used, the needs and preferences of park-goers, the benefits (ecosystem services) that such spaces provide, and conflicts that may arise. Also, because the information is entered into a GIS, it can be overlaid with map layers traditionally used by planners and compared with ecological assessments (e.g., of habitat quality), fostering more holistic thinking about socio-ecological challenges and making it easier to identify where interventions may be needed.

Assessing cultural ecosystem services in Berlin

As part of GREEN SURGE, an online PPGIS study was conducted in Berlin to explore uses of green spaces and how the cultural ecosystem services they provide are perceived (see map below). Although results were comparable to the city's last green space satisfaction survey in terms of general uses and perceptions of needs, the PPGIS survey provided much richer detail about specific parks. The survey responses revealed locations experiencing problems like overcrowding or lack of maintenance, the kinds of activities taking place and where, and the cultural values respondents associated with particular green spaces. This kind of information can serve a variety of planning, management and design applications (see inset below).



Hotspot map of favourite green spaces in Berlin that are also perceived as inspirational. The hotspots, shown in red, are centred around the public parks Tiergarten, Tempelhofer Feld, Treptower Park and Volkspark Friedrichshain.
Credit: Emily Rall

Potential applications of PPGIS

Planning

1. *Identify hotspots of value and uses*
2. *Identify potential development and/or redevelopment areas*
3. *Anticipate how people may react to planning and management decisions*

Management

1. *Pinpoint anti-social activity*
2. *Better allocate resources for maintenance*
3. *Better target communication activities (e.g., related to perceived biodiversity)*

Design

1. *Protect especially loved features in a park redesign*
2. *Redesign areas experiencing conflicts or other shortcomings*

C

TEEB (THE ECONOMICS OF ECOSYSTEMS AND BIODIVERSITY) STEPWISE APPROACH[1]

The TEEB stepwise approach is one possible means of identifying and assessing both the needs of stakeholders and the functions and benefits of UGI, as well as prioritising actions.

Step 1: Specify and agree on a problem or policy issue with stakeholders that can be tackled through ecosystem services (ESS), such as adaptation to climate change.

Step 2: Identify which ESS are most relevant in this context (e.g., regulating services).

Step 3: Determine what information is needed and select suitable assessment methods for the ESS under consideration.

Step 4: Implement methods to assess (future changes in) ESS and their values.

Step 5: Identify and assess policy, planning or management options in order to increase or secure ESS provision and design/ develop tools to set the options in motion.

Step 6: Assess the social, economic and environmental impacts of the policy options on stakeholders.

Economic assessments

Translating UGI benefits into economic values can be a particularly convincing strategy to persuade decision-makers. For instance, the City of Edinburgh assessed the social return on investment of its urban green space, showing that, for every single GBP spent, 12-14GBP are generated in social-economic and environmental benefits[2]. Similarly, illustrating the costs of NOT investing in UGI can be equally persuasive (↖Box B2 Copenhagen).

Social and ecological assessments

Many UGI services and benefits cannot be easily translated into monetary values, or it may simply not make sense to do so. Examples include a powerful place identity, inspiration received from green spaces, or the value of biodiversity. Here, other kinds of assessment come into play.

Ecological assessments can look at the quantity and quality of green spaces in general, of ecosystems, or of particular components of ecosystems. For example, a vulnerability assessment can identify areas which are more exposed to hazards from climate change and/or have less adaptive capacity (↖Box A1 Almada).

Social assessments concern the perceptions, values and goals of individuals or groups, and their relationships with green space. This type of assessment is more useful for intangible services, like spirituality or inspiration; for green spaces which are likely to have very different meanings for various user groups; or for potentially controversial green space-related actions. Tools such as public participatory GIS (↖Box B7 Lisbon and C1 Berlin on PPGIS) can help to reveal what matters most to citizens. Some expert-based studies, such as Edinburgh's Open Space Audit, can also be considered a form of social assessment (↖Box E4 Edinburgh).

Integrated assessments

Finally, integrated assessments bring together the ecological, economic and/or social dimensions. In their simplest form, individual results of the different assessment types can be discussed alongside one another, recognising that each is important to consider. Depending upon the consistency and comparability of methods, there are also integrated assessment tools that allow better side-by-side comparisons, such as multi-criteria analysis. See Toolboxes T1, T2, T6 and T7 for a range of assessment tools and Milestone 32 for more information on integrated valuation methods for UGI.

REFERENCES

1 TEEB – The Economics of Ecosystems and Biodiversity, 2011. TEEB Manual for Cities: Ecosystem Services in Urban Management. See more at www.teebweb.org

2 Reil, A., 2015. 1st Stakeholder Dialogue Forum - "Green Infrastructure for and with citizens: How can local governments make it happen?" Brussels, 13 October 2015. GREEN SURGE joint milestone "Workshop on good practice in UGI planning and green space governance" (MS35).

BOX C2: ASSESSING THE ROLE OF PERI-URBAN FARMLAND IN UGI PLANNING, MALMÖ

Urban green space planning tends to focus on public spaces such as parks or urban forests, with less attention paid to privately-owned or leased sites such as farmland. However, land used for farming has the potential to make a significant contribution to urban green infrastructure. Farmers should be considered important partners for UGI planning and development, and their interests and perspectives combined with broader planning objectives.

As part of the GREEN SURGE Urban Learning Lab in Malmö, Sweden, an assessment framework for the city's peri-urban farmland was developed by an interdisciplinary team, made up of researchers and staff from five municipal departments. The City of Malmö owns about half of the farmland within its city limits – about 2,200 ha in total – and another 1,500 ha in adjacent municipalities. The city purchased this land for urban expansion purposes, but has since changed policy direction towards compact urban development. This presents the imperative to formulate new planning goals for the land, and also the opportunity to consider it as part of a UGI network. The assessment framework includes:

1. ***The capacity for economic benefits, such as production value, employment and self-sufficiency;***
2. ***Social and cultural benefits, such as recreation, education, social connectivity, cultural activities, inclusion and participation;***
3. ***Environmental resources and regulating functions; and***
4. ***Biodiversity.***

The framework also includes site conditions such as soil, hydrology and topography, in the interest of maintaining farmland productivity. The assessment has resulted in two main proposed strategies.

Strategy 1: Assist highly-productive farmland to contribute to UGI by (a) increasing the number of small biotopes and linear structures, so as to improve connectivity for wildlife and recreation, and (b) facilitating multiple on-site functions, such as combining market-oriented production with recreation (e.g., berry-picking fields or community vegetable gardens).

Strategy 2: Assist less-productive farmland to contribute to UGI primarily through low-intensity management, so as to maintain and enhance ecological, historic and cultural value with the potential for fostering biodiversity and recreation opportunities.

These strategies may help expand the implementation of Malmö's Green-Blue Plan (⇱Box C4 Malmö) to agricultural land. While the situation in Malmö is unique, the assessment framework approach might also be applicable to other cities looking to consider the potential role of peri-urban farmland in their UGI networks.

Malmö's eastern landscape is heterogeneous, hilly and dominated by semi-natural grassland. It has great cultural heritage and biodiversity value, and also offers recreation opportunities. Less-productive farmland is used for traditional, low-intensity purposes, such as grazing sheep.
Credit: Werner Rolf.

DEVELOPING PLANS

Coordinate planning strategies

A large variety of plans and policies can be used to support UGI, such as comprehensive urban development strategies, green space plans or thematic strategies on biodiversity, urban water or climate. A strategic perspective at the city-wide or city-regional level is important to ensure that the whole network is taken into account.

KEY MESSAGES

Get support through mandates and advocates.

Develop strong but flexible frameworks and mix instruments for implementation.

Coordinate plans, policies and instruments for achieving goals, also at different spatial scales.

Coordinate planning instruments and other mechanisms

Strategic UGI plans should be long-term instruments, modified and updated regularly in order to provide an accurate and useful framework for action (↖Box B3 Berlin and E2 Milan). Often multiple instruments are needed, including at different spatial scales, and these need to be coordinated with one another. Therefore, it is important that UGI plans are embedded in the city's planning system and linked to other planning instruments (↖Box C4 Malmö). Berlin's Urban Landscape Strategy is a good example of a strategic plan coordinated with other planning mechanisms, as well as instruments such as pilot projects and dialogue forums, within a framework to involve non-government actors to develop the city's UGI (↖Box E6 Berlin).

Planning for an uncertain future

In the face of the uncertainties that current urban challenges create, especially climate change, the key requirement for planning is to adopt 'no-regret' or 'low-regret' strategies over 'hard' adaptation (e.g., early warning systems, insurance, dykes). No/low-regret strategies are designed to increase robustness at low costs, or compensate costs with other benefits (↖Multifunctionality, ↖Integration, also Box E1 Malmö).

Legislating and advocating

Legal requirements and political mandates are often a powerful driver for a UGI strategy, since they constitute a commitment on a higher legal or political level. However, even without an official mandate, decision-makers such as local politicians can sometimes secure enough political support to trigger concrete actions (↖Box B1 Szeged), while NGOs can use evidence-based proposals to influence policy (↖Box A2 Helsinki).

Edinburgh's Open Space Strategy involved consultation with many departments (↖Box E4).
Credit: City of Edinburgh Council

BOX C3: NEIGHBOURHOOD GREEN PLANS, UTRECHT

Citizens are important stakeholders who can be mobilised to take part in shaping plans. Often it is easier to engage people at a neighbourhood level, when the area they live in is directly concerned, rather than the whole city. In Utrecht, The Netherlands, Neighbourhood Green Plans have proved to be a successful instrument to engage citizens in contributing ideas for green space projects across the city. For each of the city's ten neighbourhoods, a budget of €500,000 has been made available to realise 'green' ideas brought forward by locals. These ideas were assessed by the municipality, and those considered feasible bundled together to form a Green Plan. After implementation, the municipality plans to further involve citizens in self-management of the spaces concerned.

BOX C4: MALMÖ'S GREEN-BLUE PLAN

The city of Malmö, located in the fast-growing Öresund region, is experiencing rapid urban changes. Spatial planning objectives are driven by the 'compact city' concept, with housing needs to be met through inner city densification, instead of expansion into the surrounding countryside. To support these aims, and to preserve and develop its blue-green infrastructure, the city is preparing a 'Green and Blue Plan' to replace the previous Green Plan (2003).

Using ecosystem services to highlight green blue benefits

The new plan recognises the importance of multifunctional and high quality green-blue infrastructure for the benefit of citizens, for biodiversity protection, and to minimise the effects of climate change. To increase awareness of UGI's importance among administrative staff, politicians and citizens, the concept of ecosystem services has been introduced, illustrating the value of the city's green and blue spaces for human well-being by providing cultural, regulative and provisioning services (see inset below). Maps illustrating the plan will be integrated into the city's Web-GIS platform, enabling easy access to them.

Teaming up for innovation

To develop the plan in a cooperative way, several thematic working groups were set up, crossing the traditional boundaries between nine different administrative units (including the Streets and Parks Department, City Planning Office, Real Estate Department, as well as the Culture Department and Leisure Department). This approach promoted knowledge sharing between local experts. Additionally, universities (including GREEN SURGE researchers) have been involved to discuss ideas and strategies, e.g., the strengths and weakness of current green planning approaches and potential ways forward. This inter- and transdisciplinary exchange helped to create a cutting-edge plan.

Integration into the city's strategic planning framework

The Green-Blue Plan is just one of the city's spatial planning strategies, which include the Comprehensive Plan (2014), a number of thematic plans, e.g., the Water Plan (2016) and other documents concerning the integration of ecosystem services into the planning process (the MEST and BEST plans). While none of these are legally-binding, they have been adopted by political decision-makers at the highest level. For implementation purposes, the Green-Blue Plan will be supplemented later on with a detailed action plan.

The plan's objectives

1. *In Malmö, everyone has access to recreational and healthy green and blue spaces in their everyday life*
2. *In Malmö, green and blue space have a quantity, quality and distribution that promotes high biodiversity*
3. *In Malmö, green and blue space is used for climate adaptation and purification of air and water*
4. *In Malmö, the agricultural landscape is developed long-term in a sustainable way*
5. *In Malmö, ecosystem services and biodiversity are considered in all economic positions, political considerations and other municipal decisions*

Find out more...

Malmö's Comprehensive Plan (English summary).

The Green-Blue Plan is embedded in the planning system and coordinated with a number of other documents.
Credit: City of Malmö

ENGAGING STAKEHOLDERS

Cross-sectoral and inclusive UGI planning

UGI planning requires the involvement of a variety of actors, not only public authorities but also businesses, civil society and citizens. Active engagement can promote a sense of shared responsibility for local green spaces, towards co-creation, co-management and co-governance arrangements (↖ Social Inclusion).

KEY MESSAGES

Cooperate with other departments and external experts.

Collaborate with non-governmental stakeholders and support co-governance arrangements.

Partner-up with a variety of stakeholders and find meaningful ways for them to become engaged.

Cooperation with other departments and external experts

Interdisciplinary cooperation between urban planners, green space planners, infrastructure planners and others is a critical aspect of UGI planning and an especially important success factor for green-grey integration approaches, where the complexity involved cannot be effectively addressed by a single discipline alone (↖Integration). In Berlin, an informal planning strategy illustrating a vision through visually-engaging graphics and collages has promoted cooperation with other departments, because the plan content was presented in an unusual and easily accessible way (↖Box E6 Berlin). Elsewhere, there is evidence that collaboration between planners social workers may be a productive avenue (↖Box C6 Berlin, ↖Social cohesion).

Networking, forming partnerships between different departments and sectors and integrating (external) experts early-on can also be especially helpful for developing UGI strategies at the city level. Effective local responses require knowledge of the context and potential paths forward as well as motivated actors to implement actions. Universities and other scientific institutions can also play a role in providing the relevant knowledge and measures (↖Box A1 Almada, A2 Helsinki, and B1 Szeged).

Staff from various departments in the City of Malmö discuss UGI strategies for Malmö's peri-urban farmland with a GREEN SURGE researcher and other external experts.
Credit: Anders Mårsén

Collaboration with non-governmental stakeholders

Fostering co-governance arrangements can lead to new roles for local government, e.g., as a facilitator and supporter responsible for enabling frameworks and funding programmes, but also providing ongoing oversight and guidance to ensure that public spaces remain safe and accessible. Such an approach requires a framework, rules and sufficient resources for implementation (see Deliverable D6.2). In Berlin, the Urban Landscape Strategy built upon an existing 'DIY'-culture to engage citizens in pilot projects (↖Box E6 Berlin). Where such a culture does not already exist, an external facilitator can be a reliable partner in fostering a new approach, engaging individuals in new roles. The extra efforts required can foster beneficial two-way learning processes, can lead to unexpected planning solutions and often unburden local authorities from the full scope of monitoring or instructing tasks (↖Box B5 Ljubljana, C5 Milan).

LESSONS FOR UGI DEVELOPMENT WITH NON-GOVERNMENTAL ACTORS

Based on the experience of organizing DIY-projects on public green space, city officials in Berlin gained practical lessons that may be of relevance for other cities.

- ***Determine rules for public access far in advance and review these periodically to balance public and private/user needs.***
- ***Concentrate projects in areas which have good infrastructure and that are close to a potential base of users.***
- ***Cluster and advertise temporary uses so people are aware of them.***
- ***Factor in a lot of coordination, discussion, and oversight of projects.***

BOX C5: URBAN REFORESTATION WITH LOCAL RESIDENTS, MILAN

Boscoincittà (The Forest in the City) is an urban reforestation project located in Milan, Italy, conceived to counter the negative effects of urbanisation and to foster community well-being.

Established in 1974 on 35ha of abandoned farmland, Boscoincittà has since grown to over 120ha. The site offers 150 allotment gardens, available to local citizens upon application. There are also bike and footpaths and horseback riding trails; recreation areas; and event spaces available for local community hire. Hiking and cycling tours take place regularly, as well as workshops for schools and community groups.

The project is managed by the non-profit organization Italia Nostra (Our Italy) and supported by thousands of volunteers involved in planting, maintenance and other initiatives. This has reduced the maintenance burden on the municipality of Milan (which owns the land) and enabled the project to expand, It has also fostered opportunities for local citizens to grow food, and to interact with nature and with each other. The positive results for the local economy, for citizens' health and for community ties (↖Social Cohesion, Green Economy) have inspired a new generation of parks (e.g., Giretta Park) in the surrounding green belt of Milan.

Before (top) and after (bottom). Buildings on the site have been transformed through community-driven management. *Credit: Centro Forestazione Urbana archive*

Find out more...

Italia Nostra website (in Italian)

BOX C6: UGI DEVELOPMENT WITH THE HELP OF SOCIAL WORKERS IN BERLIN

Since 1999, the City of Berlin has been running an urban regeneration endeavour called the Neighbourhood Management Programme as part of the national 'Social City' initiative.

Programme overview

Right now, 34 deprived areas of the city are being assisted through neighbourhood management offices, which usually employ between two and four social workers. These offices are well-informed about the problems of their local residents and some also have considerable experience with different types of green interventions, such as nature-based educational programmes or contests for small green projects within their neighbourhoods. Most projects aim to make direct contact with residents on-site.

Social effects of local greening projects

GREEN SURGE analysed the role of six neighbourhood management offices in neighbourhood greening projects. Investigating these cases showed that greening can improve social conditions in dense inner-city areas where public or semi-public spaces are scarce. Re-greening an inner courtyard, a public square or a playground offers a chance to involve residents in the design and maintenance of the space, as well as creating a new meeting place. For instance, the neighbourhood management office in Berlin-Neukölln initiated a programme called 'Hidden Places – Beautiful Courtyards' encouraging both landlords and tenants to re-green their courtyards with the help of planners and some financial assistance. These opportunities can be particularly valuable for low income residents, who are often socially segregated.

The role of social workers in overcoming obstacles

Obviously, a number of challenges are likely to arise: landlords need to be convinced, tenants are sometimes less interested in bottom-up neighbourhood improvement initiatives than owners, resident councils often become dominated by 'middle-class ideas' in their decisions, while planning departments are often too bureaucratic and not open to innovative approaches. However, in this context, social workers can play a key role in identifying and counteracting such challenges before they become major problems. In addition, established links between the social workers and local residents with various demographic and cultural backgrounds are often crucial to the longer term sustainability of greening projects.

The cases studied here reveal that social workers can help UGI planners to achieve positive social impacts with small, up-scalable green projects, activating different groups and engaging them in the design and long-term management of local green spaces.

Otto Park in the very dense Moabit-West neighbourhood management area.
Credit: Iván Tosics

Find out more...

Neighbourhood Management Programme

Hidden Places - Beautiful Courtyards. Video about the project (in German).

IMPLEMENTATION

Take action and monitor impacts

Making the leap from paper to practice is a challenge for any policy or plan. A range of tools are available to help implement UGI planning (e.g., ⇱Toolbox T7 to increase participation), but a key question is usually how to get the resources.

KEY MESSAGES

Create a framework for regular monitoring of UGI resources.

Start with pilot projects in order to adapt strategies and build public and political support.

Unlock additional resources by collaborating, pooling knowledge and accessing external funding.

Collaboration and sharing knowledge can be an effective way to better deal with resource constraints. This includes, in particular, collaboration at the expert level and pooling knowledge from various partners (⇱Engaging stakeholders). In addition, the involvement of citizens can help planning to better correspond to local needs and to target investments more efficiently (⇱Assessing UGI networks).

Learning by doing

Pilot projects have been shown to be an effective means of testing new approaches. They can encourage similar initiatives and convince decision-makers that an idea is worth pursuing. A pilot project focusing on a key issue or objective of broad relevance can help to gain interest and support across different departments (⇱Box E1 Malmö). Learning from these examples can also help to adjust and refine a planning strategy before it is expanded to other areas.

Unlock alternative resources

GREEN SURGE research found external funding to be a major factor for supporting UGI (see Deliverable 5.1). Access to European and national funding programmes is very important for implementing innovative strategies on larger scales and testing new approaches that require time and (human) resources. However, funds from developers or other private actors can also support implementation (⇱Box B3 Berlin, C7 Lodz), provided there is a framework to ensure that private profit is not prioritised over the public interest, and benefits distributed equally (⇱Green Economy). Importantly, resources are not only monetary! Volunteerism and citizens' knowledge count among the resources that local governments can harness to get things done (⇱Box C8 Ljubljana).

BOX C7: A PPP FOR GREEN SPACE RENEWAL

Lisciasta Park Residence is a housing complex in the north of Lodz, Poland, and bordered by green spaces to the south and east – including a park, the Sokolowka stream and several reservoirs. In 2006, the City Office rehabilitated the stream and created the Teresa Reservoir, but there were no funds to improve the surrounding green spaces.

When the Residence was constructed soon after (2010-2013), a Public-Private-Partnership was arranged between the developer and the municipality. The developer cleaned and rehabilitated the adjacent land; partly as mandatory compensation for their removal of local trees, and partly to maximise the positive influence of the green surroundings on prospective sales. The rehabilitated green space remains in public ownership and management, and the City Office hopes to enable similar private investment in improving green space.

Liciasta Park Residence and its regenerated green spaces, Lodz.
Credit: Budomal

BOX C8: TESTING NEW URBAN GREEN PARTNERSHIPS, LJUBLJANA

The City of Ljubljana, Slovenia, is aiming to find new ways to engage with citizens and, at the same time, to develop a financially sustainable governance model for urban green space, avoiding increased public expenditure on maintenance as a result of greening the city.

In response to these goals, a GREEN SURGE Learning Alliance partnership between the municipality, planners, researchers and non-state actors investigated new partnership models with businesses and NGOs. The resulting collaboration has influenced Ljubljana's new Sustainable Urban Strategy 2014-2020: engaging the public to 'promote participatory planning and governance of urban green, especially with vulnerable groups' is now at the core of the strategy.

How to partner

The partnership also resulted in a demonstration project, 'LivadaLAB', testing an alternative planning and governance model on a 0.6ha public space. According to one of the city officials involved, bringing researchers and practitioners together was a key success factor for this project, enabling the stakeholder landscape to be comprehensively mapped and analysed. "This approach helped to identify a very good local NGO partner, Zavod BOB, to develop the site with us" she says. The partner NGO drove a focus on involving high school drop-outs who are often particularly under-represented in green space projects.

Putting ideas into practice – together

Through team-building efforts, the researchers facilitated discussion of various practical questions concerning the demonstration site, e.g., the site's ecological potential, how ecosystem services could be integrated into the local economy, and how citizens could be best engaged. In the end, a largely unused green space was transformed into one offering multiple benefits, ranging from sports to culture; from local food production to education about the rare biodiversity present at the site. This pilot project has inspired the city to explore whether to introduce the same governance model for other public green spaces.

Opening of the LivadaLAB with volunteers and the Mayor of Ljubljana, during EU Green Week 2016.
Credit: Anja Manja Segulin

Find out more...

Ljubljana Sustainable Urban Strategy 2014-2020 (in Slovenian)

Non-state financing

A wide range of instruments and approaches can be used to secure financing and resources from non-state actors. These include:

- ***Taxes and other regulatory instruments***
- ***Partnerships (↖Box C7 Lodz)***
- ***Incentives***
- ***Corporate social responsibility and social entrepreneurship***

↖Toolbox T8 offers a detailed list of funding mechanisms, as does Deliverable 4.1.

Monitoring

Monitoring is essential to ensure that UGI is not only maintained in a good state but ideally regularly improved. It is also a mechanism to check if targets are being met or strategies need to be adjusted. For instance, a UGI strategy for climate change adaptation may involve targets to protect and increase tree cover, in order to moderate the urban heat island effect, reduce stormwater runoff, sequester carbon, and reduce cooling energy demands. Regular tree audits could help to determine if stronger protections for existing trees in certain types of development are necessary, or more incentives to encourage tree planting.

Monitoring is often undervalued and underfunded in many cities. However, there are cases of municipalities successfully partnering with university researchers to monitor UGI or its benefits (↖Box E5 Lisbon). Monitoring goes hand-in-hand with a commitment to regularly updating plans; ensuring that goals and strategies remain in line with the reality on the ground (↖Box B3 Berlin, E4 Edinburgh).

D

CONCLUSION AND NEXT STEPS

Conclusion
Reflecting on UGI planning in your city
Rapid UGI planning checklist
Detailed UGI planning checklist

CONCLUSION

D

This guide has outlined the fundamentals for planning and developing urban green infrastructure – whether it be to kickstart a new UGI planning strategy in your city, or to improve an existing approach. Ultimately, it provides a framework for getting started, with insights from case studies throughout Europe. More specific practical tools and guidance are available in the ↖Toolbox section.

Priorities for local UGI planning

Before developing a UGI planning strategy, local priorities need to be defined. Such priorities are often driven by widely-recognised urban challenges. Hence, these challenges may present windows of opportunity for UGI planning to play a greater role in urban development and decision-making overall. In this guide, four key urban challenges have been examined for their relevance to UGI planning: climate change adaptation, biodiversity protection, promoting a green economy and increasing social cohesion. While these are growing in importance, they are not the only ones that cities face. You may identify others that are more pressing for your local community – a declining manufacturing sector, for instance, or rising public healthcare costs.

Bringing things together – a holistic approach to UGI planning

The underlying principles and practical guidance offered here need to be understood as part of a holistic approach – one that will need to be adapted to suit your local context: the planning system, social, economic and environmental conditions, as well as the available actors. In addition, successfully planning UGI requires a strategic approach. Once clear priorities and objectives are established, the linkages, synergies and potential conflicts between these should be taken into account.

Importantly, the four UGI principles are fundamentally inter-linked. For instance, improving connectivity within a green network can increase the provision of ecosystem services, which in turn enhances multifunctionality. Solutions for green-grey integration likewise provide multiple benefits beyond the mono-functionality of conventional solutions for transport routes and stormwater disposal. In parallel to these three principles, it is essential to involve different groups in UGI planning in order to ensure equitable recognition of their needs and distribution of benefits – in other words, to incorporate the principle of social inclusion.

The city of Essen in the Ruhr district was the European Green Capital in 2017. It has built up a network of green and blue corridors and high quality parks, such as Krupp Park.
Credit: Johannes Kassenberg

REFLECTING ON UGI PLANNING IN YOUR CITY

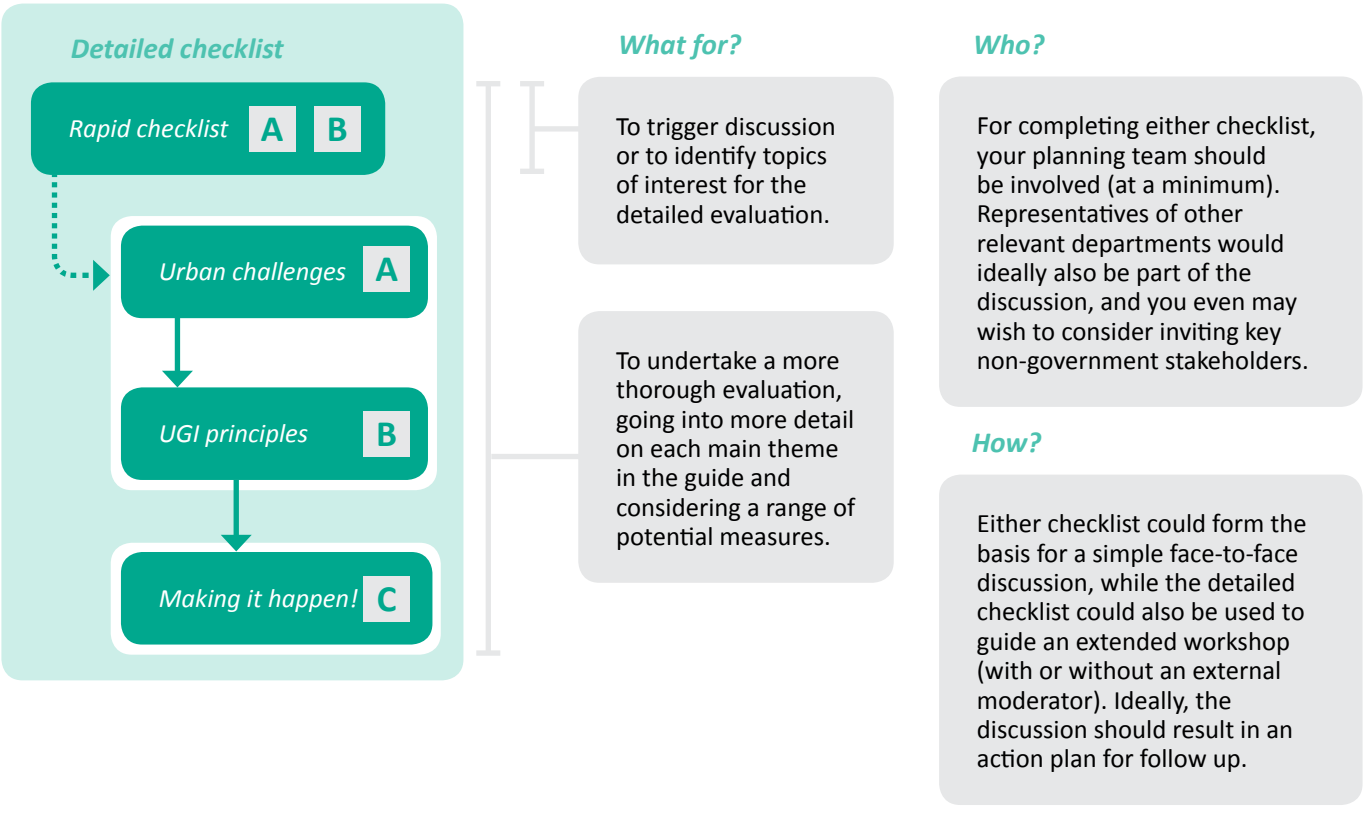
To help you evaluate your current planning approaches and to identify priorities and action steps for implementing UGI planning, we have prepared two evaluation checklists – one rapid, and one detailed (see illustration below for how they work).

Both checklists are tailored to strategic planning at the city-level (such as green space plans or open space plans), but they might also provide insights for regional planning or local, site-specific projects. The aim is to identify the potential to advance or update existing practices, plans and policies by adopting the UGI planning approach (e.g., Are there gaps to be filled? Are action steps required? Do additional stakeholders need to be involved?).

The suggested measures listed in the detailed checklist are the result of research conducted throughout GREEN SURGE, including a literature review of identified urban challenges and core UGI planning principles, as well as experiences from cities across Europe that have been studied in-depth (see Deliverable 5.2). The listed measures include planning objectives and actions that could be included in a strategic plan; as well as ideas for initiatives, regulatory and financial instruments, and participatory engagement policies that require broader action. This is neither an exhaustive list, nor one that will necessarily suit every situation. For each measure, consider its relevance and adequacy for the given context in your city. Either evaluation can be undertaken for:

1. ***Existing plans, strategies and policies relevant to urban green space planning, in order to identify gaps and potential for improvement;***
2. ***Plans, strategies and policies that are in an early stage of development, in order to identify specific needs and priorities for action.***

Both evaluations begin with the one-page rapid checklist.



RAPID UGI PLANNING CHECKLIST

☑ Tick this box if an item has already been considered in your plan

☒ Cross this box if action is needed

↗ Cross-link to related evaluation areas (if an area is identified as a priority)

HINT: For those items with crosses in the right-hand box, you might be interested in going to the corresponding section in the detailed checklist to review this area in more depth.

A URBAN CHALLENGES

UGI planning can help to tackle important urban challenges, such as climate change adaptation, biodiversity protection, a green economy, social cohesion, and others.

	Does your plan (existing or in development) include activities and measures to...	☑ ☒
CLIMATE CHANGE	... adapt to the adverse effects of **climate change**, for instance by assessing vulnerabilities, taking appropriate action to prevent or minimise damage, and seizing opportunities that may arise (e.g. low-/no-regret solutions)?	☐ ☐ *Go to A.1*
BIODIVERSITY	... protect local **biodiversity**, offer nature experience opportunities for citizens, and raise awareness for the benefits of species-rich environments?	☐ ☐ *Go to A.2*
GREEN ECONOMY	... contribute to a **green economy** that aims to improve human well-being and social equity while reducing environmental risks and depletion of natural resources? This involves considering the direct and indirect economic benefits of urban green spaces.	☐ ☐ *Go to A.3*
SOCIAL COHESION	...provide equal opportunities for people from different backgrounds to access and benefit from urban green spaces and to promote social interactions among them, in the interest of greater **social cohesion**?	☐ ☐ *Go to A.4*
???	In your local context, are there additional pressing challenges? Please make a note of them and discuss ways they might be tackled through UGI planning.	☐ ☐

B UGI PLANNING PRINCIPLES

UGI planning is an approach based on the core principles of green-grey integration, connectivity, multifunctionality and social inclusion.

	Does your plan (existing or in development) include activities and measures to...	☑ ☒
INTEGRATION	...**integrate** urban green spaces with 'grey' infrastructure (e.g. roads, canals, drainage systems) and to promote combined green-grey infrastructure in ways that provide more benefits than traditional engineering approaches?	☐ ☐ *Go to B.1*
CONNECTIVITY	...**connect** different green spaces in order to enhance recreation, mobility by bike and on foot, biodiversity and natural ventilation, ideally by combining different goals for humans, other species and abiotic flows?	☐ ☐ *Go to B.2*
MULTIFUNCTIONALITY	...support the capacity of urban green spaces to provide **multiple** ecological, socio-cultural and economic benefits, combining functions and services in ways that create synergies and reduce conflicts and trade-offs between them?	☐ ☐ *Go to B.3*
SOCIAL INCLUSION	...facilitate collaborative, **socially inclusive** planning processes that are open to all and incorporate the knowledge and needs of diverse parties, with emphasis on vulnerable social groups?	☐ ☐ *Go to B.4*

DETAILED UGI PLANNING CHECKLIST

☑ Tick this box if an item has already been considered in your plan

☒ Cross this box if action is needed

↗ Cross-link to related evaluation areas (if an area is identified as a priority)

HINT: Use the space next to each section to note down priorities, other ideas, or specific steps for action. When thinking about what's appropriate for your local context, make sure you consider the full spectrum of types of green (and blue) spaces that make up UGI (e.g., urban farmland, schoolgrounds, railroad embankments, green walls, green roofs and abandoned areas – see Guide Part A: Green Space Typology).

A URBAN CHALLENGES

		☑	☒ Notes (priorities/ideas/actions)
A1	**Climate change adaptation: Specific activities and measures may include:**		
A1.1	Assessing the potential impacts of different climate change effects, including identification of vulnerable areas or groups (e.g., people living in flood-prone, densely built or socio-economically disadvantaged areas).	☐	☐
A1.2	Reducing the urban heat island effect in dense areas (e.g., requiring or incentivising street trees, green walls and green roofs, requiring minimum green space amounts in developments).	☐	☐
A1.3	Providing climate refuges for vulnerable resident populations in high density areas (e.g. shaded areas and/or areas with water features)	☐	☐
A1.4	Measures to prevent and minimise damage such as protecting and restoring floodplains, wetlands and coastal landforms	☐	☐
A1.5	Decreasing the amount of impervious surface (e.g. minimum requirements, incentivising pervious or semi-pervious surfaces).	☐	☐
A1.6	Developing a planting strategy composed of diverse species (with preference for heat-tolerant varieties, especially for street trees).	☐	☐
↗	*B1 Integration, C1 Assessing UGI networks, C3 Engaging stakeholders*		
A2	**Biodiversity: Specific activities and measures may include:**		
A2.1	Protecting and enhancing native species and biotopes, especially those that are ecologically significant and threatened. This may include restoring damaged valuable habitats and controlling invasive species.	☐	☐
A2.2	Establishing a well-connected, citywide and diverse biotope/habitat network.	☐	☐
A2.3	Creating areas of low intensity management where nature can 'run wild' and species can establish themselves spontaneously, or protecting existing sites (e.g., brownfields with high quality habitats).	☐	☐
A2.4	Promoting biodiversity in ornamental and constructed green spaces, e.g., parks, green roofs, and street green (e.g., by increasing structural diversity, planting native species, allowing for succession, and planting pollination-friendly plants).	☐	☐
A2.5	Providing guidance and/or incentives to business- and homeowners to support biodiversity on their properties (for measures see prior point).	☐	☐
A2.6	Educating the public on the importance of biodiversity and ways to protect it, as well as opportunities available to them to experience nature.	☐	☐
↗	*B2 Connectivity, B3 Multifunctionality, C2 Developing plans*		

A	URBAN CHALLENGES	☑	☒	Notes (priorities/ideas/actions)
A3	**Promoting a green economy: Specific activities and measures may include:**			
A3.1	Assessing the value of the **benefits** and **avoided costs** green spaces can provide (e.g., reduced asthma and respiratory disease rates, avoided damage from flooding and other natural events).	☐	☐	
A3.2	Engaging the **private sector** in financing UGI (e.g. public-private partnerships, regulatory instruments, taxes, user-pays and compensation schemes, business improvement districts).	☐	☐	
A3.3	Collaborating with **volunteers** for green space **development** and **maintenance** (e.g., through time banks, reward schemes, non-profit partnering).	☐	☐	
A3.4	Promoting green space as an asset in city marketing and economic development initiatives.	☐	☐	
↗	*B4 Social inclusion, C3 Engaging stakeholders, C4 Implementation*			
A4	**Increasing social cohesion: Specific activities and measures may include:**			
A4.1	Assessing or creating standards for **equitable** green space **accessibility** (e.g., providing parks within a 15 minute walk of all residents analysing public transit links to popular parks).	☐	☐	
A4.2	Ensuring the **quality and safety** of new and existing green spaces (e.g., adequate lighting, maintenance, design), as well as designing new spaces in ways that leave room for creative play and neighbourhood identity.	☐	☐	
A4.3	Promoting **community** or intercultural **gardens** as spaces where people from different backgrounds may interact.	☐	☐	
A4.4	Supporting **local NGOs and citizens' initiatives** to create and maintain green spaces.	☐	☐	
↗	*B4 Social inclusion, C3 Engaging stakeholders, C4 Implementation*			
A5	**Other challenges:**			

B	UGI PRINCIPLES	☑	☒	Notes (priorities/ideas/actions)
B1	**Integration: Specific activities and measures may include:**			
B1.1	Linking green spaces with **stormwater infrastructure** to improve water quality and reduce pressure on stormwater systems (e.g., incentives or standards for decentralised water retention and drainage through rain gardens, swales, green roofs, constructed wetlands and permeable pavement; centralised solutions like bioretention basins; regional cooperation for vegetated river buffers and wetland protection).	☐	☐	
B1.2	Linking green spaces with **transport infrastructure** to improve air quality, mitigate noise and provide safe opportunities for walking and biking and/or species movement (e.g., vegetation to house species and trap pollutants and noise along transport corridors; installing bike paths in green corridors).	☐	☐	
B1.3	Linking green infrastructure with **energy and communications infrastructure** to maximise design and construction efficiencies and encourage walking, biking, species movement, aesthetic appearance and educational opportunities (e.g., bike paths along powerline corridors, promoting native vegetation, installing nature interpretation signage).	☐	☐	
B1.4	Linking green infrastructure with **buildings** to maximise recreation opportunities in residential, institutional and commercial areas (e.g., through minimum requirements or incentives for green courtyards or accessible green roofs).	☐	☐	
↗	*B3 Multifunctionality, C3 Engaging stakeholders, C4 Implementation*			
B2	**Connectivity: Specific activities and measures may include:**			
B2.1	Developing and preserving a **city-wide** and **regionally-linked** green network that promotes synergies between recreation, mobility, cultural heritage, wildlife, local climate and the built environment.	☐	☐	
B2.2	Developing and maintaining a **well-connected, safe** bike and pedestrian network (e.g., working to fill in missing segments of key corridors, producing a bike map) and ensuring **public accessibility** to both local parks and key recreational areas (e.g., instituting minimum requirements for park access, ensuring adequate access points at key parks).	☐	☐	
B2.3	Developing and conserving a **habitat network** to support the **movement of species** (including identifying critical habitats and corridors as well as barriers or bottlenecks) and ensuring that quality habitats for flora and fauna are **well-distributed** throughout the city, based on sound ecological knowledge (e.g., key species, habitat preferences, seed dispersal, adaptation capabilities and movement patterns).	☐	☐	
B2.4	Developing green corridors and 'perforated' green space (e.g. areas of dispersed vegetation) capable of improving **natural ventilation** as well as **flood control** in vulnerable areas.	☐	☐	
↗	*A2 Biodiversity, B1 Integration, C1 Developing plans*			

B	UGI PRINCIPLES	☑	☒	Notes (priorities/ideas/actions)
B3	**Multifunctionality: Specific activities and measures may include:**			
B3.1	**Assessing** the various **ecological, social** and **economic** benefits of urban green spaces and **communicating** these to policy-makers and the public.	☐	☐	
B3.2	Assessing the **demand** for green spaces across the city and their **capacity** to provide services, now and in the long term.	☐	☐	
B3.3	Developing strategic plans that highlight UGI's diversity of functions and services city-wide, including **socio-cultural** (e.g., nature contemplation, social interaction, sports and play), **biodiversity** (e.g., habitats for rare species, wilderness), **regulating** (e.g., temperature regulation, flood control) or **provisioning** (e.g., agricultural products, fresh water, wood).	☐	☐	
B3.4	At the site level, developing green spaces in ways that **create synergies** between different functions and services and **reduce conflicts** (e.g., through visitor management and guidance or spatial separation of conflicting uses).	☐	☐	
↗	*C3 Engaging stakeholders, C2 Assessing UGI networks*			
B4	**Social inclusion: Specific activities and measures may include:**			
B4.1	Actively including citizens in plan **development** and **implementation** (e.g., through visioning forums, questionnaires, charrettes and citizens' juries).	☐	☐	
B4.2	**Mobilising** and including the views of populations not usually active in planning (e.g., people with disabilities and the elderly, children and adolescents, immigrants, low-income and homeless people) by applying **participation methods** oriented towards these groups (e.g., Photo-voice).	☐	☐	
B4.3	**Delegating responsibility** to citizens (e.g., by supporting participatory budgeting, citizens' urban gardening initiatives, volunteer maintenance schemes or other forms of civic engagement for UGI).	☐	☐	
↗	*C3 Engaging stakeholders, A4 Social cohesion*			

C EMBEDDING UGI IN PLANNING

To successfully embed UGI in the planning process, a number of factors have been shown to be important. These include systematic assessment, strategic planning and coordinating different plans, cooperating with a range of stakeholders, and finding the means for implementation and maintenance.

		☑	☒	Notes (priorities/ideas/actions)
C1	**Assessing UGI networks: Specific activities and measures to expand knowledge base and support for UGI and inform decision-making may include:**			
C1.1	Conducting a **comprehensive assessment** of existing green spaces of all types (i.e., also private and underutilised sites like brownfields and railways) in order to better understand the **deficits and potential** of your UGI network (e.g., quantity, quality, distribution, access, supply of benefits and citizen demand).	☐	☐	
C1.2	Identifying existing areas that need to be **conserved or improved** and the need for **new** UGI elements and corridors between them.	☐	☐	
C1.3	Using **integrated methods** to assess not just UGI'S monetary value, but its social and ecological value too, where appropriate.	☐	☐	
C1.4	Framing assessments in terms of **challenges** to be tackled (e.g., vulnerability to the impacts of climate change, habitats that are threatened) and demonstrating potential **cost-savings** (e.g., by conducting a cost-benefit analysis).	☐	☐	
C1.5	Illustrating UGI benefits in a format that is attractive and easy to understand for non-experts (local politicians, decision-makers, and the general public) in order to raise **awareness** and gain **support**.	☐	☐	
C2	**Developing plans: Specific activities and measures to strategically support UGI with available planning instruments may include:**			
C2.1	Developing a strategic plan with a l**ong-term vision** for UGI development and conservation, including **regular updates** to monitor progress and respond to changing conditions.	☐	☐	
C2.2	Considering measures which are **'no-regret'** or **'low-regret'** (i.e., designed to increase robustness at low costs or to compensate for extra costs through added benefits).	☐	☐	
C2.3	Getting plan support: through **mandates** (e.g., global or national policies that support the plan and its objectives), by linking it to locally important **challenges** (such as climate change) and/or collaborating with strong **advocates** (e.g., politicians, environmental NGOs).	☐	☐	
C2.4	Developing a **coordinated** UGI strategy by considering the full spectrum of available planning **instruments** (e.g., formal and informal), and their strengths and weaknesses, as well as a range of **implementation mechanisms** (e.g., funding programmes, regulations, pilot projects to demonstrate new approaches, initiatives to support non-state actor involvement).	☐	☐	
C2.5	**Linking** the UGI plan with those of other departments/sectors and those at other levels (e.g., at the city and regional levels), aiming at **synergies** (e.g., with the aid of cross-sectoral working groups or coordinated, simultaneous development of different plans).	☐	☐	

C	EMBEDDING UGI IN PLANNING	☑	☒	Notes (priorities/ideas/actions)
C3	**Engaging stakeholders: Specific activities and measures to involve a variety of actors in inclusive UGI development may include:**			
C3.1	Identifying relevant **actors** (e.g., staff in other departments, external experts, universities, businesses and civil society) that are not yet engaged in UGI development, and finding **meaningful ways to engage them** (e.g., by networking, by directly reaching out to them, or by developing incentives for their involvement).	☐	☐	
C3.2	**Cooperating** with other departments and external experts and maintaining **interdisciplinary networks** (e.g., identification of shared topics or objectives related to UGI across departments, sharing and exchanging knowledge from different fields of expertise and aiming at shared UGI solutions).	☐	☐	
C3.3	Collaborating with non-governmental stakeholders, e.g. by supporting **co-governance** arrangements in the management of bottom-up initiatives (e.g., community gardens), and **fostering** the required **skills and frameworks** for coordinating such arrangements within or outside the administration (e.g., taking on a supervising, moderating or facilitating role, as well as establishing contract agreements and access rights).	☐	☐	
C4	**Implementation: Specific activities and measures to aid the implementation of UGI plans and projects may include:**			
C4.1	Using **pilot projects** to test novel approaches in cooperation with relevant partners (e.g., engineering, building design, water management, parks and recreation). Results should be evaluated to enable such strategies to be refined before application on a larger scale.	☐	☐	
C4.2	Exploring additional **resources**, including European or national funding programmes, funds from private actors (e.g., Public-Private-Partnerships, compensation schemes and other regulatory instruments), joint projects with other departments or non-financial support through voluntary work and local knowledge.	☐	☐	
C4.3	**Monitoring** to document improvements in the city's UGI and progress towards planning and performance targets, with provision to adjust strategies if progress is not adequate.	☐	☐	

WHAT NOW?

We hope this checklist has helped you to reflect on your plan and how to incorporate elements of UGI planning into it, as well as to identify some potential measures for action. If you have too many areas where action is needed, think about reducing them to the five most urgent or most promising ones. To help build a coherent UGI strategy, we invite you to visit (or revisit) these areas of our Practitioners' Guide:

- ***Core planning instruments, their potential, and interrelations between them (see Guide Part C);***
- ***Green space types within your city and their (potential) contribution to a multifunctional and connected UGI network (see Guide Part A: Green Space Typology);***
- ***Tools to assess the current state of your city's UGI (see Guide Part C: Assessing UGI networks and related Toolboxes);***
- ***Potentially helpful partners and supporters in and outside your organisation (see Guide Part C: Engaging stakeholders);***
- ***Implementation mechanisms, including resources you need and ways to obtain them (see Guide Part C: Implementation and Toolbox T8), as well as;***
- ***Barriers that you need to overcome (see case studies throughout Guide, and at Part E).***

E CROSS-CUTTING CASE STUDIES

E

BOX E1: INTEGRATION FOR STORMWATER MANAGEMENT, MALMÖ

Flooding is a major challenge for Malmö, being a relatively flat city. Open green space has played a key part in flood mitigation strategies, with the city administration opting for green roofs, retention ponds and bioswales to complement the sewer pipes below ground.

Strategy

The integration of green and grey infrastructure in Malmö has not resulted from a single, uniform strategy, but rather grown over time. In the late 1980s, the City's Water and Sewage Authority and the Street and Parks Department began to work together to address stormwater management issues – originally through building retention ponds. The first pond was built in 1989 on public green space in the eastern part of the city, as part of a new industrial and commercial development. The main impetus for the pond was that the areas receiving stormwater runoff did not have the capacity to dispose of the peak flows that the newly-sealed surfaces would create. Since then, about 35 ponds and streams have been constructed in public green spaces. Most were built as part of development schemes for new residential, industrial or retail areas, or for roads.

In 2000, these efforts were expanded and formalised as a planning policy, stating that new stormwater facilities should be integrated into parks and other recreation areas. Early integration efforts aimed to avoid damage caused by combined sewer overflow. More recently, the risk of damage from cloudburst flooding has been highlighted within the Cloudburst Plan, approved by the city board in 2017. The Plan stresses the need for open space, the necessity of integrating green and blue spaces and the importance of close cooperation and engagement with stakeholders. The plan is a sub-document of the city-wide Comprehensive Plan, which sets goals for local development.

Implementation

Implementation of Malmö's stormwater policy has mostly focused on large development projects within new local master plans, and involves collaboration between various city departments and private developers. Stormwater management planners get involved at an early stage of master planning, to calculate the minimum share of green space needed to absorb the expected rainfall. Solutions are then negotiated between several municipal departments including the City Planning Office, Street and Parks Department, and Water and Sewage Authority. Large-scale retention ponds are managed by the Street and Parks Department, with maintenance funded by the Water and Sewage Authority(↖Implementation).

Retention pond constructed in an existing park, Augustenborg, Malmö.
Credit: Tim Delshammar

Learning from experiments

For the Malmö Building Exhibition in 2001, an entirely open stormwater system was designed for a new development area (the Western Harbour) and an existing neighbourhood (Augustenborg). Both areas became test-beds to explore how an open stormwater system could be implemented in reality in two different contexts, and with the involvement of different kinds of actors. In Augustenborg, the City's Streets and Parks Department collaborated with a publicly-owned social housing company to rebuild green spaces and install green roofs; in the Western harbour, the City worked with several developers to build the open stormwater structures (⇱Engaging stakeholders).

At the time, there were very few Swedish examples of open stormwater management systems that had been thoroughly integrated into the urban fabric. There was no experience of how to scale up the system, how to maintain it, or how the public would react. The pilot-project-based, step-by-step approach enabled continuous 'learning-by-doing' among those involved. Some of the design concepts had to be adjusted, but today most of the integrated systems remain unchanged and function as expected.

Other insights were that maintenance, planning and financing have to be agreed upon and coordinated between the landowners concerned. The most important outcome was to demonstrate that an open stormwater system can be introduced in an existing residential area. However, Malmö's green-grey integration measures have tended to be especially successful in new, large-scale development projects.

Stormwater reservoir constructed in an existing schoolyard, Augustenborg, Malmö.
Credit: Tim Delshammar

The main supporting factors in Malmö include the legal framework (such as the Planning and Building Act), local policies (the Comprehensive Plan, local master plans, and the stormwater policy), and funding for construction. In the longer term, the City's commitment to maintain the open stormwater systems (once built) has been key to the infrastructure's viability, while voluntary guidelines and incentives have also played a part in mobilising non-state actors. Some developers have opted to voluntarily detain stormwater via ponds or green roofs in order to meet the requirements of rating systems such as BREEAM Communities, or a local sustainable urban development assessment including green area ratios (GAR). Homeowners who disconnect their drainpipes from the public system can receive a refund from the Water and Sewage Authority.

Find out more...

BREEAM Communities

Local assessment for sustainable urban development Malmö (In Swedish).

Further reading on lessons learned. Scandanavian Green Roof Institute.

GAR – Green Area Ratio
The Western Harbour – experiences and lessons learned. Malmö, Sweden. Persson, B. (ed.), 2013.

Case study and sustainability assessment of Bo01, Malmö, Sweden. Journal of Green Building, 8 (3), 34-50. Austin, G., 2013.

Blue-green fingerprints in the city of Malmö, Sweden: Malmö's way towards a sustainable urban drainage. Malmö: Va syd. Stahre, P., 2008.

BOX E2: REGIONAL ECOLOGICAL NETWORK, MILAN

The most comprehensive environmental plan for the Lombardy region is the Regional Ecological Network (Rete Ecologica Regionale, or RER). The RER was established in 2009, as part of a strategic framework for environmental connectivity and sustainability. It is characterised by a planning structure nested at multiple scales and intended to serve as a model for local, provincial and regional planning in other parts of Italy.

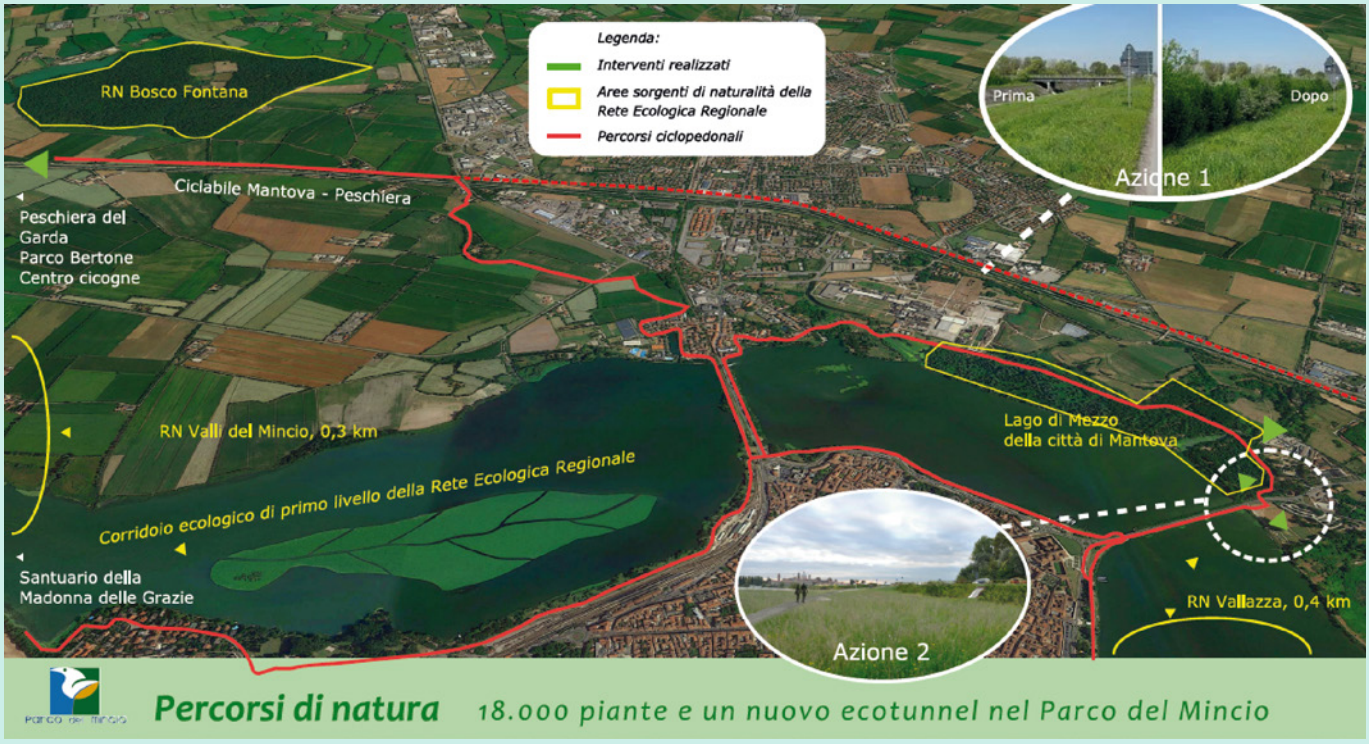
The RER's goal is to build a network of primary ecological corridors, linking priority areas for biodiversity and strengthening their habitat quality and ecological value by enhancing the effectiveness of the ecosystem functions they perform. Since 2010, the plan has been gradually translated from the regional to the local scale, and is now in the process of incorporation into municipal planning.

Actors

The RER was developed and drafted by The Directorate General for Landscape, Urban Planning and Soil Conservation and the Agriculture Division, Department of Agriculture of the Lombardy Region in consultation with technical advisors. As part of the network, environmental and agricultural associations collaborate with local experts to enact policies aimed at delivering quality ecosystem services, in the interest of a sustainable natural environment. Additional actors are universities (and other scientific institutions that supply information on animal and plant life), environmental NGOs (e.g., WWF Italia), citizens, and the agricultural sector. Public-private partnerships share the implementation, management and maintenance costs of the green spaces concerned, combining the knowledge and needs of different sectors in an interdisciplinary team.

Implementation and resources

Implementation and monitoring of the RER is based on priority indicators (e.g., urban sprawl). The network is guided by best practices (e.g., creation of buffer zones to absorb nitrates, reintroduction of native species) at the urban, peri-urban and regional levels, and supported by provincial and municipal plans.



Mincio Park project showing two actions to create ecological connectivity. Action 1 (Azione 1): a green corridor was implemented cutting through the urban zone. Action 2 (Azione 2): a second intervention eliminated a critical barrier, the San Giorgio Bridge, which caused fragmentation of the ecological corridor of the Mincio canal. Legend: Finished interventions (green lines); natural green areas of the Regional Ecological Network (RER) (yellow squares); bike paths and footpaths (red lines); primary ecological corridor of the RER (green leaf on the canal).
Credit: Mincio Park Press Office

Resources to promote the RER include programmes and policies with specific objectives and plans of action that operate at multiple scales, e.g., the Territorial Governance Plan at the local/municipal level. Both public and private funds support the implementation of the RER, namely the Green Areas Fund of the Lombardy Region (funds of €15 million) and the Cariplo Foundation (which provides a line of credit to support RER initiatives). Funds also flow from the provinces and municipalities to their respective local areas, and from afforestation compensation schemes to mitigate the loss of land to urban development. Additional resources are joint funding shared between the European Union and national/regional instruments (e.g., rural development programmes).

Mincio Canal

One RER project implemented to date involves Mincio Park. In 2014, a new green corridor was developed along the banks of the Mincio Canal, consisting of tree rows over a distance of seven km. The corridor intersects with the city of Mantua and strengthens the overall ecological function of the Mincio Canal in its most urbanised tract. Existing vegetation on the canal banks has been integrated with new native trees and shrubs, increasing local biodiversity (⇱Biodiversity). The project also laid the foundations for an urban greenway that allows pedestrians and cyclists to travel from the peri-urban zone to the beginning of a bike path north of the city, and provides a 33m-long underpass, or 'ecotunnel', for pedestrians and wildlife (⇱Green-grey integration).

The Mincio Park project received funding through two public grants for ecological networks (from the Lombardy Region and the Cariplo Foundation). The total cost amounted to €425,000 for plantings along the canal and the enhancement of the wooded areas, and an additional €220,000 for the ecotunnel. Partners were Mincio Park as lead agency, the Province of Mantua, Municipality of Mantua, and public authority AIPO (the Interregional Agency for the Po river). Citizen involvement included a press conference open to the public to present the project, educational visits for schools, tree-planting days for the general public, and a public inauguration of the project advertised by television and press coverage.

The various sites are cared for through a five year maintenance contract with a bank guarantee of 110% of the works' value released each year. Other initiatives to protect the project are through monitoring by the Mincio Park Voluntary Ecological Guards and 24 hour camera surveillance connected to the control centre of the Municipality of Mantua's local police force.

Further outlook

An innovative aspect of the RER is the shift from traditional government-driven green space planning and management to a greater role for non-state actors, especially those from the agricultural sector. The intent is to prioritise even more agricultural sector involvement in the future. Furthermore, the RER aims to offer a technical reference framework for future modifications to other provincial ecological networks. A related action is continued updating and implementing of skills and best practices within the framework, through web publications and training sessions for practitioners.

Find out more...

- RER document
- Mincio Canal
- Video Parco Nord Milano

All in Italian.

BOX E3: RENEWAL OF THE GELLERUP HOUSING COMPLEX, AARHUS

Gellerup is the largest social housing complex in Denmark, built in 1968-72. The 30 tower blocks comprise 2,400 apartments and were home to just over 7000 residents as of January 2013. Since the 2000s, Gellerup has been considered a disadvantaged area, due to high levels of unemployment and criminal activity, and low levels of education and income across its resident population. In 2013, almost 79% of residents came from non-Western countries, compared to 11% for Aarhus as a whole. Many apartments have remained vacant in recent years due to the site's poor reputation.

In 2007, the municipality of Aarhus decided to develop a new master plan with the aim of transforming Gellerup from a monofunctional housing estate into an attractive, multifunctional urban area, with new housing, amenities, workplaces and revitalised green areas that perform a variety of social and ecological functions (⇱Multifunctionality). The master plan has a long-term time frame, targeting overall completion in 2027, with the green space renewal to be complete by 2017. The project has been financed through a special urban renewal fund (Landsbygge fonden). The funds are provided by the city of Aarhus, the Brabrand Social Housing Association that manages the site, a private foundation, and a national ministry. It has a budget of €100 million, of which €12.5 million is allocated to the development of urban green space.

Key features of the renewal

In the first phase, three large housing blocks in the centre were demolished, making room for shops and a community house. In addition, the old school was replaced by the construction of a 'children's city', combining six kindergartens from Gellerup and a health centre. In future, the tenure structure will be adapted in some parts from rental to ownership in order to provide a more differentiated resident composition. The changes will be accompanied by special safety programmes for residents and economic support during the transition process.

The green space design has been underpinned by a multifunctional inventory approach, with the intention that key elements address three dimensions: social/health issues, economic sustainability and climate and environmental sustainability. Key aims are to increase perceived safety and improve visual orientation, while also improving biodiversity and rainwater absorption capacity (⇱Biodiversity, Climate Change Adaptation).

The large open outdoor spaces will be divided into smaller zones as playgrounds, allotment gardens and playing fields that will turn the former wasteland into a series of active areas. These are intended to function as an intercultural commons, bridging boundaries between different ethnic and social groups (⇱Social Cohesion). In this way, the planning process has recognised and sought to address both social and ecological objectives.

Planning approach

The planning approach has combined a traditional Danish municipal top-down planning process with a bottom up participation process. Danish law supports the rights of public housing tenants and requires any changes to their living conditions to be agreed upon by the Brabrand Social Housing Association. In addition, two elected boards exist at the site, independent of the housing association, whose agreement also needed to be secured.

Visualisation of an edible park with cherry trees and space for recreational activities, urban gardening and meeting places, to improve the area's social cohesion.
Credit: SLA Architects 2014

Increasing connectivity by restoring a 'missing link' in the form of the northern green wedge and southern blue wedge to the south, as part of Gellerup's green space restoration (black line)
Credit: SLA Architects 2014

Find out more...

Gellerup Masterplan. Aarhus Municipality, 2014.

Climate Adaptation Plan 2014 (in Danish).

Gellerup Urban Park overview on SLA Architects website. SLA Architects, 2014.

Dispositionsplan Gellerupparken + Toveshøj (in Danish). Aarhus Municipality, 2011.

Strategies to secure and sustain resident engagement

Among the resident migrant groups there are large differences in traditions for involvement in democratic processes of this kind. Thus, many simply did not participate in the planning process. Several participation schemes were tested to overcome this obstacle, ranging from more traditional public hearings, to participatory workshops and 'look-and-learn' visits to other places in Denmark (⇱Social Inclusion). Four walks with women from different ethnic groups were held, considering the existing green areas and talking about the forthcoming changes. The main purpose was to bring residents from different groups together and allow them to designate areas where safety aspects could be improved.

Youth associations and clubs received special attention, as part of a strategy to engage people in the planning process 'from inside-out'. Through contacts between the local municipal officer and representatives of local clubs and institutions, a group of 21 young people participated in a trip to 'Superkilen' (the Super Wedge) in Nørrebro, Copenhagen. Nørrebro has been transformed from an industrial and housing area into a multicultural leisure and recreation area. The visit fostered dialogue with the group and helped to discuss options for and barriers to the future development of Gellerup's park.

The municipality has also established a group of ten 'leisure time workers'. These are young people from different ethnic groups who receive a small salary from the municipality for informing the local residents about the renewal plans and possibilities for participation in planning and decision-making. A positive effect of this initiative is that vandalism has decreased at the places where the leisure time workers are active.

Lessons learnt

The level of public participation has evolved continuously since 2006. Participatory efforts with a special focus upon certain groups seem to have been most successful in generating understanding of and meaningful feedback on the plan. Despite the extensive legal rights that public housing residents have in Denmark, the representatives of the two housing boards were initially involved only at a relatively low level. But active lobbyism succeeded: they have since become included in all important decisions and at the same time act as an important communication channel between the planning team and residents.

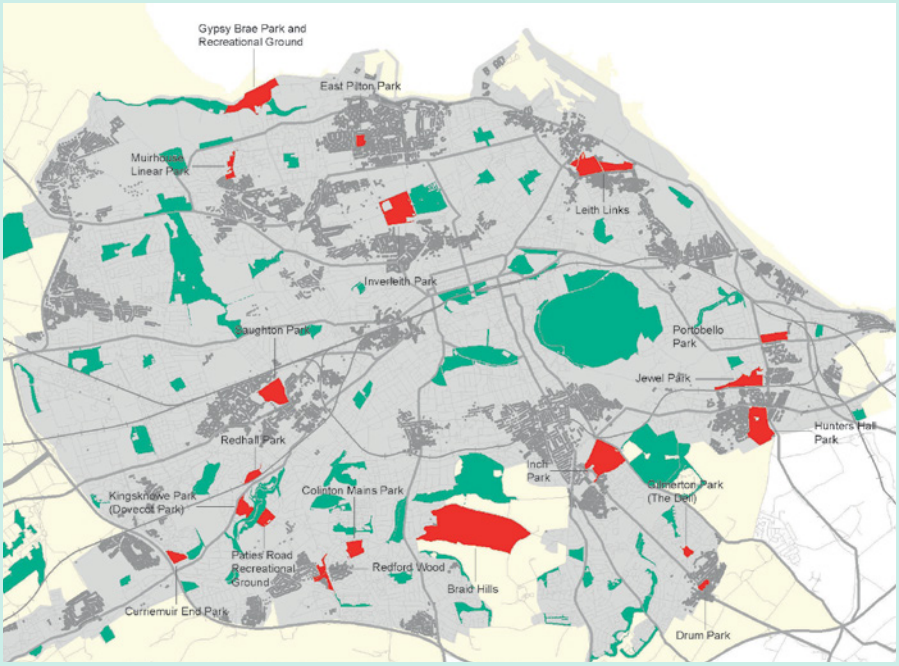
BOX E4: OPEN SPACE STRATEGY, EDINBURGH

The City of Edinburgh Council developed an Open Space Strategy as part of a coordinated approach to meeting the city's open space needs. The strategy development began in 2009 with an audit of all open spaces sized 500m² or larger: the first such comprehensive assessment since 1969. It was launched in 2010, including twelve neighbourhood action plans to improve open space provision across the city, and updated in 2016. In the new version, Open Space 2021, the action plans have been consolidated into four Locality Open Space action plans.

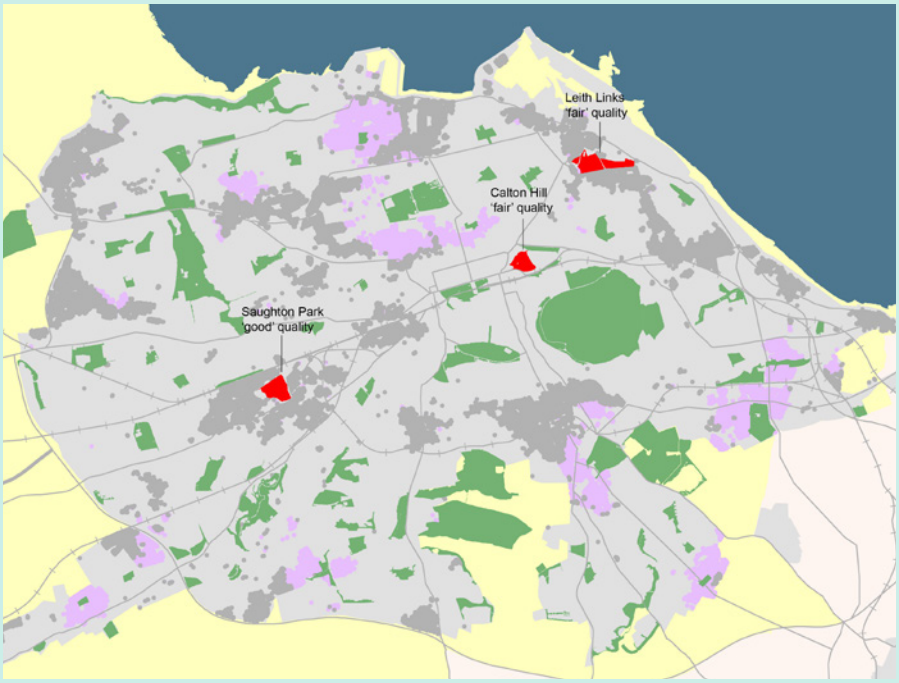
Strategy background and components

The Open Space Strategy was driven by Scottish planning policy, which encourages Scottish local authorities to prepare such strategies and provides guidance on doing so (Planning Advice Note 65). Another important driver was developer demand for a fair, clear and consistent approach to open space requirements, particularly for residential developments.

The strategy comprises three core components: an audit, standards, and action plans. The audit ranks the quality of Council-owned parks and gardens, residential amenity spaces, green corridors, cemeteries and other semi-natural green spaces (e.g., sports areas). Private gardens and backyards are not included. The Council took an active approach to assessing citizens' green space needs, using two audit questionnaires and community meetings in 2008/9 to gain more understanding of open space use, and undertaking consultation on the draft audit and plan (⇱Social Inclusion).



BEFORE: Open Space Strategy Map (2010) showing green spaces meeting the large green space standard (green), those deficient (red), and residential areas not meeting the standard (dark grey).
Credit: City of Edinburgh Council



AFTER: Map (2016) showing green spaces meeting the standard (green), deficiencies (red), residential areas now meeting the standard (pink) and those not yet meeting it (dark grey). Many previously-deficient areas have turned pink since 2010.
Credit: City of Edinburgh Council

Using open space standards to assess multifunctionality city-wide

The results of the audit and consultation formed a basis for developing Edinburgh-specific open space standards. These assess the quality of Edinburgh's open spaces across multiple benefits and quality indicators and from the perspective of both humans (access to space and appearance of space) and other species (diversity of habitats and degree of connectivity). In addition, various uses are recorded (e.g., informal ball games, seating, community growing, observing wildlife ↖Multifunctionality) and the appropriateness of each use scored in relation to the context (e.g., size, location, adjacent use). Three standards were defined, ensuring that all residents have adequate access to high quality open spaces of each of the following types: a) local green space, b) large green space, and c) play space. The Council also created maps to visualise areas with access deficiencies.

In 2010 almost 20 green spaces did not meet the standards, while by 2016 that number was down to three, and over 30 new local green spaces had been created within 400 metres of homes – evidence of the strategy's successful implementation. The Council resolved to retain and strengthen the standards for the updated 2016 strategy (following a stakeholder workshop) to encourage delivery of multifunctional green space in new developments and to promote environments which support social interaction and active living.

Action plans

For the 2010 strategy, twelve action plans were prepared at neighbourhood level, describing the actions required to provide more homes with sufficient access to good quality green spaces. They also specified a timescale for each action, the lead organisation, funding sources and an estimated cost. The action plans were prepared by the Council's planning department, and consultation was sought with Neighbourhood Partnerships (groups made up of local public service representatives and citizens) and the wider community.

Responsibilities and funding

Council's planning department is in charge of preparing and updating the strategy and associated audit and action plans. The steering group has representation from the Neighbourhood Partnership teams and other departments, including the Parks and Green Spaces Department. The action plans are either resourced internally by different departments or externally, e.g., national cycle charity Sustrans has contributed funds to improve some of the green corridors, while other actions have been funded through residential developer contributions either on- or off-site.

Support factors: policy mandate, consultation, collaboration

The clear mandate provided by national planning policy has been an important factor in supporting the open space strategy's development and implementation. Further, a high level of consultation on the audit and strategy took place. Council staff actively consulted with people at a variety of places (farmers markets, gala days, community councils, Neighbourhood Partnership meetings, etc.). Other stakeholder groups were approached via email and post, including entrepreneurs, environmental and youth groups. Children and young people were invited to participate at schools and clubs, as well as parents in other organisations across Edinburgh (↖Social Inclusion).

Finally, collaboration between the planning department and other departments in preparing the audit, strategy, and action plans has ensured its coordinated usage, and also improved cross-department collaboration and strategic investment in green spaces. The strategy will be updated every five years and provide a basis to monitor and evaluate development of the city's green spaces.

A take-home message from Edinburgh is that knowing your green space resources, including their uses, accessibility, and quality, pays off when it comes to strategically aligning public and private investment in the city's natural environment.

Find out more...

Open Space 2021: Edinburgh's Open Space Strategy. The City of Edinburgh Council, 2016.

Audits and Locality Action Plans

Planning Advice Note 65: Planning and Open Space. Scottish Government, 2008.

How Neighbourhood Partnerships Work. Overview on the Edinburgh Neighbourhood Partnership website.

BOX E5: ACTION PLANNING FOR BIODIVERSITY, LISBON

As part of the UN Decade for Biodiversity (2011-2020), the municipality of Lisbon, Portugal, decided to take action and aim for an ambitious 20% improvement in its potential biodiversity by 2020 relative to its 2010 levels. For this purpose, the municipal strategy 'Biodiversity in the City of Lisbon, a strategy for 2020' was formulated in 2012, soon followed by the 'Local Action Plan for Lisbon Biodiversity' in 2015.

The action plan is designed not only to implement the strategy's biodiversity objectives, but also to indirectly impact improvements in environmental quality, climate change adaptation, resident well-being and city competitiveness (↖Climate Change Adaptation, Green Economy). The plan is intended to be coordinated at a regional scale, whereas specific actions are defined at local scale. The action plan defines and details actions related to three main areas.

1. Improving environmental awareness:

- *Awareness and education campaigns targeting local governments, schools and the public.*
- *Training for potential biodiversity guides.*
- *Organisation of yearly events.*

2. Creating and sharing knowledge:

- *Support for international conferences focused on urban biodiversity.*
- *Partnerships with universities on internships, and Master and Doctoral degrees focused on green connectivity, animal behaviour, and ecosystem services modelling and monitoring.*

3. Specific green space management actions:

- *Increasing the number of public green spaces.*
- *Increasing connectivity within medium-sized and large green spaces Increasing green connectivity with peripheral municipalities.*
- *Ecological restoration actions Increasing structural and floristic diversity in green spaces.*
- *Creating biodiversity hotspots and wildscapes, and renaturalising streams.*

A network of municipal allotment gardens (established in 2007) has been implemented in existing or new green spaces in the city, or integrated into the urban fabric, in order to promote ecological connectivity between existing green spaces. This has contributed to a landscape mosaic with great potential for supporting biodiversity.

Innovative monitoring approach

The action plan is employing the City Biodiversity Index (CBI, ↖Toolbox T1) and two monitoring campaigns (scheduled for 2017 and 2020) to monitor and evaluate its performance (↖Implementation). Based on the CBIs used in Curitiba, Brazil, and Singapore, the Lisbon municipality, in cooperation with the Municipal Agency for Energy and the Environment (Lisboa e-nova), created its own version specific to the local context. The CBI comprises 23 indicators, with sub-indicators divided into three main categories: biodiversity, ecosystem services, and governance.

Tagus Estuary: the north shore of the estuary is part of a natural marshland area of high ecological interest. It will be restored as part of Lisbon's local action plan for biodiversity.
Credit: CML Website / Sítio da CML www.cm-lisboa.pt

Biodiversity Route: a guide to a 14 km walking route, connecting Monsanto Forest Park to the Tagus river. It was prepared as part of Lisbon's strategy to promote biodiversity awareness and education.
Credit: CML Website / Sítio da CML www.cm-lisboa.pt

Implementation

The Lisbon municipality intends to involve non-governmental actors in implementing the action plan through events and activities by fostering partnerships with companies, NGOs and universities, as well as promoting volunteering (⇱Engaging stakeholders).

Expected challenges to the plan's implementation include the likelihood of divergent interests between stakeholders and political parties, and densification of the city's urban fabric, which is leaving less and less room for biodiversity promotion. Furthermore, the country's ongoing economic crisis seriously limits the city's budget.

At the same time, the economic crisis has increased demand for green spaces within the city, close to citizens' homes. This presents an opportunity for city officials to generate citizen interest in volunteer projects, e.g. eradicating invasive plants and carrying out projects in partnership with companies, NGOs and universities to minimise costs (⇱Green Economy). Lisbon's action plan has been met with growing interest from research institutions and environmental NGOs. Furthermore, other municipalities have signalled interest in cooperating with the municipality to set up similar approaches.

Find out more...

Local Action Plan for Lisbon's Biodiversity (in Portuguese). Câmara Municipal de Lisboa, 2015.

BOX E6: ENHANCING UGI THROUGH DIY, BERLIN

Berlin's Urban Landscape Strategy (ULS), published in 2012, is a strategic vision that focuses on harnessing the potential of the city's wealth of public green spaces to improve the city's quality of life and strengthen its image. One of three major themes is 'Productive Landscape', which concentrates on leveraging the long-standing do-it-yourself (DIY) culture of the city to improve the productivity of public green space while also fostering public engagement, creative recreational uses and place identity.

Actors and objectives

The ULS was developed based on a Senate mandate to integrate green and open space planning instruments in the interest of strengthening the city's resilience. The strategy was developed by the Senate Department for Urban Development and the Environment in conjunction with two commissioned landscape planning and architecture firms. Consultation was undertaken through events with a wide range of stakeholders, e.g., administrative officials, local NGOs, real estate developers, and people interested in cultural and historical site preservation. Furthermore, discussions took place with experts in green space planning and management as well as with the coordinators of other strategic plans (e.g., the Biodiversity Strategy Berlin).

The strategy also seeks to activate more non-state-actor engagement in urban green space development and maintenance in innovative ways, particularly in relation to fostering social and cultural activities, food production, urban cooling and biomass production (⇱Climate Change Adaptation). Implementation of the Productive Landscape approach relies strongly on communicating the potential of urban green spaces via a discourse platform and exemplary projects, many of which have already been put into practice.

Example: Urban Pioneers on the Tempelhofer Feld

One of the pilot projects illustrating the Productive Landscape theme was the 'Urban Pioneers' project on the Tempelhofer Feld, a former airfield that is now one of Berlin's largest public parks. The project involved around 20 temporary uses of space, including gardening, culture and art initiatives, and learning and sport facilities. Each of the pioneer uses was proposed, implemented and maintained by individuals and groups from the local community (⇱Implementation). The idea was that these temporary uses could contribute towards the park's sustainability aims, kick-start its development, and shape its appearance and image in a positive way (⇱Green Economy).

Some of them have been very successful, for instance the Allmende-Kontor community garden, which grew from 10 raised beds in 2011 to 250 in just a few years. It is now actively used by over 500 members, and connected to a network of community gardens elsewhere in Germany.

Collage illustrating the visionary character of Berlin's Urban Landscape Strategy. *Credit: Projektbüro Friedrich von Borries und bgmr Landschaftsarchitekten on behalf of the Senatsverwaltung für Stadtentwicklung und Umwelt Berlin*

In part due to the creative spirit fostered by these projects, place attachment to the park grew quickly and strongly. A top-down driven, long-term master plan for development along the park's edges was met with much community opposition, resulting in a citizen referendum in 2014 that vetoed the City's plans, and an intensive, two-year participation process for the park's future development.

Success factors and challenges

One factor contributing to the success of the ULS has been the brand of the strategy itself (logo, images, name and the associated culture that they together elicit), which helped to add weight and legitimacy to project ideas and facilitate communication between governmental and non-governmental actors. The strategy has also been supported by other administrative units, partly because it refers to many existing plans and programmes with stronger mandates.

Another success factor was that the city allocated significant funds to implementing the ULS: €10 million in total.

In public spaces such as the Tempelhofer Feld, one challenge is that green space departments need to allocate resources towards organising, supporting, and monitoring DIY initiatives, which makes such projects cost- and personnel-intensive. Balancing a range of activities at available spaces and preventing people from getting too attached to temporary uses are further challenges.

Berlin's existing DIY culture and the readiness of citizens to initiate and take responsibility for projects has been essential to implementing the Urban Landscape Strategy, in this way supplementing declining city resources. This case study also shows that ongoing investment of time and resources is needed if authorities and citizens are to work together in more productive and harmonious ways.

Find out more...

Urban Landscape Strategy Berlin. Senatsverwaltung für Stadtentwicklung und Umwelt, 2012.

Grünanteil website. German-wide online network for bottom-up urban green space initiatives, including urban gardens.

Both in German.

Nuture Mini ART Golf, one of the 20 'Urban Pioneer' projects on the Tempelhofer Feld. The mini-golf course was built by artists using recycled materials and is almost entirely run on renewable energy.
Credit: Emily Rall

TOOLBOX

T1: Tools for Protecting Biodiversity
T2: Tools for Promoting a Green Economy
T3: Tools for Increasing Social Cohesion
T4: Tools for Green-Grey Integration
T5: Tools for Connectivity
T6: Tools for Multifunctionality
T7: Tools for Social Inclusion
T8: Funding Tools and Mechanisms

T1: TOOLS FOR PROTECTING BIODIVERSITY

METHOD/ TOOL	WHAT FOR?	SCORING SYSTEM	FIND OUT MORE
City Biodiversity Index (CBI)	Also known as the Singapore Index on Cities' Biodiversity, the CBI is a tool designed for cities to monitor and evaluate their progress and performance on conserving and enhancing biodiversity and ecosystem services. Suitable for: city-wide scale	CBI includes 23 indicators divided into 1) native biodiversity, 2) ecosystem services, and 3) governance and management of biodiversity. For each indicator, the CBI manual proposes a score of 0-4 points, where 0 corresponds to poor performance and 4 to excellent.	**CBI website**
Wildlife Friendly Development Certification programme	Programme designed for use prior to a new development project, to initiate an early dialogue between developers and biologists and to identify important natural resources. Projects are evaluated using criteria which allocate points during the design, construction and post-construction phases. Suitable for: neighbourhood/site scale	The scoring criteria are divided between two sections: 1) Development Conservation Design, and 2) Development Construction and Post-Construction, which the applicant uses to assess progress towards certification and make any adjustments to the project necessary. If an applicant earns less than 50% of the applicable points from each section, the certification process cannot continue.	**Wildlife Friendly Development Certification website**
Biotope Area Factor, Berlin (BAF)	The BAF provides minimum ecological standards for new development and alterations or additions on a site. It considers protection of ecosystems, biotopes and species as well as landscape appearance and recreational use. Suitable for: site scale in built-up areas	The BAF is the area of a site that hosts species or performs other ecosystem functions, expressed as a ratio in relation to the total site area. BAF values can be used to define a minimum standard to be achieved when a site is redeveloped.	**BAF description, on the Berlin Senate Department for Environment, Transportation and Climate Protection website**

T2: TOOLS FOR PROMOTING A GREEN ECONOMY

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
Business mapping in and around urban green spaces	Method to map and analyse the kind of businesses located in and around green spaces. Data on businesses and their addresses is relatively easily accessible, e.g. from OpenStreetMap (OSM). The user needs to select a buffer zone – indicating a certain range of proximity to a green space within which a relationship is expected.	**Cash flows generated by urban green spaces: methods for identifying indirect values of UGI.** GREEN SURGE Deliverable 4.2. Andersson, E., Kronenberg, J. et al., 2015. pp18-19 and pp26-27.
Identification of R&D offices and other creative companies	Method to examine where companies in the creative industries, and/or those engaged in research and development (R&D), are located relative to urban green spaces.	**Cash flows generated by urban green spaces: methods for identifying indirect values of UGI.** pp22-21.
Hedonic pricing	Method to assign value to non-market components of real estate sales or rental prices. A model is used to calculate the impacts of different variables on property sales or rental prices, usually including structural, geographic and environmental attributes of these properties and their surroundings. The latter ones are most often associated with distances to different types of urban green spaces.	**Cash flows generated by urban green spaces: methods for identifying indirect values of UGI.** pp29-30.
InVEST	Open source software to map and assess the monetary value of ecosystem services. Results can also be non-monetary (e.g., tonnes of carbon sequestered).	**InVEST website**
i-Tree	Software package from the USDA Forest Service that provides urban forestry analysis and benefits assessment tools.	**i-Tree website**

T3: TOOLS FOR INCREASING SOCIAL COHESION

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
Accessible Natural Greenspace Standard (ANGSt)	Sets benchmarks for the accessibility of green space (e.g., maximum distance to parks and area of parks or woodlands per capita).	**Nature Nearby. Accessible Natural Greenspace Guidance.** Natural England, 2010.
URGE criteria and indicators for social assessments of urban green spaces	Completed EU project to develop green spaces in the interest of improving the quality of life in cities and urban regions. Among its outputs is a catalogue containing criteria, indicators and suggested methodologies for use in assessing the social aspects of urban green spaces.	**Social Criteria for the Evaluation and Development of Urban Green Spaces.** Coles, R., Caserio, M., 2001.
Public Benefits Recording System (PBRS)	Tool for strategic planning and investment that aims to identify synergies between social, economic and environmental needs and opportunities, using GIS software.	**PBRS Website** Example Report: **Lancashire Green Infrastructure Strategy. Public Benefit Assessment. Project Report.** PBRS, 2008.
Social Cohesion Radar	Measures a country's social cohesion based on three domains (social relations, connectedness, and focus on the common good) and nine dimensions.	**Project summary** **Social Cohesion Radar. Measuring Common Ground. An International Comparison of Social Cohesion.** Bertelsmann Stiftung (Ed.), 2013.
Social Cohesion Policy News	Review system to measure the state of social cohesion in a country (based on indicators in three dimensions: social inclusion, social mobility, social capital) and to identify policies that can strengthen or improve social cohesion.	**OECD social cohesion policy reviews. Concept Note.** OECD, 2014.

T4: TOOLS FOR GREEN-GREY-INTEGRATION

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
Minnesota Stormwater Manual	This online source provides a comprensive overview of popular stormwater modelling software to assist with selecting the right one for your purposes. A selection of possible tools is outlined below.	**Minnesota Stormwater Manual website**
SUSTAIN - Systems for Urban Stormwater Treatment and Analysis Integration	Decision support tool evaluating optimal location, type and cost of the stormwater management practices needed to meet water quantity and quality goals. Note that EPA support for newer versions of SUSTAIN for later version of Windows or ArcGIS has ended.	**SUSTAIN website**
RECARGA	Design tool developed by the Wisconsin Department of Natural Resources for performance evaluation of bio retention facilities, rain gardens and infiltration basins.	**RECARGA website**
P8 - Program for Predicting Polluting Particle Passage through Pits, Puddles & Ponds	Models the generation and transportation of pollutants through urban runoff and the effectiveness of green infrastructure for improving water quality.	**P8 website**
SWMM - EPA Stormwater Management Model	Supports planning, analysis and design concerning stormwater runoff, combined sewer overflows and drainage systems.	**SWMM website**
MUSIC - Model for Urban Stormwater Improvement Conceptualisation	Models stormwater system performance to assist in selecting an appropriate strategy.	**MUSIC website**
WinSLAMM - Source Loading and Management Model for Windows	Evaluates stormwater pollution and runoff volume at the area where runoff is generated and the effectiveness of a range of control measures, including infiltration/ biofiltration basins, street cleaning, wet detention ponds, grass swales, filter strips, porous pavement, catchbasins, water reuse, and various proprietary devices.	**WinSLAMM website**
i-Tree Hydro	Simulates the effect of trees and green cover on water quality. Designed to be simple enough for non-experts to use.	**i-Tree Hydro website**

T5: TOOLS FOR CONNECTIVITY

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
Corridor Design	A platform offering access to CorridorDesigner (a basic ArcGIS toolbox for creating corridor models) and links to a range of other GIS tools to model, map and assess ecological connectivity, corridors, or habitats.	**Corridor Design website**
SCALETOOL	Part of the SCALES project (Securing the Conservation of biodiversity across Administrative Levels and spatial, temporal, and Ecological Scales), this is a platform offering methods and tools to assess ecological connectivity at various scales, as well as a connectivity learning module, background reading material and links to other resources online. Also useful for assessing and monitoring biodiversity.	**SCALETOOL website**
Corridor Toolbox	The Connectivity Conservation Specialist Group offers a toolbox including links to software, technical papers and web resources useful for ecological connectivity.	**Corridor Toolbox, on the Connectivity Conservation Specialist Group website**
Green Walkable City Plan	Stockholm's Green Walkable City Plan (Den gröna promenadstaden) has a particular focus on connecting residents to green (and blue) areas, with identified focus areas and defined strategies, as part of the comprehensive city plan 'The Walkable City: Stockholm City Plan'. An English summary of the comprehensive plan and an article describing the Green Walkable City Plan are available online.	**Stockholm City Plan website** (English summary) **The Walkable City: Stockholm City Plan, 2010.** (in English) **Green Walkable City Plan, 2013** (in Swedish) **Planning the Green Walkable City: Conceptualizing Values and Conflicts for Urban Green Space Strategies in Stockholm.** Littke, H., 2015.
Accessible Natural Greenspace Standard (ANGSt)	Sets benchmarks for the social accessibility and connectivity of green space (e.g., maximum distance to parks and area of parks or woodlands per capita). Also useful as part of evaluating a community's social cohesion.	**'Nature Nearby' Accessible Natural Greenspace Guidance.** Natural England, 2010.

T6: TOOLS FOR MULTIFUNCTIONALITY

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
GreenKeys@YourCity – A Guide for Urban Green Quality	Manual, toolbox and e-learning module published by the IOER Leibniz Institute of Ecological and Regional Development, Dresden. See in particular monitoring and project evaluation tools.	**GreenKeys website.** Green Keys Team, 2008.
Green Flag Award	Benchmark standard for parks and green spaces in the UK. It is based on 27 criteria across eight categories, including, among others, benefits for humans, sustainability, and conservation of biodiversity and heritage. The diversity of the criteria promotes a multifunctional approach to assessing the capacity of green spaces. Applicants are required to demonstrate their understanding of the site's users, the site itself and its special characteristics (whether historical, social or physical), and their long-term management strategies.	**Green Flag Award website**
The Mersey Forest Multifunctionality GIS mapping	A GIS mapping approach developed by a UK-based network of woodlands and green spaces. The methodology includes assessing data needs and acquiring data, ahead of mapping green infrastructure, its various functions and benefits, and associated needs. It is designed to be adaptable to a range of different projects and scales.	**The Value of Mapping Green Infrastructure.** The Mersey Forest, 2011.

T7: TOOLS FOR SOCIAL INCLUSION

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
TOOLS FOR ASSESSMENT AND VALUATION		
Stakeholder Analysis	Method to ensure that relevant stakeholders are contacted in an action-planning project.	**The URBACT II Local Support Group Toolkit**, p64-65.
Importance/ Influence Matrix	Method to prioritise stakeholders, as well as to think about the right approach to take with each of them. Often used in combination with a stakeholder analysis.	**The URBACT II Local Support Group Toolkit**, p66-67.
TOOLS FOR PARTICIPATING IN PLANNING		
Forestry Commission public engagement toolbox	Resources and guidance for fostering public participation in planning, prepared by the UK-based Forestry Commission. The toolbox is aimed at managers of forests and woodlands, but also useful for other practitioners involved in green space planning and management.	**Public engagement toolbox on the Forestry Commission website**
Community planning methods	The community planning website provides an A to Z of possible methods to employ for greater social inclusion in the planning process. Selected options are outlined below.	**Community Planning website**
Charette or 'inquiry by design' workshop	A workshop where stakeholders come together to identify issues, deliberate about preferred outcomes and create plans for the future.	**Engaging Communities Toolkit.** West Lothian Community Planning Partnership, 2015, p15.
Citizens' juries	A group of citizens is selected, based on special criteria, as a representative cross-section of a wider community. Much like a jury in a legal context, they are required to meet as a group, receive information, deliberate together and ultimately make recommendations about an issue of public importance.	**Active Democracy website**
Photovoice	Cameras are provided to community members to identify and record their community's situation and experiences through photography. The emphasis on visual objects makes it easier for populations without strong command of the local language to participate.	**Community Toolbox website: Implementing Photovoice in Your Community**
Participatory Budgeting	City residents are given the chance to decide how to spend part of a municipal budget. Besides increasing transparency and educating citizens about the costs of public management, this can increase engagement and empowerment.	**Participatory Budgeting Project website**
Neighbourhood Green Plans	Communities work together on developing projects and/ or plans for more livable neighbourhoods. Examples range from more traditional, top-down approaches with strong community involvement to completely community-led initiatives which then go for city council approval.	**How to resource your neighbourhood plan.** Planning Aid. **A Guide for Developing Neighbourhood Plans (Neighbourhoods Alive!).** Manitoba Government, 2002.
PPGIS	**For flexible mapping:** options include Wikimapping (free), ArcGIS Story Map Crowdsource℠ app (license-based) and Maptionnaire (paid subscription). **For citizens' requests and complaints:** options include Fix My Street and Improve My City (both free).	**Wikimapping** **ArcGIS Story Map Crowdsource℠** **Maptionnaire** **Fix My Street** **Improve My City**

T8: FUNDING TOOLS AND MECHANISMS

METHOD/ TOOL	WHAT FOR?	FIND OUT MORE
Business use of public spaces	Businesses pay a fee for the right to use public green space for commercial profit, such as for running a park café (e.g., in the form of a lease or licence).	Example: **Business Use of Public Spaces.** Randwick City Council, Australia.
Business improvement districts (BIDs)	Business-led partnerships that manage privately-owned areas. They are based on a majority of businesses (either land owners or tenants) agreeing to pay a member contribution. Related greening initiatives can serve the public good but are primarily motivated by increased value return to owners and investors, and should be deployed with caution, as they may grant exclusionary rights to these parties.	Example: **Green benefits in Victoria business improvement district.** Rogers et al., 2012.
Compensation schemes	Such schemes include requiring private land owners to compensate for any impact on public goods caused by their activities (such as Biodiversity Offsets), or offering alternative plots of land or financial compensation in exchange for their land if they do not intend to manage it in line with local authorities' requirements.	Example: **Biodiversity Offsets.** UNDP 2016.
Rain tax	Paid by a land owner based on the volume of surface runoff from their property.	**Wastewater taxes.** ECOTEC 2001.
Payments for ecosystem services (PES)	Financial incentive where ecosystem services (ESS) are purchased from ESS providers to ensure ecosystems are managed in a way that maximises the delivery of a particular service.	**Payments for ecosystem services.** UNEP 2008.
Public-private-partnerships (PPP)	Local authorities have the option of providing incentives to enhance collaboration with the private sector and enable more flexible conditions for investment. A win-win-situation for both partners is key to a successful PPP.	Example: ⇱Box C7 Lodz.
Competitions, award schemes	Local, regional, national, and international governments or organisations may organise these to encourage investment in UGI.	Examples: **European Green Capital Award** **Green Flag Award**
Charity events and activities (e.g. funruns)	Undertaken by non-profit organisations such as 'friends of parks' groups.	Example: **Glasgow City Council. Friends of Glasgow Parks.**
Sponsorship	Companies, communities or individuals may 'adopt' trees or green spaces.	Example: **Million Trees NYC.**
Green bonds	Fixed-income investors provide funds to support bank loans for eligible projects, e.g., those seeking to mitigate climate change or to help affected communities adapt to it. For instance, the Green Infrastructure Investment Coalition (GIIC) brings together investors, governments, green infrastructure developers and development banks to help increase the flow of capital to green infrastructure around the world.	Example: **Green Infrastructure Investment Coalition**

APPENDIX

List of contributors

LIST OF CONTRIBUTORS

CONTRIBUTOR	AFFILIATION	CONTRIBUTIONS TO
Andersson, Erik	Associate Professor at Stockholm Resilience Center (SRC) Stockholm University, Sweden	Green Economy, Assessing UGI networks
Branquinho, Cristina	Associate researcher at Ce3C - Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências de Lisboa (FFCUL), Portugal	Climate Change Adaptation
Brinkmeyer, Daniel	Researcher at Chair of Ecosystem Science/Plant Ecology, Technical University of Berlin (TUB), Germany	Box C6
Caspersen, Ole Hjorth	Senior researcher at Institut for Geovidenskab og Naturforvaltning, Landskabsarkitektur og planlægning Københavns Universitet (UCPH), Denmark	Box E3
Chapman, Eleanor	Assistant researcher at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Editorial, layout, intro, Part A, C, D
Cvejić, Rozalija	Researcher at Biotehniška fakulteta Univerza v Ljubljana (UL), Slovenia	Social Inclusion, Box B5, C8
Davies, Clive	Visiting Professor at Dipartimento di Scienze Agro-Ambientali e Territoriali (Di.S.A.A.T.) Università degli Studi di Bari 'Aldo Moro' (UNIBA), Italy	Connectivity
Delshammar, Tim	Landscape architect at City of Malmö, Street and Parks Department, Sweden	Integration, Box E1
DeBellis, Yole	Assistant at Dipartimento di Scienze Agro-Ambientali e Territoriali (Di.S.A.A.T.) Università degli Studi di Bari 'Aldo Moro' (UNIBA), Italy	Connectivity Box C5, E2
Erlwein, Sabrina	Student assistant at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Editorial, layout of Field Test Version 1.0, Connectivity Box C5, E6
Fohlmeister, Sandra	Researcher at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Concept, editorial of Field Test Version 1.0
Gentin, Sandra	Teaching Assistant Professor at Institut for Geovidenskab og Naturforvaltning, Landskabsarkitektur og planlægning Københavns Universitet (UCPH), Denmark	Box E3
Geroházi, Éva	Researcher at Metropolitan Research Institute (MRI), Hungary	Social Inclusion, Box B1
Hansen, Rieke	Researcher at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Concept, editorial, layout (also Field Test Version 1.0), Part A, C, D, Multifunctionality, Box B3, B4, C4, E6
Kronenberg, Jakub	Associate Professor at Faculty of Economics and Sociology Uniwersytet Lodzki (ULOD), Poland	Green Economy, Box C7
Lafortezza, Raffaele	Senior Researcher/Associate Professor at Dipartimento di Scienze Agro-Ambientali e Territoriali (Di.S.A.A.T.) Università degli Studi di Bari 'Aldo Moro' (UNIBA), Italy	Connectivity
Luz, Ana Catarina	Post-doctoral researcher at Ce3C-Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências de Lisboa (FFCUL), Portugal	Climate Change Adaptation, Green Economy, Box A1, B7

CONTRIBUTOR	AFFILIATION	CONTRIBUTIONS TO
Nastran, Mojca	Researcher at Department for forestry and renewable forest resources, Biotechnical Faculty University of Ljubljana (UL), Slovenia	Social Inclusion, Box B5
Pauleit, Stephan	Professor at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Concept, editorial, Climate Change Adaptation, Box B2
Pintar, Marina	Professor at Biotehniška fakulteta Univerza v Ljubljana (UL), Slovenia	Box B5
Rall, Emily	Researcher at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Concept, editorial, Part A, C, D, Social cohesion, Integration, Snapshot B3, C1, E6
Rolf, Werner	Researcher at Chair for Strategic Landscape Planning and Management Technical University of Munich (TUM), Germany	Concept, Connectivity, Box B4, C2
Santos, Artur	Researcher at Ce3C-Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências de Lisboa (FFCUL), Portugal	Biodiversity, Climate Change Adaptation, Green Economy, Box E5
Santos-Reis, Margarida	Scientific coordinator at Ce3C-Centre for Ecology, Evolution and Environmental Changes, Faculdade de Ciências de Lisboa (FFCUL), Portugal	Climate Change Adaptation, Box A1
Stahl Olafsson, Anton	Assistant professor at Institut for Geovidenskab og Naturforvaltning, Landskabsarkitektur og planlægning Københavns Universitet (UCPH), Denmark	Multifunctionality, Box E3
Száraz, Luca	Researcher at Metropolitan Research Institute (MRI), Hungary Now: Institutionen för landskapsarkitektur, planering och förvaltning, Sveriges lantbruksuniversitet (SLU), Sweden	Integration, Climate Change Adaptation, Social Cohesion, Box B1, C3
Tosics, Iván	Managing director at Metropolitan Research Institute (MRI), Hungary	Social Inclusion, Box B6, C6
Van der Jagt, Alexander	Researcher at Land Use and Ecosystem Services Group Centre for Ecosystems, Society and Biosecurity, Forest Research (FCRA), United Kingdom Now: Copernicus Institute of Sustainable Development, Utrecht University, The Netherlands	Box A3, A4, E4
Vierikko, Kati	Post-doctoral researcher at Department of Environmental Sciences Helsingin Yliopisto (UH), Finland	Biodiversity, Box A2
Železnikar, Špela	Researcher at Department of Agronomy, Biotechnical Faculty University of Ljubljana (UL), Slovenia	Box B5